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Software Engineering — Recommended Practice for the Internet — Web Site Engineering, Web Site Management, and Web Site Life Cycle

Ingénierie du logiciel — Pratique recommandée pour Internet — Ingénierie du site web, management du site web, et cycle de vie du site web



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IEEE Standards

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IEEE Recommended Practice for the Internet—Web Site Engineering, Web Site Management, and Web Site Life Cycle

IEEE Computer Society

Sponsored by the
Internet Best Practices Working Group

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IEEE Recommended Practice for the Internet—Web Site Engineering, Web Site Management, and Web Site Life Cycle

Sponsor

Internet Best Practices Working Group
of the
IEEE Computer Society

Approved 21 January 2003

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IEEE-SA Standards Board

Abstract: Recommended practices for World Wide Web page engineering for Intranet and Extranet environments, based on World Wide Web Consortium (W3C®) and related industry guidelines, are defined in this recommended practice. This recommended practice does not address stylistic considerations or human-factors considerations in web page design beyond limitations that reflect good engineering practice.
Keywords: Extranet, Internet, Intranet, Web page, Web site, Web site engineering, Web site life cycle, Web site management, well-engineered Web page, World Wide Web

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Introduction

(This introduction is not part of IEEE Std 2001-2002, IEEE Recommended Practice for the Internet—Web Site Engineering, Web Site Management, and Web Site Life Cycle.)

The World Wide Web is expanding and its value is increasing as a method for locating and delivering information. This creates a significant engineering challenge. Locating applicable information requires that indexing information be incorporated into Web page development. Once an applicable page has been located, essential information may not be present, resulting in user frustration and a failure of the Web application to meet its purpose.

This is a revision of the 1999 accumulation of Web site management "recommended practices." This revision is based on IEEE Std 2001-1999, extending it based on recommendations since it was developed, addressing "site-wide" issues as well as "managed" Web sites (as opposed to just Intranet and Extranet sites). These can serve to improve the effectiveness of Web pages for users, Web page developers, and the value of the Web in corporate and organizational applications. This recommended practice is focused on managed Web sites, Intranet (within an organization), and Extranet (between a group of collaborating organizations). Other projects are being evaluated by the Internet Best Practices working group (IBPwg) within the IEEE Computer Society. See http://dx.doi.org/10.1041/standard/2001 for current details.

Web page engineering often is done with little consideration for the immediate or ongoing implications of Web site design or implementation. Some sites reflect "state of the art" delivery that can only be accessed with the most recent tools. This may be inconsistent with the business objectives for that site. Some sites will languish beyond their applicable life, occupying valuable resources (particularly as these are incorporated into organizational indexes, and delivered as prospective "query returns" by indexing and search services). Poor Web page engineering results in lost productivity and user frustration, and can result in legal liabilities.

There is no clear prediction of when the World Wide Web or a specific site will be obsolete. There is a legitimate engineering concern that this lifespan may be significantly underestimated or disregarded entirely in many Web site designs. Vendor products—past and future versions, format preferences, or selection of implementation languages—may require future re-engineering as vendors and products fade. Corporate Web sites may not need to live beyond the life of the corporation, however, public sector and other institutional sites may well span centuries. A significant portion of the content of these sites may not require updating, except in cases of shortsighted design. The Magna Carta and the works of Shakespeare are examples of fairly stable content.

The recommended practices and requirements set forth in this recommended practice are aimed to reduce the risks associated with Web page investments. Further revision of this recommended practice is expected, partially to reflect changes in the Web environment, but also to reflect increased understanding of "recommended practices" in Web page engineering. There is a popular awareness of "Web years," characterized by rapid advances in the platform technology for clients and servers. There is a potentially expensive, misinformed conclusion that might be drawn from this, which is that Web pages (and more directly, information content and services delivery) either are, or should, move forward at this same rate. Some of today's Web pages will warrant long-term retention, and within the context of business operations (which is the core of managed sites), re-engineering of last year's Web pages is an investment that requires justification. The value of Web-based operations is the delivery of the right information and services to the right persons at the right time with the least amount of effort. Success in Web-based operations is based more on engineering design in response to an understanding of the target-user community and information, than it is on the rapidly evolving technology for Web platforms.

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IEEE Recommended Practice for the Internet—Web Site Engineering, Web Site Management, and Web Site Life Cycle

1. Overview

This recommended practice provides guidance for designing and implementing well-engineered Web pages for use in managed Web sites. The goal of this recommended practice is to improve the productivity of managed Web operations in terms of:

a) locating relevant information,
b) facilitating ease of use,
c) reducing legal liabilities, and
d) providing for efficient development and maintenance practices.

This recommended practice will focus on vendor- and product-independent considerations.

This recommended practice provides guidance for persons designing and developing Web pages, and managers responsible for establishing guidelines for Web site development.

1.1 Scope

This document defines recommended practices for World Wide Web page engineering for Intranet and Extranet environments, based on World Wide Web Consortium (W3C®) and related industry guidelines.

This recommended practice does not address stylistic considerations or human-factors considerations in Web page design beyond limitations that reflect good engineering practice. Annex B contains topics which are not sufficiently mature or where there are not specific recommendations for inclusion in the current issue of this recommended practice.

1.2 Purpose

This recommended practice is intended to provide guidance to Web page developers in Intranet (organizational internal), and Extranet (amongst a limited domain of organizational participants) Web environments on recommended practices for Web page engineering. The objective is to improve the productivity of Intranet/Extranet Web operations in terms of locating relevant information, and efficient development and maintenance practices.

The 2002 revision of this recommended practice addresses items identified in Annex A of IEEE Std 2001-1999 [B14][1] which can be well-defined and to respond to emerging technology and changes in practice that have resulted in new material or changes to approved recommendations. Conformance to this recommended practice in developing and publishing a Web site provides a basis for a well-engineered Web site.

[1]The numbers in brackets correspond to those of the bibliography in Annex A.

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1.3 Conformance

This recommended practice defines two forms of conformance: "IEEE Std 2001-2002-conforming Web page" and "IEEE Std 2001-2002-conforming Web page generation tool." Throughout this recommended practice, the use of the verb *shall* indicates a requirement of the standard; the use of the verb *should* indicates a recommendation; and the use of the verb *may* indicates an option or variation that is permitted by the recommended practice. Although users of this recommended practice are strongly encouraged to consider the recommendations made within, the implementation of recommendations is not a requirement of Web page conformance.

1.3.1 IEEE Std 2001-2002-conforming Web page

A conforming Web page implements all the requirements of this recommended practice. A Web page that conforms to this recommended practice may indicate this by the use of the following tag:

```
<span class="IEEEstd2001">

      <a href= "http://dx.doi.org/10.1041/standard/2001/2002/logo/use"

           <img src= "http://dx.doi.org/10.1041/standard/2001/2002/logo"

           alt="IEEE Computer Society Best Practices axV2 Logo"

           width="80" height="40" />

      </a>

</span>
```

NOTE—The HTML Reference Designator (HREF value will change with each version of this recommended practice. Tools should use the HREF value to determine the version of the standard being used.

The image file may be downloaded and referenced using relative Uniform Resource Identifiers (URIs), but the target HTML file must be referenced by an absolute URI.

Consistent with 4.1.10 of this recommended practice, a meta statement indicating conformance to this recommended practice may be included. This statement is:

```
"<meta name="guideline" content="computer.org/2001/2002" />
```

1.3.2 IEEE Std 2001-2002-conforming Web page generation tool

A product for generating well-engineered Web pages dynamically, or as an authoring tool, conforms to IEEE Std 2001-2002 if it satisfies all of the following conditions:

a) It generates pages that conform to the XHTML DTD recommendation of the W3C, or it documents which DTDs it supports.
b) It generates pages which comply with the DTD selection of the user.
c) For versions HTML 3.2 and higher, or XML; it supports Cascading Style Sheets (CSS) 1.0 or higher, or it supports XSL and, in either case, it documents the use of this function and identifies which recommendations are supported.
d) It generates pages that conform to all of the requirements, recommendations, and options of this recommended practice. Tools may allow for creation of non-conforming pages as a user option (in which case the IEEE 2001 tag cannot be included on the page.)
e) It supports the Web Consortium's Authoring Tool Accessibility Guidelines (see 2.8).

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2. References

This recommended practice shall be used in conjunction with the following publications. When the following specifications are superseded by an approved revision, the revision shall apply. See Annex A for informative bibliographic references. Uniform Resource Locators (URLs) provided in this recommended practice are current as of the date submitted for publication[2]. See http://dx.doi.org/10.1041/standard/2001/2002/references for a list of normative and informative reference URLs on-line.

36 CFR 1194 –Electronic and Information Technology Accessibility Standards, Federal Register Dec. 21, 2000; Code of Federal Regulations (CFR).[3]

Authoring Tool Accessibility Guidelines 1.0, W3C Recommendation 3 February 2000, Guidelines required by Web page generation tools to support accessibility requirements.[4]

HTML 4.01 Specification, W3C Recommendation 24 December 1999.[5, 6]

ISO 639-1:2002, Codes for the Representation of Names of Languages—Part 1: Alpha-2 Code.[7]

ISO 639-2:1998, Codes for the Representation of Names of Languages—Part 2: Alpha-3 Code.

ISO 3166-1:1997, Codes for the Representation of Names of Countries and their Subdivisions—Part 1: Country Codes.

ISO 4217:2001, Codes for the Representation of Currencies and Funds.

W3C REC-CSS1-19900111, W3C Recommendation Cascading Style Sheets, level 1—W3C Recommendation, 17 Dec. 1996, revised 11 Jan 1999.[8, 9]

W3C REC-CSS2-19980512, W3C Recommendation Cascading Style Sheets, level 2 CSS2 Specification—W3C Recommendation, 12 May 1998.[10, 11]

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[2]If direct access to W3C recommendations is not possible, they can be located from the primary site: http://www.w3.org.

[3]For information on this document, please visit http://www.access-board.gov/sec508/508standards.htm.

[4]For information on this document, please visit http://www.w3.org/TR/ATAG10/.

[5]This specification defines the HyperText Markup Language (HTML), the publishing language of the World Wide Web. This specification defines HTML 4.01, which is an update of HTML 4. In addition to the text, multimedia, and hyperlink features of the previous versions of HTML (HTML 3.2 [HTML32]—see [B60]—and HTML 2.0—see [B20]), HTML 4 supports more multimedia options, scripting languages, style sheets, better printing facilities, and documents that are more accessible to users with disabilities. HTML 4 also takes great strides towards the internationalization of documents, with the goal of making the Web truly World Wide. HTML 4 is an SGML application conforming to ISO 8879:1986 [B43].

[6]For information on this document, please visit http://www.w3.org/TR/1999/REC-html401-19991224.

[7]ISO publications are available from the ISO Central Secretariat, Case Postale 56, 1 rue de Varembé, CH-1211, Genève 20, Switzerland/Suisse (http://www.iso.ch/). ISO publications are also available in the United States from the Sales Department, American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, USA (http://www.ansi.org/).

[8]This document specifies level 1 of the Cascading Style Sheet (CSS1) mechanism. CSS1 is a simple style sheet mechanism that allows authors and readers to attach style (e.g., fonts, colors, and spacing) to HTML documents. The CSS1 language is human readable and writable, and expresses style in common desktop publishing terminology. One of the fundamental features of CSS is that style sheets cascade; authors can attach a preferred style sheet, while readers may have a personal style sheet to adjust for human or technological handicaps. The rules for resolving conflicts between different style sheets are defined in this specification.

[9]For information on this document, please visit http://www.w3.org/TR/REC-CSS1.

[10]This specification defines Cascading Style Sheets, level 2 (CSS2). CSS2 is a style sheet language that allows authors and users to attach style (e.g., fonts, spacing, and aural cues) to structured documents (e.g., HTML documents and XML applications). By separating the presentation style of documents from the content of documents, CSS2 simplifies Web authoring and site maintenance.

CSS2 builds on CSS1 and, with very few exceptions, all valid CSS1 style sheets are valid CSS2 style sheets. CSS2 supports media-specific style sheets so that authors may tailor the presentation of their documents to visual browsers, aural devices, printers, Braille devices, hand-held devices, etc. This specification also supports content positioning, downloadable fonts, table layout, features for internationalization, automatic counters and numbering, and some properties related to user interface.

[11]For information on this document, please visit http://www.w3.org/TR/REC-CSS2/.

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W3C WAI Web Content 19990505, W3C Recommendation Web Content Accessibility Guidelines 1.0, WAI Page Author Guidelines—W3C, 5 May1999.[12, 13]

XHTML™ 1.0: The Extensible HyperText Markup Language, A Reformulation of HTML 4 in XML 1.0, W3C Recommendation 26 January 2000.[14, 15]

3. Definitions, terminology, abbreviations and acronyms

3.1 Definitions

3.1.1 archival pages: On-line data that is 1) not expected to change, and 2) no longer maintained. This data also may not be readily renderable by future tools.

3.1.2 body metadata: Elements in the body of an HTML document providing administrative and/or navigational facilities for the user or administrator.

3.1.3 cookie {XE "Cookie definition of"}: A quantity used to indicate or signal to a recipient of data, significant changes in the state of the entity supplying the data. Web sites may store/retrieve cookies from user client systems to maintain state information including identification of users and transaction coherency.[16]

3.1.4 Extranet: A set of Intranets connected for specific objectives, spanning multiple organizations.

3.1.5 Intranet: A managed network operating strictly within an organization. More than one Intranet may exist within an organization, these may be isolated.

3.1.6 managed network: A network or set of networks established and controlled by one or more organizations to meet specific organizational or business needs.

3.1.7 managed Web site: A site created and maintained based on organizational guidelines.

3.1.8 mirror site: A duplicate copy of a master site maintained on a different host typically to provide redundancy, higher performance, or local access.

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[12]These guidelines explain how to make Web content accessible to people with disabilities. The guidelines are intended for all Web content developers (page authors and site designers) and for developers of authoring tools. The primary goal of these guidelines is to promote accessibility. However, following them will also make Web content more available to all users, whatever user agent they are using (e.g., desktop browser, voice browser, mobile phone, automobile-based personal computer, etc) or constraints they may be operating under (e.g., noisy surroundings, under- or over-illuminated rooms, in a hands-free environment, etc). Following these guidelines will also help people find information on the Web more quickly. These guidelines do not discourage content developers from using images, video, etc, but rather explain how to make multimedia content more accessible to a wide audience.

[13]For information on this document, please visit http://www.w3.org/TR/WCAG10.

[14]This specification defines XHTML 1.0, a reformulation of HTML 4 as an XML 1.0 application, and three DTDs corresponding to the ones defined by HTML 4. The semantics of the elements and their attributes are defined in the W3C Recommendation for HTML 4. These semantics provide the foundation for future extensibility of XHTML. Compatibility with existing HTML user agents is possible by following a small set of guidelines.

XHTML is a family of current and future document types and modules that reproduce, subset, and extend HTML 4.0. XHTML 1.0 provides the basis for a family of document types that will extend and subset XHTML, in order to support a wide range of new devices and applications, by defining modules and specifying a mechanism for combining these modules. This mechanism will enable the extension and subsetting of XHTML 1.0 in a uniform way through the definition of new modules.

[15]For information on this document, please visit http://www.w3.org/TR/xhtml1.

[16]W3C's Document Object Models (DOM) describe cookie operations within the Web document context. IETF RFC 2965:2000 [B23] describes a proposed standard for HTTP State Management based on the cookie concept.

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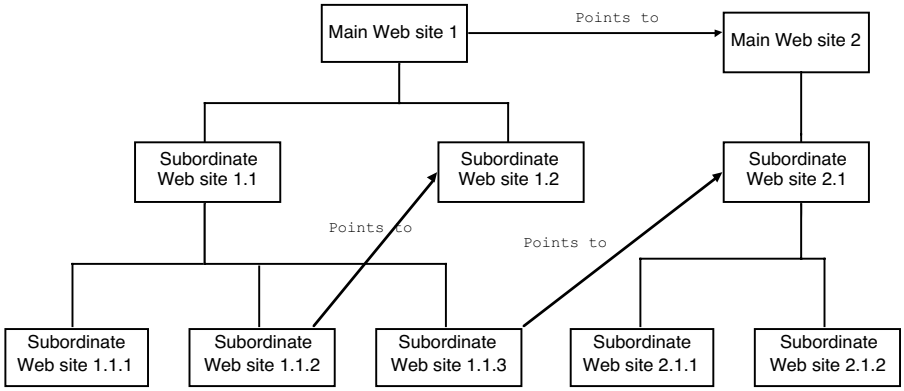
3.1.9 persistent URI: A Uniform Resource Identifier (URI) is persistent if it is a reference that does not need to change at the link in a document, and can still reach the desired object even though that object may have changed locations.

3.1.10 subordinate Web site: A site contained within another Web site.

3.1.11 Web page: A digital multimedia object as delivered to a client system. A Web page may be generated dynamically from the server side, and may incorporate applets or other elements active on either the client or server side.

3.1.12 Web site: A collection of logically connected Web pages managed as a single entity. A Web site may contain one or more subordinate Web sites. (See Figure 1 for a representative architecture that is possible for a collection of Web pages within a Web site.)



NOTE—All elements of this diagram may represent separately managed Web sites. Such management should reflect deference to the applicable policies of the organization hierarchy. Note that Web sites are not implicitly hierarchical, it is the organization hierarchy policies that may be relevant.

Figure 1—Example of a Web site architecture

3.1.13 well-engineered Web site: A Web site designed and implemented in accordance with the recommendations of IEEE Std 2001-2002.

NOTE—Frame, NoFrame and Robot are used based on the HTML 4.01 specification.

3.2 Terminology

This subclause describes terms used in a specific manner in this recommended practice. The descriptions are not intended as definitions, but rather as explanations of the special usage.

3.2.1 Rfield: The designation for a Web page segment presented within a well-engineered Web page, primarily for the human reader. Typically, the contents are not structured for machine interpretation.

3.2.2 Mfield: The designation for a Web page segment presented within a well-engineered Web page, in machine-readable format, which is not intended to be presented to the human reader.

3.2.3 RMfield: The designation for a Web page segment presented within a well-engineered Web page, structured for both machine interpretation and for presentation to the human reader.

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3.3 Abbreviations and acronyms

CSS	Cascading Style Sheets
CSS1	Cascading Style Sheets, level 1
CSS2	Cascading Style Sheets, level 2
DHTML	Dynamic HTML
DNS	Domain Name Service
DOI	Digital Object Identifier™
DTD	Document Type Definition (for XML or SGML specifications)
GIF	Graphics Interchange Format
HREF	HTML reference designator
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
IBPwg	Internet Best Practices Working Group
IETF	Internet Engineering Task Force
IP	Internet Protocol
IPR	Intellectual Property Rights
ISBN	International Standard Book Numbers
JPEG	Joint Photographic Experts Group (image format)
NMG	Network Motion Graphics
PDA	Personal Digital Assistant
PICS	Platform for Internet Content Selection
PNG	Portable Network Graphics
RDF	Resource Definition Framework
SGML	Standard Generalized Markup Language
SI Units	International System of Units: the modern metric system
TCP	Transport Control Protocol
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
URN	Universal Resource Name
UTC	Coordinated Universal Time
WAI	Web Accessibility Initiative (W3C)
W3C	World Wide Web Consortium
XHTML	Extended HyperText Markup Language
XML	Extensible Markup Language

4. Design practices

The developer of a well-engineered Web site should prepare a project plan, or follow an existing plan, covering the entire life cycle of the well-engineered Web site, including development, maintenance, and retirement. The well-engineered Web site project plan shall incorporate consideration of the implications of both minimum and maximum Web site life expectancies.

The project plan should address Web site maintainability. The plan should address requirements for dates (see 7.4) and contact information (see 4.2.6 for privacy, 5.7 for Webmaster, and 5.11 for site center).

Some well-engineered Web pages have as a significant objective the delivery of specific information to individuals who need that information. Well-engineered Web sites shall have an identified set of metrics that can be evaluated. Ease of access to information by targeted-user communities is an example of one of the possible design goals.[17]

[17]For this example, usability testing would be a potential test methodology.

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Navigation aids, buttons, user readable body metadata, and other items commonly appearing on multiple well-engineered Web pages should be consistent across the site. The consistency shall include the common look and feel as well as a common location within the well-engineered Web page.[18]

This recommended practice should be reviewed, in its entirety, during the early part of the design stage to identify all factors that need to be considered for the design, development, and maintenance of a well-engineered Web site.

Design shall take into consideration the characteristics of the client and server environment. Failure to do this may interfere with access to the presented material by some of the target-user community. Plans should include contingencies for technical obsolescence and growth.

Test cases shall be designed considering the user interaction with the Web site. Some testing effort shall stress performance and scalability features supported by servers that will be used when the site is in operation.

Recommended security practices for connecting to the Internet are being defined in a draft IEEE Standard which currently has a proposed designation of 2002. These recommended practices for Internet operations are also applicable for Intranets and Extranets. Well-engineered Web site design shall consider the recommended security practices contained in IEEE Project 2002 once it is published as an approved IEEE Standard.

If a well-engineered Web site is complex or if it implements interactive functionality, it may be useful to consider it as a software product and to apply appropriate standards for software development and maintenance. Several IEEE standards may be useful in this regard:

a) IEEE/EIA Std 12207.0-1996 [B15] prescribes processes useful throughout the entire software life cycle including development, operations, and maintenance.
b) IEEE/EIA Std 12207.1-1997 [B16] describes minimum data that should be recorded for the purposes of producing documentation.
c) IEEE Std 829-1998 [B4] provides material helpful in test planning, specification, and reporting.
d) IEEE Std 830-1998 [B5].
e) IEEE Std 1016-1998 [B7] provides the necessary information and recommendations for the design description of software.
f) IEEE Std 1028-1997 [B8] explains the conduct of design reviews.
g) IEEE Std 1058-1998 [B9] provides requirements for the management of software projects.
h) IEEE Std 1074-1997 [B10].
i) IEEE Std 1490-1998 [B13].

NOTE—Additional standards are listed in Annex A.

4.1 General requirements

4.1.1 Target-user community

A Web site may address one or more diverse sets of users. Designers shall identify and document one or more targeted user communities. Representatives of these communities, which may include persons with disabilities, should be included in the design process and the ongoing evaluation of the site.

[18]Common location, look, and feel can be tested by visual inspection or focus group evaluation.

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The evaluation shall include the client environments of these target-user communities. Diversity of browsers in use, complementary capabilities (e.g., script, byte code, graphics, etc), and the bandwidth of connectivity shall be included in this environmental evaluation. The target-user community may have a wide diversity of display devices and/or selected presentation formats within the display windows; this may establish some presentation constraints (consider displaying Web pages to pocket devices, etc).

The selection of implementation tools (e.g., servers, generators, and selected "levels" of HTML, CSS, XML, scripting, etc) shall be based on this evaluation of the target-client communities. The site should be monitored to determine changes in client environment that could affect the Web site design.

The designer shall document the targeted environment range for the Web site for future reference. It may be advantageous to establish documentation or specifications applicable to the Web pages for an entire network, and encourage or enforce conformance to these. The documentation shall include statements about the page formats generated, including HTML version (and in some cases excluded functionality), CSS version, XML version and XML DTD(s), graphics formats, scripting and/or byte code executable versions and/or limitations, human-language considerations (as well as character sets), bandwidth considerations, and other characteristics from this recommended practice or as identified during the design phase. The documentation should be updated based on actual experience. Specification in terms of vendor-specific products should be avoided along with the associated loss of product independence.

4.1.2 Key information to convey

The delivery of the information to the user is the primary purpose of a Web site. Comprehension and navigation are key engineering design considerations. Non-textual information (e.g. video, graphics, audio) can consume significant bandwidth, but can also provide advantages in delivering information in a coherent and easily comprehended way. The low bandwidth environments of some users, the inclusion of an option for text-only delivery, adaptation for the visually impaired, and delivery in multiple languages are issues that should all be considered.

Well-engineered Web site design may segment information contents by expiration and/or revision date and incorporate this into the overall Web site design. Well-engineered Web site design shall include a clear way to identify the areas changed without the need for navigating the whole site. The segmentation should be at the page level. A policy for the expiration of the changed-pages list should be described.

Some information has a limited useful life. Stock quotes, telephone directories, product specifications, organizational charters, and archival background information change at different rates. The nature of the information and the need of the user to have "current" information affects the contents of well-engineered Web pages, as well as the methods used to deliver these pages.

4.1.3 Expected results

Metrics for evaluation of well-engineered Web sites shall be derived from evaluation by the target-user community and information to be conveyed. Simplistic "hit rate" metrics may not be sufficient unless well-engineered Web pages for low-bandwidth or text-only users are being compared to equivalent well-engineered Web pages. A representative metric may be the measurement of the time or the number of keystrokes required of the user community to arrive at the desired end page.

Organizational effectiveness, competitive success, and even meeting legal obligations and liabilities can depend on timely access to critical information within an organization. Intranet/Extranet design should consider this, particularly as it is used to displace other methods for information delivery. User feedback should be actively sought as part of this process.

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4.1.4 Life cycle

Web pages, Web sites, and Web projects have a lifetime—a life cycle. The well-engineered Web site developer should estimate the duration of the life cycle and should plan for well-engineered Web site maintenance during its active life cycle. Some well-engineered Web pages will be "permanent archival" material, with little maintenance, and with an unbounded life span.

The well-engineered Web site project plan, if prepared, shall document requirements for scheduled well-engineered Web site maintenance and/or well-engineered Web site expiration. Some well-engineered Web pages will require ongoing maintenance (for example, due to a legal or regulatory mandate).

Permanent archival content should be implemented following strict adherence to standards and minimal dependence on vendor-specific or immature technology. This will facilitate access over an extended period of time, and minimize maintenance requirements.

4.1.5 Life cycle management

In some cases, a well-engineered Web site may approach the complexity of a software project, particularly if the site implements interactive functionality. In these cases, one or more projects should be initiated to execute the responsibility to plan and manage the well-engineered Web site throughout its entire life cycle from conception through retirement. The software life cycle processes of IEEE/EIA Std 12207.0-1996 [B15] should be considered for acquisition, supply, development, operation, and maintenance of well-engineered Web sites.

4.1.6 Web site life cycle plan

A plan should be prepared for managing appropriate life cycle processes for the Web site—acquisition, supply, development, operation, and maintenance. The plan for the Web site should define when, how, and by whom specific activities are to be performed, including options and alternatives, as appropriate. The plan should include, at least, the following generic items:

a) Date of issue and status
b) Scope
c) Issuing organization
d) References
e) Approval authority
f) Planned activities and tasks
g) Macro references (policies or laws that give rise to the need for this plan)
h) Micro references (other plans or task descriptions that elaborate details of this plan)
i) Schedules
j) Estimates
k) Resources and their allocation
l) Responsibilities and authority
m) Risks
n) Quality control measures
o) Cost
p) Interfaces among parties involved
q) Environment/infrastructure (including safety needs)
r) Training
s) Glossary
t) Change procedures and history
u) User support needs (help desk, end-user documentation, telephone line)
v) Target community descriptions

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NOTE—The items of this plan are quoted from subclause 5.2 of IEEE/EIA Std 12207.1-1997 [B16]. The architects of complex well-engineered Web site projects may wish to consider more detailed plans described elsewhere in IEEE/EIA Std 12207.1-1997 [B16]. The developers of complex well-engineered Web site projects may also wish to consider the use of IEEE Std 1058-1998 [B9].

4.1.7 Well-engineered Web site requirements specification

A requirements specification should be prepared for a well-engineered Web site. This specification should include, at least, the following generic items:

a) Date of issue and status
b) Scope
c) Issuing organization
d) References
e) Approval authority
f) Body
g) Delivery instructions
h) Assurance requirements
i) Conditions, constraints, and characteristics
j) Glossary
k) Change history

NOTE—The items of this specification are quoted from subclause 5.7 of IEEE/EIA 12207.1-1997 [B16]. The architects of complex well-engineered Web site projects may wish to consider more detailed specifications described elsewhere in IEEE/EIA 12207.1-1997 [B16]. The developers of complex well-engineered Web site projects may also wish to consider the use of IEEE Std 830-1998 [B5].

4.1.8 Well-engineered Web site design description

A design description should be prepared for the Well-engineered Web site. The design description for the Well-engineered Web site should include, at least, the following generic items:

a) Date of issue and status
b) Scope
c) Issuing organization
d) References
e) Context
f) Notation for description
g) Body
h) Summary
i) Glossary
j) Change history

NOTE—The items of this plan are quoted from subclause 5.1 of IEEE/EIA 12207.1-1997 [B16]. The architects of complex well-engineered Web site projects may wish to consider more detailed descriptions described elsewhere in IEEE/EIA 12207.1-1997 [B16]. The developers of complex well-engineered Web site projects may also wish to consider the use of IEEE Std 1016-1998 [B7].

4.1.9 Design review

Web page designs should be subjected to design reviews in keeping with good engineering practices. Depending on the value and expected impact of specific well-engineered Web site, additional reviews may be warranted. The design review subject matter may include evaluations of the graphical design, legal implications, cultural impacts, linguistic review, market research, accessibility and usability. The design review should span the entire range of functional objectives, technical capabilities and constraints throughout the system. The review should also address the capabilities and limitations of the target user community. The

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insertion of new technology into the system requires the widest range of reviewer experience. In addition, the content should be subjected to review by applicable experts and other users.

NOTE—IEEE Std 1028-1997 [B8] describes how to conduct design reviews.

4.1.10 Proofreading and quality objectives and testing

Quality assurance should be part of site planning and development. The project plan should indicate specific tools and processes to be used during implementation to assure the quality objectives are met.

Well-engineered Web pages should be subjected to proofreading and quality assurance. Proofreading should involve the use of the full range of browsers, screen resolutions, and browser window sizes and shapes. Final assessments must be done on the object(s) (text, graphics, layout, navigation, multimedia, etc) as delivered to client device(s), and not assume that generation tools will convert the source accurately. Proofreading shall be applied to static as well as dynamically generated pages.

The quality assurance process should validate that the presentation meets all the objectives and requirements of this recommended practice and other applicable standards. It should also validate the user requirements. Quality assurance shall be applied to static as well as dynamically generated pages.

Validation testing should be pursued in at least two distinct phases: development testing and operational testing. Development (component) testing should be conducted as part of the implementation process.

Development testing of well-engineered Web sites shall be designed to address issues such as:

a) Well-engineered Web pages shall display as designed.
b) Scrolling requirements shall be sensitive to the type of information being conveyed.
c) Well-engineered Web sites shall provide security controls such as passwords and firewalls if required.
d) Well-engineered Web pages shall be tested for conformance to this recommended practice using a verification tool to verify compliance where appropriate

Operational testing should be conducted using the support of the members of the intended user community. Operational testing of well-engineered Web sites shall be designed to address issues such as:

a) Well-engineered Web pages shall display as intended.
b) Well-engineered Web pages shall not require excessive scrolling.
c) Well-engineered Web sites shall provide required security controls.
d) Well-engineered Web pages shall be tested for conformance to accessibility requirements.
e) Well-engineered Web pages should render a reasonable printout or offer an alternative method of print output.
f) The Web site shall meet all defined user requirements. New user requirements that evolve from design initiation through final delivery shall be documented.
g) All links shall work correctly.

NOTE—IEEE Std 829-1998 [B4] provides material helpful in test planning, test specification, and test reporting.

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4.1.11 Managed pages

Managed pages shall include one or more meta tags indicating the guidelines or standards applicable to this page. The format for the meta tag shall be "`<meta name="guideline" content=URI of guideline />.`" Said URI should be a unique identifier for a specific version of a guideline which might not resolve to an actual document. Pages conforming to this standard may include the meta tag designated in 1.3.1. This will facilitate site management against selected guidelines, and also target client selection of conforming pages.

4.2 Environment selection

4.2.1 HTML version(s)

The version of HTML, and the features within that version of HTML, should be selected based on the client environment of the target-user community. For example, “frames” and Java scripts are representative of the elements that reflect significant design incompatibilities with older browser versions, and are examples of the type of feature that must be given critical evaluation in the design phase. Removal of an architectural feature like “frames” can require significant redesign. Web page developers should be familiar with XML and evaluate how, if, and when to incorporate XML into a well-engineered Web site.

As a default, new well-engineered Web pages should use XHTML in its HTML compatible form. Some of the XHTML compatible guidelines should be included in the well-engineered Web site project plan, even where older browser compatibility is required (for example, lowercase tags.)

Essential elements of XHTML compatibility:

a) All tag elements and attributes in lower case.[19]
b) Documents to be well formed, have properly nested elements and have end tags on all elements that have content (including `li`, `p`, etc). Empty elements to have a closing slash in the tag (e.g. `<br />` —note space before slash in this example for HTML compatibility).
c) All attribute values to be quoted.
d) Use ‘`id`’ for fragment identifiers (in addition to `'name'` for HTML compatibility, e.g. `<a name="IEEE" id="IEEE">`).
e) Use ‘[CDATA[…]]’ construct for enclosing script, style or other ‘commented’ elements (comment structures may be stripped by server during delivery process).
f) Avoid linebreaks or excess spaces in attribute values.
g) Do not include more than one ‘`isindex`’ element in a page.
h) Include both ‘`lang`’ and ‘`xml:lang`’ values.
i) Include both ‘xml’ and ‘http-equiv’ character encoding statements.
j) Specify ampersand as & in attribute values.
k) Be aware that CSS defines different conformance for XML and HTML.

4.2.2 Cascading style sheets (CSS)

Well-engineered Web pages shall separate the presentation from the content, to the extent that it is feasible. Style sheets should be used to accomplish this. The trade-off between accommodating a greater range of target-client browsers using page-specific characteristics and the maintenance advantage of page-independent presentation offered by style sheets, shall be included in well-engineered Web site design. The decision to use CSS should include evaluation of the capability of target user environments.

[19]Tools, including ‘freeware’ such as TIDY (at W3C site) exist to facilitate transformation of HTML pages into XHTML or partial transformations such as conversion to lowercase.

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A simple example is using color in Web pages. Explicit incorporation of color is one option; style sheet incorporation of color is another. The same color scheme can be applied to a diverse set of pages in a consistent way using a style sheet, reducing coding and maintenance effort. A change to the common style sheet, rather than changes to the many pages using that plan, can accomplish a change in the color scheme. Moreover, specific user communities may want or need to override the color selection put forward by the design (visual impairments for example), which is only viable with a mechanism such as cascading style sheets. Similarly, if hard-copy printing of a page is desirable, the CSS printer presentation style should be included.

Web page generation tools shall support CSS as an external style sheet, only using site-developer specified/selected ‘class’ (or ‘id’) attributes and avoiding the ‘important(!)’ designation so end-users can apply their own style sheets to match their preferences/requirements.

4.2.3 XML considerations

XML provides mechanisms for delineating document structure in ways that are responsive to business objectives. A well-formed HTML document is one instance of an XML document. XML provides for new tags that can be content specific, and facilitate automated processing of content. Within the HTML environment, XML-type structures should be designated with the id and class attributes, and potentially the `<span>` and `<div>` elements.

Within an HTML 4.0 document, `id` is defined as being unique, and can be used as an anchor for fragment links, whereas `class` can be duplicated many times within a document. Both `id` and `class` can be used to distinguish a page segment for style sheet presentation control (developers should verify that usage of 'class' and 'id' for style specification work for the targeted range of browsers).

Well-engineered Web sites may plan for the accommodation of a range of browsers identified in the target-user community client environment during the design planning process. This can be accomplished by identification of browser types and delivery of different sets of pages based on this, or by ensuring that the critical information content for a page can be effectively presented by the full range of browsers. Browser and version-specific dependencies should be avoided.

4.2.4 Physical characteristics

Consideration shall be given to the legacy and anticipated evolution of the user-community environment in terms of hardware and software capabilities. The rate of adoption of new technology at the consumer level often exceeds that of industry and the public sector. Similarly, consideration shall be given to anticipated or likely changes in technology to minimize the need to re-engineer Web sites to accommodate these changes. Some examples of devices that should be considered include:

a) Personal Digital Assistants (PDAs)
b) Video enhanced telephones
c) TV devices with Web interfaces
d) Braille display units
e) Access-specific and/or text-only devices
f) Wireless and mobile devices

Considerations should include screen display area (which can be quite small on some of these devices); latency of communications (e.g., satellite links, wireless channel bandwidth, etc); and, limited (or non-existent) local cache/storage. Similar considerations related to communications bandwidth and costs are required. U. S. communications tariffs are not exemplary of international practices. Limited bandwidth and “per minute” tariffs are common on an international basis and in the emerging mobile and radio communications environments.

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Protocols or protocol subsets to support this next generation of mobile devices may require additional consideration in selection of target protocols. Consideration should be given to the wireless applications protocol (WAP), and XHTML base protocol. Note that rapid expansion of low bandwidth wireless devices in the next few years may be a significant consideration in Web page design.

4.2.5 Scripting and executable considerations

Client side execution such as scripting may be refused by clients. Part of the design process shall include documenting when, if ever, such facilities will be used. Tools shall not include client-side scripting unless that option has been selected by the author. Note client environments may disable client execution or scripting for security reasons, therefore servers should be able to deliver information without scripting. Minimally, a site shall notify the user that scripting is required for some functions. Selection of specific tools or versions of implementations shall be considered in both the context of the target-client environments and the life cycle management of the well-engineered Web site. Where possible, standards-based environments that are platform (processor, operating system, and browser)-independent should be targeted (see also 4.3.1).

4.2.6 Privacy policies

Well-engineered Web site design should be governed by the legal and ethical guidelines of both the target-user community, and others with access to the pages. Privacy considerations shall include organizational policies, legal context (e.g., many European countries have very strict privacy laws), and an awareness of potential network integrity issues. Information associated with identifiable individuals and personal data such as phone numbers, home address, salary, and so forth are all subject to these considerations; and the requirements on these vary between jurisdictions, cultures, and national boundaries. Well-engineered Web sites shall address the range of access across jurisdictional boundaries in identifying the information to be provided and protections to be applied. Top-level pages should include links to applicable privacy policy statements.

All information collected from a user that would identify the user shall be discarded when the user terminates the session prior to the delivery of the prescribed item. It is acceptable to retain the data collected if the user accepts the retention of data (such as for return for later completion of the action) at the time the session is terminated. The user may be asked to allow retention of data, when the data to be collected from the user requires a significant input from the user. The information should be retained for a fixed length of time (such as one day) after which it must be discarded.

Anonymity shall be allowed upon user choice, with the potential of not providing the service or the information requested. Informative messages should be provided to explain the needs of the service and to exhibit some contact points for further clarification. End-user data collection (e.g., e-mail address, username, etc) shall not be gathered without explicit user consent. In some countries, this is related to legal issues.

It may be necessary to know the geographical location of the server (perhaps provided in metadata) and the client in order to determine what information can be provided. Legal jurisdictions and industry segments are formulating privacy guidelines that may require consideration of both at the time of design, and when reviewed, as conditions change.

Well-engineered Web site shall follow legal and industry guidelines on the collection, notification, and retention of information related to users. Annex F contains pointers to principles for privacy from the European Union, U. S. Dept. of Commerce (Safe Harbor), U. S. Federal Trade Commission (COPPA)[20], and the Organization for Economic Cooperation and Development (OECD) guidelines.

[20]COPPA is Children's Online Privacy Protection Act.

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Indexing can provide a back door to restricted information. This may require restricting access to the index or excluding restricted information from the index. Indexing of well-engineered Web sites by conforming Web page generation tools shall adhere to the robot exclusion guidelines (see Annex E).

4.2.7 Content accessibility

The target-user community evaluation shall take into account the likely existence (or future existence) of individuals who will need to access the information or services of the site and who have limited sight, color blindness, mobility impairments, audio impairments, or require other special considerations as well as ergonomic requirements for general ease-of-access and ease-of-use for users.

Well-engineered Web pages shall conform to the Web Content Accessibility Guidelines Level A (priority 1 checkpoints). Well-engineered Web pages should conform to Level Double-A (priority 1 and 2 checkpoints). The design process shall include consideration of conformance to Level Triple-A (priority 1, 2 and 3 checkpoints). (See W3C WAI Web Content 19990505.[21])

The World Wide Web Consortium's Quick Tips[22] summarize key concepts of Web site accessibility considerations as follows:

a) Images and animations. Use the `alt` attribute to describe the function of each visual.
b) Image maps. Use the client-side map and text for hotspots.
c) Multimedia. Provide captioning and transcripts of audio, and descriptions of video.
d) Hypertext links. Use text that makes sense when read out of context. For instance, avoid "click here."
e) Page organization. Use headings, lists, and consistent structure. Use CSS for layout and style where possible.
f) Graphs and charts. Summarize or use the `longdesc` attribute.
g) Scripts, applets, and plug-ins. Provide alternative content in case active features are inaccessible or unsupported.
h) Frames. Use the `noframes` element and meaningful titles.
i) Tables. Make line-by-line reading sensible. Summarize.
j) Check your work. Validate. Use tools, checklist, and guidelines at http://www.w3.org/TR/WCAG.

There are legal requirements for access that vary by jurisdiction[23], and also practical considerations as Web-based information becomes either "mission critical" within an organization or displaces other forms of communication with target-user community individuals. Information about current guidelines and related initiatives from the W3C can be found at http://www.w3.org/WAI.

Use of the 216 "Web safe" colors is recommended. These colors are selected, in hex terms, with RGB values of 00, 33, 66, 99, CC or FF only.

Well-engineered Web page text to background luminance-contrast shall exceed 33% (better than 67% recommended). Thus the luminance for any specific RGB color can be computed as: luminance = 0.3 × Red + 0.59 × Green + 0.11 × Blue.[24]

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[21]Information on references can be found in Clause 2.

[22]WAI Quick Tips http://www.w3.org/WAI/References/QuickTips/ Copyright © 2001, World Wide Web Consortium, (Massachusetts Institute of Technology, Institut National de Recherche en Informatique et en Automatique, Keio University). All Rights Reserved. http://www.w3.org/Consortium/Legal/.

[23]For example: the U. S. Americans with Disabilities Act, Section 508 of the Rehabilitation Act; and the Canadian Human Rights Act. See http://www.w3.org/WAI/References/Policy for other national guidelines. Recent examples include U. S. court blocking of an Austrian Web site seeking to market U.S.Absentee ballots; French courts requiring U. S. Sites to not offer Nazi materials for sale, and so forth.

[24]The percentage difference can be calculated as the absolute value of the difference between the two color intensities, divided by 255, which is the maximum difference.

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Well-engineered Web pages shall avoid color combinations that cause problems for individuals with color blindness in its various forms. Avoid using the color pairs (see Annex H) for background/foreground of text, or of any objects (e.g., links, borders or icons) which need to be differentiated by color (this relates to red and green deficiencies, which are the most common).

A table of Web-safe colors has been arranged to indicate which colors should not be used together. See Annex H for the numerical version and the visual color table.[25]

The requirements in this subclause are expected to provide substantive conformance to 36 CFR 1194.[26] None-the-less sites required to meet 36 CFR 1194 shall assure they meet the requirements of Annex I which duplicates the relevant sections of 36 CFR 1194.

Well-engineered Web pages shall not include flashing or blinking objects which have a blinking frequency or flicker rate greater than 2 Hz without consideration for photosensitive epilepsy impact. Frequency greater than 55 Hz is acceptable under 36 CFR 1194.22(j).[27]

Where timeout is applied to user response forms, a mechanism shall be provided to allow a user to indicate more time is required. Timeouts or refresh should be used with care to assure users can understand and interact with pages correctly.

Forms shall use label and tab index designations to allow persons using assistive technology to access the fields and functionality required to complete and submit the forms.

Well-engineered Web pages shall use the TABINDEX attribute in conjunction with the A, AREA, BUTTON, INPUT, TEXTAREA, and OBJECT elements where this provides a logical sequencing to access these elements. Where a set of pages contain common initial links, and/or duplicate links, TABINDEX shall be used to present unique links for this page first. To allow the user to avoid duplicate links, TABINDEX shall be used to present duplicates after all links have been sequenced once, and a 'refresh' link provided to reset the series without traversing the duplicates. Specification of all possible TABINDEX elements may be necessary to assure proper browser sequencing. Sequencing should be verified with target browsers.

Well-engineered Web pages should use the ACCESSKEY attribute with the BUTTON, INPUT, and TEXTAREA tags to initiate the related functions. ACCESSKEY should be considered for initiating link operations with the A and AREA tags as well. When specified, ACCESSKEY designators should be made visible to users and given a distinguishing style (which should be done with CSS class/style designations) to facilitate user awareness. ACCESSKEY designations should avoid overlap with browser and operating system defined shortcuts. Note: browsers do not have a common set of shortcut key assignments. Also browsers and assistive technologies do not have a common set of shortcut key (accesskey) assignments.

For forms that have more than one logical section, for example, personal information, billing information, ship-to information, FIELDSET and LEGEND elements shall be used to identify these sections.

Form fields shall have associated LABEL elements (affects TEXTAREA, SELECT, and INPUT fields of type TEXT, PASSWORD, CHECKBOX, RADIO, and FILE).

Repetitive navigation links shall be assigned a TABINDEX value of zero (which should result in these being presented at the end of the tabbing sequence).

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[25]For extra information on choosing colors and color vision deficiency, see http://www.labs.bt.com/people/rigdence/colours/.

[26]Further information at : http:/www.access-board.gov/sec508/508standards.htm.

[27]36 CFR 1194 proscribes blink or flicker rates between 2 Hz and 55 Hz.

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Well-engineered Web pages where the primary page content does not start immediately in the BODY element shall define a DIV element with the attribute ID="content" to enclose the primary content. This will facilitate access for users of restricted browsers, as well as indexing of page content.

Pages should use a common look and feel, including the location of a common set of navigation buttons. The first link on a page should be a link to the unique content of this page and be identified with `alt` text such as 'skip navigation' or 'skip to content.' This initial link may need to be a 1x1 pixel image that is not visible to users operating on a visual basis, but will be presented to individuals using audio or Braille output where avoiding the repeated information is important.

4.2.8 Site/page relocation

It is likely that a site and/or pages within a site will need to be relocated over the life of that site. Techniques to accommodate this should be applied appropriately. These include:

a) A site-specific Cname or Domain Name Service (DNS) entry. For example "http://mysite.domain.com." This allows "mysite" to be changed to a different set of systems in a transparent way. This can also provide for redundancy, fail over, and similar capabilities. Where possible, accesses to the old location should resolve or be redirected to the new location.
b) Site-specific names should not include a specific machine name, location name, or other element that is likely to change with time.
c) Physical Internet Protocol (IP) addresses should not be used, except in maintenance applications where a specific physical target is essential. Be aware that the application of dynamic addresses on the client side may not provide desired physical target even with specific IP addresses.
d) Documents of enduring relevance that are accessed via a Web site should be provided with URLs that are similarly enduring. For example, the path coded in a URL should not mirror the transitory organization of the Web site. The organization of the Web site may change; the URL to access enduring documents should not.
e) If, when HTTP Error 404 (page not found) is encountered, an informative page with links to key parts of the site (and a means of searching the site) is provided, the site will be much more usable following relocations of material.
f) Relative URLs and host relative URL servers can use the "redirect" capability of either HTTP or server scripting to ensure that the user receives the right page. This can be used to accommodate changes in page location. Other uses are outlined in 7.10. Relative URLs allow for:

    1) Migration of pages within a site.
    2) Maintenance of a replica or development version.
    3) Consistent digital signature/integrity validation (see 6.4).

4.2.9 Maintenance

Well-engineered Web site maintenance planning shall consider, as a minimum, the following factors:

a) Eliminating obsolete information or services.
b) Updating the status of information or services.
c) Changing and periodically validating links to related information.
d) Changing client or server environments that may require or warrant well-engineered Web site re-engineering.
e) Changing policy (e.g., organizational, regulatory, legislative, etc) that may require changes in information content, protection, designation, or access.
f) Updating well-engineered Web sites to remain in conformance with applicable standards.

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Style sheets may be used to indicate obsolete pages or other classifications (e.g., “draft,” “confidential”) as “background.” If style sheets are not available, the well-engineered Web site design shall use an alternate method for indicating page classifications. An alternate method for accessibility to users with physical disabilities should be included.

In some cases, a well-engineered Web site may approach the complexity of a software project, particularly if the site implements interactive functionality. In such a case, a software maintenance process should be adopted to provide a disciplined basis for the maintenance activity. The software life cycle maintenance process of IEEE/EIA Std 12207.0-1996 [B15] should be considered for this purpose.

4.2.10 Appropriate content

Content of a site shall be considered in the context of ethical and legal considerations recognizing that these may vary throughout the jurisdictions and cultural environments where the site is accessible. Exclusion of content, selective delivery, or limited access shall be implemented to reflect such evaluation. Specific consideration shall be given to content that may not be appropriate for minors, to topics or pictorial content that is deemed offensive (or illegal) for distribution in given environments. The site design process shall recognize that the legal and cultural norms of one jurisdiction may not apply in other jurisdictions.

Where applicable, a profile for Internet content selection (PICS) designation should be included in the site to facilitate indexing and filtering operations by user services.

Sites should include a meta statement declaring the jurisdictions in which the site is intended for use: “`<meta name="intended for use" content= list of ISO 3166-1:1997 country codes />`”.

4.2.11 Site presentation updates

Web pages that present data to users (such as product descriptions, product availability) for purchases and related actions must accurately represent the product that can be shipped and the timeliness of the delivery. Thus the data, including representative images, should accurately reflect the item that will be provided. Thus, the data should include an indication of “out of stock” when appropriate. The user should be advised if “equivalent” items may be delivered in lieu of the item described on the Web page.

4.3 Scripting languages and Java

4.3.1 Scripting languages

Scripting languages are widely used, and supported by most recent browsers. Scripts can operate on the server side using, for example, the common gateway interface (CGI) or on the client side through scripts embedded in the page or applets. However, not all browsers support client-side scripts and users may turn off both Java and client side scripting. This may be a matter of corporate security policy, or to reduce the distraction of intrusive dynamic elements. The W3C WAI stipulates that any Web page using client-side scripts must provide the same functionality on the page without the scripts in order to be considered accessible.

Dynamic page creation should be focused on server side scripting/programming. This facilitates end-user accessibility, the range of target devices, and security.

NOTE—Persons accessing pages using non-visual means have trouble identifying dynamic page changes, and become frustrated with scanning duplicate content to identify changes.

See also 4.2.5.

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4.3.2 Java

Java is currently a key language of the Internet. This is also the case for Intranets, since considerable corporate application functionality can be provided through the use of applets client-side communicating with servlets server-side, and capable of yielding generally superior performance and security to CGI scripts. The recent advent of application service providers in the Internet is likely to accelerate the use of Java. Java foundation classes (JFC) with the swing architecture and the accessibility classes offer interface flexibility and accommodation to users with disabilities that are not possible using DHTML and style sheets. Current browser offerings do not yet support all of the JFC. For some applications, HTML may be secondary to the Java portions of a Web page, acting only as a carrier for multiple applets that do the actual work and presentation of the page. The W3C WAI stipulates that, to be accessible, a page containing an applet must be capable of operating without the applet. This may also be required to serve clients where Java is disabled for policy or security reasons. Server side applications and detection of client preferences can be used to meet this objective.

5. Server, HTTP and site considerations.

5.1 HTTP 1.1 application

Where possible, HTTP 1.1 or versions that are more recent should be used at the server. This is compatible with earlier clients, and also improves the efficiency and robustness of the network environment.

5.2 Cache expiration date

Well-engineered Web sites shall incorporate a cache expiration date that reflects the rate of change of the data being provided. This date should not exceed the date of content expiration (see 7.3). Caching servers should not retain pages longer than the cache expiration date.

5.3 Non-caching

Well-engineered Web sites shall not disable caching unless the rate of content change relevant to the users is high, the data is unique to a specific user, or data security/sensitivity warrant such treatment. Collection of hit count statistics, or ‘pushing’ secondary content (e.g. advertising) should not be allowed to impact response times nor to increase network overhead.

5.4 Browser language selection

Well-engineered Web sites should evaluate the client’s human language environment selection and initialize or deliver pages responsive to this within the overall context of the target-user community. The user should be able to select the language of preference from the browser environment, and this should be provided to the server via the HTTP “Content-Language” header. If the preferred language is not available, then the user should be given a selection of languages, if these are available. When a user has elected to see a page in a specific language, this should override the user’s preset preference; and this may require use of information about the link that lead to the target page (see 7.5.5.)

Automated translation tools may provide capabilities that meet the need for multilingual delivery. These may be more effective if Web contents are developed with automated translation as an objective. The Web design should consider the possible implications of user initiated automatic translation.

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5.5 Robot exclusion

Servers shall incorporate robot exclusion elements (see Annex E) based upon the implications of indexing external to the site. The use of robot technology within a Web site to create indexes or searching WEPs shall respect these guidelines.

5.6 Browser tolerance

Web sites should monitor client browsers and capabilities as a basis for ongoing environmental documentation updates. Well-engineered Web site designers should also remain aware of the need for the Web site to be tolerant of browsers not currently in use by clients, especially because people who are disabled and people with different browsers may join the client group at any time.

5.6.1 HTML validation

Well-engineered Web pages should be submitted for either internal or external validation of HTML or XML for DTD conformance[28] using tools such as those developed by the W3C (http://validator.w3.org) (see [B58]). Submission of well-engineered Web pages to validation tools shall be done in a way that is consistent with the proprietary nature of the information content.

5.7 Webmaster contact

E-mail to "Webmaster@domain" shall provide a point of contact for the site. The point of contact e-mail address shall exist and be actively monitored for messages in keeping with the criticality of the site(s). This may be necessary to notify a site of problems that preclude successful access to the site or its proper content. This is a required e-mail address, even if it is not part of the page content. This is not an alternative for having information concerning the content owner, the person responsible for the information content presented.

The person(s) actively monitoring for messages should direct the message to the person(s) assigned the responsibility for responding to the message. A Web site may have multiple Webmasters responsible for independent subsets of the Web site. In this case, the person(s) monitoring for messages should direct the message to the appropriate internal Webmaster.

5.8 Redirection

Redirection can be initiated by a server to provide better response to user request. Reasons for applying redirection include:

a) Page location changes (see 4.2.8).
b) Catch directory changes and direct request to the correct URI.
c) To accept and resolve mistyped URIs.
d) Eliminating case dependencies in URIs.
e) Adjusting for differences in object name extensions (e.g., htm/html, jpg/jpeg, etc).
f) Common spelling errors that may be site-specific.
g) Provide default for attempts to access directories.
h) Delivering selected well-engineered Web pages to client from a selection list.
i) To accommodate language preference (see 6.3.7).
j) To accommodate text-only preference.

[28]Older versions of HTML have only one DTD, however HTML 4.0 has at least 3 relevant DTDs (strict—no deprecated elements, transitional, and frameset).

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Redirection has the advantage of providing back the corrected URI so that bookmarking occurs with this version. The design should consider the value of having directions for users to implement the redirection manually, when appropriate.

Servers should respond to attempts to access invalid links within an existing site by redirecting such requests to a defined working page with an explanation of the error and some navigational hints.

Redirection or refresh of a page shall not inhibit a user's ability to navigate to prior pages. Users shall be allowed to return to the page from which they initiated a hyperlink [this relates to requirement 22(o) of 36 CFR 1194, U. S. regulation on accessibility, commonly called Section 508. Portions of 36 CFR 1194 are provided in Annex I].

5.9 Compression

During content negotiation with the server, the server may identify that the client can accept compressed content. Precompression of static pages will reduce site and network overhead. Delivery of compressed dynamic pages may be a useful trade-off to deliver content to the client with the least connection overhead. If data is also to be encrypted, it should be compressed first.

Similar preformatting of images into efficient formats, such as the Joint Photographic Experts Group (JPEG), Portable Network Graphics (PNG) or graphical interchange format (GIF), can also provide timely response to clients that can accept these more efficient formats. The smallest acceptable image should be transferred to the client.

Client selection of data formats may be critical to client-side applications, and should be respected when possible.

Thumbnails (a miniature picture of an original that is scaled down until it is slightly bigger than a postage stamp) for large size images should also be provided.

5.10 Site conventions

It is appropriate to establish site conventions for data types (PNG, JPEG, GIF, HTML), file and/or directory naming (e.g., ".fr" for French version, ".en" for English, etc), and other management objectives. Some client environments may not be able to handle data types if the file extensions vary from common usage.

Default files for copyright information, contact information, style sheets, and other site-specific data may be created for a site, or inherited from a broader organizational context.

5.11 Web site center page

Well-engineered Web sites shall include a site center page. Each site page should include an active link to the site center. This site may be part of a larger site construct, and if so the site center shall contain a link to that overall site. The site center may be a top level (home) page for this site. The site center page shall either contain, or point to:

a) Links to all "top level pages" (home pages) for this site.
b) The responsible Webmaster by name or title (with e-mail contact).
c) The person(s) responsible for content, by name or title with e-mail contact(s).
d) The applicable intellectual property considerations (copyright, trademark, etc) (see 7.2).
e) The applicable privacy statement(s) (see Annex F).
f) The applicable indexing/authoring information (see 5.12).

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g) The organization responsible for this site and it's corporate or higher level affiliation, including a link to the appropriate top level pages for these entities.
h) Applicable warranty, terms and conditions, terms of use.
i) Date of last content update for this site center page or policy pages indicated by this page.
j) Statement of purpose as to the site's intent and reason for being. This may consist of a mission statement; description of business model; disclosure of for-profit and non-profit status; disclosure of relevant business and professional relationships; disclosure of sources of funding and/or transaction fees; or other statements for the purpose of allowing consumers internationally to evaluate the credibility of the information presented and identify potential sources of bias.
k) Location and/or a pointer to physical location information (see 7.15), as well as phone number, fax number, physical address, and related information.

The Site center page may also contain:

a) Links to site index listings (including lists of recently updated pages, etc).
b) Search services for the site.
c) Any 'brands' applicable to the site (such as the IEEE 2001 conformance logo).
d) Feedback form related to content and/or site design considerations.
e) Contact information relevant to legal rights or other site elements.
f) Statement of policy for redress (correction) of inaccurate information found on the well-engineered Web site and a contact number whereby the person in charge of this well-engineered Web site can be reached.
g) Frequently asked questions (FAQs).
h) End-user on-line documentation (as applicable).
i) For business to consumer sites, the site center should include (or provide links to) disclosures related to business identification; applicable law and jurisdiction; terms, conditions and costs of transactions; confirmation and cancellation provisions; customer service, shipping and fulfillment; available guarantees and warranties; dispute resolution procedures; and other necessary information to facilitate consumer transactions. Well-engineered Web sites should comply with the Guidelines for Consumer Protection in the Context of Electronic Commerce authored by the Organization for Economic Cooperation and Development (OECD) (see [B56]) and the recommendations authored by Consumers International (see [B1]) for consumer protection and online shopping.[29]
j) The site center should also include any relevant disclosures relating to separation of editorial content and advertising, and the presence of sponsored content and sponsored links. Well-engineered Web sites should adopt and comply with the American Society of Magazine Editors' best practices guidelines for digital media (http://asme.magazine.org/guidelines/new_media.html) as a baseline industry standard for issues relating to the distinct treatment of editorial content, advertising, and special advertising sections.

5.12 Site index and search

Well-engineered Web sites shall include an index of all pages relevant to the target audience. A site may have more than one such index if there are distinct target audiences. The site index shall be accessible, following the requirements of 4.2.7, and should be provided in plain text format.

Web indexes maintained within a managed site shall consider the implications of referencing pages beyond the maintained responsibility of the site. Such pages may vary in availability, size, consistency of style, accessibility, correctness, timeliness, human language or other requirements of the managed site. A similar distinction may be applicable to any pages indexed which are not managed Web pages adhering to the site's

[29]OECD guidelines are available as a downloadable PDF at http://www1.oecd.org/dsti/sti/it/consumer/) (see [B56]) and the Consumers International recommendations are available at:. http://www.consumersinternational.org/campaigns/electronic/e-comm.html) (see [B1]).

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guidelines. Contractual arrangements with external site managers may be appropriate to address requirements of the managed site. Maintenance of bibliographies of offsite references may also be appropriate.

Users may expect site index/search results to access all appropriate content and not content from outside of the site. If the search results contain references from outside the Web site, such site references shall be listed separately from the references within the Web site, and shall be clearly identified as being external to the Web site.

6. Header information

Well-engineered Web pages should not contain non-essential header data (e.g., between the <head> and </head> HTML tags). All header data shall be a conscious item for inclusion by the Web page developer(s), and of direct value in meeting the information or service objectives for the target-user community.

6.1 Document type declaration

Well-engineered Web pages shall have initial lines <Content-Type ...> as typically provided by the server for static Web pages, but which may be required for dynamically generated Web pages. <!DOCTYPE ...> indicates the DTD applicable for this page. XHTML pages should have the initial <?xml …> declaration, and for HTML consistency may need to include both HTML and XHTML head elements.

NOTE—Head data gets preferential treatment in network transfers, and it is assumed that it must all be transferred for the client to be able to establish the environment for page processing. The incorporation of extraneous data at this point is poor Web page engineering.

6.2 Title

The page title shall include useful and distinctive indication of the contents. The HTML title should be chosen carefully considering its role in search engine indexing, query responses, window title bar, and in bookmark labels. If structured consistently, it may also improve the orientation of the user in the site.

6.3 Metadata

Well-engineered Web pages shall incorporate appropriate metadata to provide for accurate cataloguing and indexing of pages for the environment in which the pages are accessible. Well-engineered Web pages shall not provide duplicate data to search engines or indexing systems, other than divergent spellings or grammatical forms. Header tags should include data needed for page processing (link, style, script) or page indexing (title, meta/keywords, meta/description, PICS, and Dublin Core items.) Where more than four metatags are included, the use of link to profiles should be used. Links to style sheets and script files should also be used to facilitate reuse as well as off-loading network overhead.

6.3.1 Description tag

The DESCRIPTION metatag may be used to provide guidance to search engines on what to present users in the search response (e.g., <meta name="description" content="response" />).

Search engines often display the first few lines of a Web page to help searchers to identify the sites they want. Some engines display the META tag DESCRIPTION attribute instead. This display can persist long after the actual Web page has been deleted. Therefore, if you want specific information to be visible, early page placement can help. If you do not want information to be visible, then avoid early page placement (note that for various reasons search engines may be displaying pages that you did not intend to have publicly

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available). Finally, to assure old information is not presented by search engines, it may be necessary to replace the page with a "no longer available" message page for an extended period of time to provide for search engine replacement of the earlier data (resubmission may also be useful.)

6.3.2 Keywords

Search engines should be expected only to consider some limited number of keywords when indexing pages. Well-engineered Web pages shall present keywords in priority order and without duplication (e.g., `<meta name="keywords" content="keyword1, keyword2" />`).

6.3.3 Dublin Core

The Dublin Core DTD was developed by the library sciences community, but may be applicable to general purpose well-engineered Web page indexing. The Dublin Core Metadata (see Annex D for a recent version) shall be used for fields of information that are of value in indexing or cataloguing the well-engineered Web page.

6.3.4 Content selection

Well-engineered Web site design shall include consideration of content-selection mechanisms. Within the context of Intranets/Extranets, PICS rating services and mechanisms may be useful to ensure that users are accessing the preferred information sources. For example, an index search within an organization for information about a corporate policy may yield pages with opinions, local implementations, or other variations. A rating system within an organization may distinguish between "corporate" policy data, legal requirements, and other guidelines. The PICS mechanism could then be used to provide users with a view of the data that was relevant to their environment, rather than forcing them to locate the relevant views from a much wider set of responses. The use of metadata and content included for the purpose of content selection (indexing) shall not be misleading.

Emerging tools, such as XML and RDF will provide additional mechanisms for content selection that should be considered in the future.

6.3.5 Robot exclusion

Well-engineered Web sites shall incorporate robot exclusion elements (see Annex E) as the method for indicating pages to be indexed or searched by automated means and those to be excluded.

6.3.6 Bandwidth efficiencies

The first bytes (including `<head>` bytes) have the most impact on network overhead. Transport Control Protocol (TCP) operates with a "slow start," awaiting an acknowledgment of initial packets sent before initiating a full sequence of transmissions. This avoids congestion of the net that may be directed to a non-responsive site. This makes the data transferred first from the server, and initial elements of the page (e.g., `<head>`, etc) more critical in response time and network loading. Data in the `<head>` sequence should be focused to minimize overhead, and provide essential data to the client. Unfortunately, the HTML format calls for all metadata to be in the head section (see Nielsen, et al, [B55] and W3C Web HTTP Performance Overview [B63] for more details on bandwidth impact).

Tags expected in the head section of a well-engineered Web page including minimal overhead would include: 'title', 'link' (to style sheets), 'meta' (as designated in Dublin Core plus 'keyword', 'description', or "http-equiv"), 'base', 'script', 'object'. Where extended sets of metadata, style or scripts are included, the 'link' element should be used to reduce 'in page' overhead. Relevant information about the metadata should be indicated with the 'profile' attribute of the 'head' tag.

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To facilitate indexing presentation of a collection of related pages, indicate the “initial” page in all of the pages with the “link” element.

Example:

```
<link rel="start" type="text/html" href="first_page.htm" title ="what-
ever the title of this set should be">
```

6.3.7 Human language specification

To facilitate accurate indexing and ease of access for users, well-engineered Web pages shall include the LANG metatag declaring the primary language environment(s) for each page.

6.4 Digital signature

Digital signature and other fingerprinting mechanisms should be applied when appropriate, to ensure page integrity and authentication. This would be appropriate when it is necessary to assure the material presented has not been changed, as when posting price data or other data that must be secured for legal or business reasons. Information related to this may be communicated through header extensions or related files, or it may be implicit in the content body. Resigning pages may be problematic, so extra care should be given to ensure the immutability of the data (including links, etc) within the signed area (see 4.2.8). (Testing for this is not easily automated.)

NOTE—To date the primary focus of security has been on the envelope for e-commerce. It is critical that the well-engineered Web page content be appropriately secured as well.

7. Body information

7.1 Sensitive information exposure

Web page content, even when robot exclusion has been requested, may be indexed or stored by search engines (or users) that have access to the content. Simple removal of the pages does not eliminate the content that may be accessible to users of a search engine. Some search engines have “archival caches” of pages in case the page is no longer accessible. Most search engines include the first lines of pages in their results response (use of “description” meta attribute can provide some control over this).

Inclusion of sensitive data should be considered in this context. Efforts to eliminate data errors or expired pages may require replacement with other content at that URI and re-indexing of that content to flush out archival caches. Digital signature or fingerprinting of pages to assure content integrity can reduce risks of user modification of sensitive data, however, it is not possible to take action to assure the elimination of all copies of specific content.

7.2 Intellectual property rights (IPR)

Web pages may contain intellectual property that belongs to the owner of the Web page or to a third party. Usage of intellectual property should be reviewed by appropriate counsel.

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7.2.1 Copyright information

Every Web page has an implicit copyright, subject to the legal jurisdiction in which the work was created or claimed and any contractual arrangements between the developer and other interested parties. Every well-engineered Web page should include a specific copyright statement eliminating any ambiguity about this (which might be kept in metadata if the visible presentation is deemed objectionable). Even if the intention is to make material available in the public domain, the wording to be used should be reviewed with experts familiar with the relevant jurisdiction(s).

Well-engineered Web pages shall not knowingly include copyright-protected information without appropriate permission from the copyright holder.

Well-engineered Web pages should include a `<link rights=.../>` entry (see Annex D).

7.2.2 Trademark information

Well-engineered Web pages and well-engineered Web sites may use trademarks that are the property of either the site owner or another party. These trademarks may be used within the scope of the site or used within the domain name, metadata, or a dynamic database that generates the well-engineered Web page. Because the international trademark system is both industry- and geographically-oriented, this inherently presents the potential for conflicts between Web site owners and trademark holders. Well-engineered Web pages should include information, including applicable Rfield designations, that helps resolve these conflicts. This could include metatags, explanations, and links to the appropriate information regarding the trademark owner.

7.3 Security designations

In an Intranet environment, pages should include an RMfield identified by the XML tag set `<security-designation>...</securitydesignation>` indicating the organizational security characteristic of the page content.

For HTML, use:

```
<span id="securitydesignation"> ...</span>
```

The exact wording will vary in different organizations, and may have legal implications (which will vary by country). Typical security “banners” include:

— XYZ Corp. Confidential
— Internal Use Only
— Public Information

Be aware that pages without appropriate security designations may be implicitly public information (even though protected by copyright) or lacking in essential legal protections, depending on the legal jurisdictions from which they may be accessible. Be aware that the security designation will not assure automated enforcement of the security designation.

In an Extranet environment, pages should include similar banners in a way that is consistent with the associated Extranet community. Collaboration may permit sharing of confidential information, and such pages would carry corporate-specific banners; or collaboration may generate confidential information within the collaboration, and have designations specific to that arrangement.

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Declaration of security designation should not be considered sufficient to provide security control. Site design should include evaluation of passwords, encryption, and other techniques to provide additional security controls.

A person qualified to assess the adequacy of the security indicators and security protection for the page should subject each page with a security designation to a review. The person should conduct the review before the page is initially placed on the Web. The review will consider both the code for the page and the displayed page. Consideration should be given to viewing the page with all possible browsers. Subsequent reviews will be required to ensure continued security policy is properly implemented. Reviews may be at regularly scheduled intervals, as a result of a review-triggering event (e.g., page change), or when major architecture changes are to be implemented (e.g., expanding to the Internet or adding Extranet components).

7.4 Dates and time

A well-engineered Web pages shall include a page date as an RMfield (`<pagedate>`, or `<... class="pagedate">`). This indicates the most recent date when a change considered being of value to the target-user communities has occurred.

Each well-engineered Web page shall include an expiration date as an Mfield or RMfield (`<expiration-date>`, or `<…class="expirationdate">`). This date indicates the earliest date that the page information may be deleted. The page information can be changed during this period, but the type of information presented on the page should remain constant or the user redirected to the new location of the information.

The expiration date serves at least three functions:

a) A basis for automated deletion or archiving of the page,
b) An indication that can be used by pages linking to this page of it's expected life span, and
c) A basis for exclusion of the page from indexing or search query processes.

The value "`archival`" may be used to indicate that the page contents are not expected to change; some form of persistent URI should be considered for archival pages where ongoing reference is expected.

Well-engineered Web pages should include applicable dates from this list:

a) Date of last modification, represented as an Mfield (`<datemodified>`, `<... class="date-modified">`). Changes in this date may occur without substantive changes in the content of the page. (Mfield is suggested since this date is considered only to be of use in page management, but not for target-user communities.)
b) Content date, represented as an Mfield or RMfield (`<contentdate>`, `<... class="con-tentdate">`), which is used to indicate that the content was current as of this date. This may not reflect changes in content from a previous content date.
c) Date of next content review, represented as an Mfield or RMfield (`<nextupdate>`, `<... class="nextupdate">`), is used to indicate when a review is scheduled. Substantive changes might occur prior to this date, and some form of user notification may be needed in certain business situations. (See 7.8 on active links also.)
d) Date of retirement, represented as an Mfield or RMfield (`<dateretired>`, `< … class="date retired">` may be used to indicate when a page has been archived and is no longer considered active. Organizations with requirements for archiving some or all information may want to include use of this date in their well-engineered Web site project plan.

Content expiration and/or content review dates should reflect the expected rate of change for the content. Web site maintenance tools should use these dates. [These dates can be expected to be different from the cache expiration date, (see 5.2.)] See Annex C for examples of the dates.

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If the purpose of the above dates is for internal maintenance rather than use by the target-user community, it may be appropriate to maintain the information independently from the page content.

All dates, including the above, shall be presented with four-digit years. Designers should use ISO 8601:2000 [B25] format: YYYY-MM-DD (all digits) for dates. Dates should include time, and time-zone, such as one based upon Coordinated Universal Time (UTC), if this is relevant to the usage (HH:MM:SS, should be 24-hour format if machine-readable). If time is included, the time zone shall be specified. Because local time in this context may be ambiguous, time-zone designators are recommended (UTC or UTC-offset) when indicating the time.

The recommended ISO 8601:2000 [B25] time designation format is:

YYYY-MM-DDThh:mm:ssTZD

where:

YYYY is year
MM is month (01–12)
DD is day (01–31)
The letter “T” is required if time is present
hh is hour (00–23)
mm is minute (00–59)
ss is second (00–59) (decimal fractional extensions may be incorporated)
TZD is time-zone designator
value should be “Z” for UTC
or +hh:mm for positive (east) displacement from UTC
or –hh:mm for negative (west) displacement from UTC

This format should be used in any machine-readable fields where date is included in the field. For date independent (time only) machine readable fields the time subset should be used.

The ISO 8601:2000 [B25] date format is the preferred format by the HTML recommendations and by this recommended practice. IETF RFC 1123:1989 [B18] defines the format as exemplified by Sun, 06 Nov 1994 08:49:37 GMT, and this format is required by HTTP 1.1 in response fields.

7.5 International considerations

Web access quite often spans multi-cultural domains and/or international boundaries. Well-engineered Web sites shall take into account international and cultural requirements of the target-user community as part of the design process. If a specific culture is a significant target-user community for page content, review should be performed by persons expert in that culture.

7.5.1 Phone numbers

All well-engineered Web pages containing telephone numbers shall provide sufficient context for use of the number. ITU Recommendation E.123 (02/01) [B54] shall be used.

Example:

+1-202-371-0101.

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Toll-free numbers may not be accessible outside of the geographical area. With internal organizational networks, be aware of the potential need for contact by target-user communities who may only have access to external telephone lines (e.g., travel or telecommuting), or may need full prefix information between locations. Contact numbers shall be accessible for those who are visually impaired or deaf. Telephone numbers should be tagged using the HTML tag `<phone>` (an RMfield). Applicable hours for the telephone number should be indicated. Time zone information should be indicated for networks that span multiple time zones.

7.5.2 Icons

Icons can be international symbols or may be culturally dependent. Icons should be accompanied by text or `alt` attribute to provide for navigation by individuals who are not familiar with the icons used, individuals traversing the Web by text, and persons with visual/motion impairments. Icons may be selected from those defined in the ISO/IEC 11581 specifications (see [B50], [B51], [B52], and [B53]) for international use. Icons may have trademark or legal implications as well.

7.5.3 Holidays

Holidays vary between cultures and may even be specific to a particular locale. The well-engineered Web page should provide dates in universal formats (see 7.4) as well as any culturally-specific terms. The well-engineered Web page should not be designed on the premise that all users accessing the page will use the same time model as the page designers. Time-zone variations as well as “work day” variations should be considered in this context.

7.5.4 Place of origin

To facilitate interaction with the target-user community, or for legal protection, it may be useful for the well-engineered Web page or Web site to indicate the country or place of origin. If country of origin is to be included, it should be an RMfield, or an Rfield and an Mfield (`<origin>`, `<... class="origin">`). The country or place of origin shall use the two-letter country code identifier from ISO 3166-1: 1997 for an RMfield or an Mfield. Well-engineered Web pages may include location designations (or exclusions) where these relate to specific legal jurisdictions.

7.5.5 Language

Users in some browsers can designate human language preference. This information can be used to deliver information in the format appropriate to the user. The trade-off between clarity of communication and the expense of maintaining pages in multiple languages should be considered in well-engineered Web site design. Automatic translation tools exist that provide a range of conversion to respond to target-user communities. Legal considerations also need to be incorporated into design here, with some countries requiring delivery of certain information in specific languages. When using a single language in a multi-cultural environment, the style and simplicity (including use of idioms and specialized terms) of the language should reflect the target-user community. Where translation is required the results should be verified.

Well-engineered Web pages shall declare their language of presentation using the lang attribute as appropriate. An example of use in the `<HTML>` tag is `<html lang=en-US>`, although the lang attribute can be inherited (including use in the `span` and `div` tags) for page segments with language changes. The declaration of the language of presentation shall be the native language of the well-engineered Web page.

The two-letter codes identified in ISO 639-1:2002 and ISO 639-2:1998 shall be used to indicate common languages, which may be followed by a hyphen and a two-letter country code to denote variants (see ISO 3166-1: 1997; see HTML 4.0 specification, 8.1.1). The `<dir>` (direction) tag may also be needed to denote information for proper sequencing of presentation.

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The `lang` attribute should be used by tools for both creation (e.g., spelling checkers, etc) and presentation (e.g., speech synthesizers) where applicable.

For multiple language versions of a document, the link element with `alternate`, `lang`, and an appropriate URI may be used to indicate the URI for alternate-language versions. Also, the server may deliver alternate language versions based on site-specific conventions.

7.5.6 Hemisphericals

Some references are hemispherically oriented. Winter means something different in the northern hemisphere than it does in the southern hemisphere. Equating seasons to months should be avoided. Note that references such as “west” or “east” may be culture- or hemisphere-specific (testing for this is not easily automated).

7.5.7 Units: metric, monetary

Outside of the United States, units of the modern metric system (SI Units) are the norm for measurement, and in most of the world they are a requirement for commerce.[30] Well-engineered Web pages shall use measurement unit(s) applicable to their target-user communities, which should include metric in many cases.

Monetary units are nation-specific. Well-engineered Web pages should state monetary units in terms and currency symbols applicable to the context (both use of reference and intended user community). Some currency symbols are overloaded (such as “$”) and require additional qualification based on the user community. The monetary units defined in ISO 4217:2001 shall be used (testing for this is not easily automated).

7.5.8 Legal domains (e.g., comparative advertising, price quotes)

Business practices vary between legal jurisdictions in addition to those ways indicated above. Comparative advertising, price quotations, intellectual property, or other forms of information may be regulated or prohibited in specific environments. Well-engineered Web site engineers should review the commercial limitations of the page contents with experts in these areas, as applicable. If advertising is accepted on a site, it shall be in keeping with the legal and ethical considerations of the targeted user community (testing for this is not easily automated).

To facilitate cross-border e-commerce, e-commerce sites should prominently identify which countries they are willing to do business with, as well as any relevant geographic restrictions or conditions that affect potential users from other countries that may want to enter into transactions offered through the site. This information should be easily accessible from the site center, and available before users attempt to enter into transactions. For business to consumer (B2C) transactions, see recommended disclosures in the Guidelines for Consumer Protection in the Context of Electronic Commerce, authored by the OECD (see [B56]).

7.5.9 Physical addresses

When presenting or collecting address information, country and postal code should be included. Note postal codes vary in format, and validation code should take this into consideration. It may be useful to collect country or postal code information before other information to minimize the user entry required, although users may not know details such as postal code or province.

[30]The U. S. Congress has designated the metric system as the preferred system of weights and measures for United States trade and commerce.

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7.6 Bandwidth efficiencies

Analysis of the target-user community should include evaluation of the expected (and worst case) bandwidth. Well-engineered Web pages data elements shall be responsive to the business, information, or service objectives of the page. Tools for well-engineered Web page generation should not add extraneous information such as the name/version of the tool used.

It may be useful to have a well-engineered Web page size limit for a site, with warnings associated with links that lead to documents larger than the suggested size. Links to large items (e.g., pages, downloads, images, etc) should have size information as an RMfield (`<objectsize>`, `<... class="objectsize">`) associated with the link. Indicate the size of the object using true decimal size (not binary) in octets (eight bit elements) and either thousands ("k"), millions ("M"), or Gigaoctets ("G"). A 5 Gigaoctet image could be designated as: 5G, 5000M or 5000000k.

It is especially desirable to have the initial point of contact (home page) for a site load quickly so users can identify the content of the site. This is especially true when some users have low bandwidth connectivity. For this reason, the home page should contain few and small graphic files, and all graphics should contain height/width tags and `alt` tags so that a user can see quickly what the content of the page will be.

Reusing images will have a positive impact on the overall performance.

7.7 Navigation aids

A link shall be provided in each well-engineered Web page to get to one or more appropriate pages for more general information relevant to this site (see 5.11). The information pages should provide a context for users who may have entered from links or search results into the middle of the site. These pages may include information about the page owner. This should include a link to the site's home page and might also include owner organization, corporate department, physical location, etc.

The location and appearance of navigation aids on the various pages of an Intranet should be consistent. For example, the navigation aid to move the user to the site home page should always be located in the same page position as defined by the high level design of the Web site. This also applies to the relative location and appearance of other navigation elements such as "Top of Page," "last 25 items" or "next 25 items."

Each page should provide information such as `mailto` link for author or other point of contact for users.

NOTE—Typically, this will not be "Webmaster@domain" as discussed in 5.7.

Summaries and tables of contents of large documents should be available to allow for a quicker discard of uninteresting data/pages.

The use of the `id` attribute with HTML elements is encouraged to facilitate future links[31] to specific elements of a document. This can be particularly useful when a series of pages have common structural elements. For example, standards have a "scope" section, and the use of `<h1 id="scope">` facilitates future location of the section, and pointers to the section (see also 4.2.3).

A URI pointing to a directory should either resolve to a default file (as set in the server), a useful directory listing (for the target-user communities), or have a clearly identifiable page for further information. The name of the default page for a directory access is defined in the server configuration. The default page should be named default.htm, index.html, or home.html. The primary navigation environment should be presented

[31]Unfortunately, some browsers do not support this HTML 4.0 functionality for the `id` attribute. For external linkage with legacy browsers, the anchor `<a name="scope"> ... </a>` capability must be applied.

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when the default name within a directory is used. The `REDIRECT` header tag can be used to manage navigation. Issues related to navigation by people with disabilities have to be considered (visual or motion impairments particularly).

a) All links shall work correctly.
b) It shall be easy to navigate from any Web page back to the home page (e.g., a button should be provided to return to the home page every 1-2 screens).
c) Links to "under construction" pages should be avoided.

The class designation "duplicatelink" should be used to designate additional navigational links which duplicate one on the page. One instance should not be designated a duplicate link. This allows style sheets to hide these redundant links from users where this may be a distraction (especially for aural presentation).

Note the navigation requirements and recommendations in 4.2.7, many of which improve ease of use as well as accessibility.

7.8 Active links

Periodic review is required to verify that all links are still active. Automatic review of links should help to quickly identify targets that are not valid anymore, but human review of links may be needed to ensure validity of content. Use of persistent URIs may help to avoid some of the problems created by these references. Links that go to pages with critical information should provide indication of the last verification date as an Mfield (`<linkverified>`, `<... class="linkverified">`).

7.9 Dead links

Care should be taken that all Web links are up-to-date. Dead, inactive, or missing links severely detract from the quality of a Web site. Webmasters should periodically verify that all links are still active. Many times, links become out-of-date, and merely serve as placeholders for the actual Web link. Web sites demand periodic maintenance to insure that links are current. Automated tools exist that check the existence, if not veracity, of Web links. Web masters may want to refrain from overspecifying Web sites in order to avoid Web link obsolescence. In general, the greater the specificity, the more likely the link will become outdated. On the other hand, a more generalized Web site address can force the user to burrow down several layers in order to get to the precise Web site needed. The Web master must find a happy medium between overspecifying the Web site link and forcing the user to do extensive searching once connected to the link in question.

7.10 Absolute and relative links

Links within a Web site should be relative to the linking page, and not to the site root. Sites may wish to establish a reference point for relative references (e.g. top-level directory) and use `<BASE HREF= … />` to establish the reference point (use of the BASE tag may complicate site relocation). Links to external Web sites should use persistent URIs, where available. Site pages intended for external reference should provide persistent URIs, where applicable. Digital Object Identifiers (DOI), as defined by the DOI Foundation[32], may be useful as persistent URIs. See 4.2.8 on site/page relocation.

7.10.1 Links to protected Web sites

Links to protected Web sites should, in general, indicate that the Web site is password protected or requires a subscription or registration. This annotation can be color-coded for maximum effect, in order to alert the user to the restrictive nature of the Web site.

[32]For more information, please visit http://www.doi.org.

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7.10.2 Offsite warning

Clear indications may be needed when leaving a site for other sites, this may be related to a change of security domains, or to assure that the seamless nature of the Web does not mislead the user about the source of the content. Links that lead offsite may be tagged with "`<a …class="offsite">`" as a method for creating a CSS controlled visual distinction. Depending on the situation, it may be useful to require browser's to use this information to implement specific policies such as managing the history information (or cookies), blocking transfer, presenting the link with some warning icon, presenting the user with some "leaving xxx site" warning, etc.

As an alternative, "`<… Class="onsite">`" may be used to indicate links that are known to be appropriate for seamless transition. With the use of this approach, browsers should implement the "offsite" action for links that do not include this attribute.

7.11 Cookies

It may be useful to use cookies to maintain state between page accesses. The project plan shall document the decision to use, or not use, cookies; and the implementation shall be consistent with this plan. Tools shall verify that use of cookies is intended for a given site. In this case, the use of cookies shall be described and the user given an option of receiving these cookies as an explicit action. Well-engineered Web sites that use cookies, Web beacons, or other technologies which collect information on customer usage shall have a privacy statement available from their site center or general information page(s) that explains their use of such technology. Well-engineered Web sites shall disclose if usage of prior site information is collected, and if information is shared with other organizations. If cookies are required and the required cookies are not received, the site shall provide relevant feedback to the user as an error message (testing for this is not easily automated).

7.12 Frame considerations

Various methods can be used to encapsulate graphics or other page elements on a page that are transparent to the user. If design includes the use of frames, then provision should be made for the user community to choose a no-frame implementation of the same content. This should be considered in the maintenance plan as well. Frames shall not be used to mislead the user about the source, ownership or other aspects of frame contents. Frame presentation of third-party content shall only be done when full consideration is given to the copyright, presentation, appropriate commercial use, permissions and other legal and ethical aspects of such encapsulation.

Links can be expected by the user to lead to other sites and as such do not require these same ethical considerations (see clause 7.7).

The _blank target, or other means of creating new windows, shall not interfere with the user's ability to return to their page history (this relates to requirement 22(o) of 36 CFR 1194, commonly called Section 508. Portions of 36 CFR 1194 are provided in Annex I).

NOTE—To avoid being "encapsulated" it may be appropriate to include a `<base target="_top" />` HEAD entry to force linked[33] page(s) to acquire the full, original window. Scripting may be used to detect encapsulation and reloading the current content into the _top frame.

[33]Unfortunately it is not possible to force the initial page to the "top"—it will be encapsulated. This tag (in each page) will assure that the pages reached from this page via links will assume control of the entire window.

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7.13 Graphical images

All graphic elements shall contain declared height/width display size, permitting the immediate allocation of page layout for these and concurrent rendering. The use of consistent style sheets can reduce page size, and provide for reuse of style for subsequent pages. Reuse of images, as opposed to use of new images, can reduce download time by taking advantage of local caching.

Multiple graphic images at the server should be considered, providing for lower bandwidth connections, and/or user choice. A potential convention is to have a "thumbnail" graphic delivered, which is also a link to a higher resolution graphic as an option for the user community.

Where a server may deliver images in multiple formats, image URIs should not include a specific format name structure (e.g., xxx.gif). To allow for content negotiation with users and to minimize overhead in response, a diverse set of image formats should be provided.

Images should not be used to bypass HTML limitations or provide "style" control. Where available, CSS should be used. Images shall not be used to present text in an alternative style. This is disruptive to text-only browsers, it limits accessibility and global applicability, and it has a negative impact on performance. Graphic presentation of written materials for certain languages, cultures, or disciplines may be necessary.

Sites should support image formats for JPEG, PNG, and GIF for compatibility, and seek to deliver the least overhead image acceptable to the client. For animated images, Network Motion Graphics (NMG) should be supported, and scripting or client-side executable languages may be more efficient means of providing the required functionality.

The `alt` attribute is required by 4.2.7 to facilitate access by persons who are not displaying graphics with their browsers. This also facilitates indexing. `Alt` attribute descriptions should start with unique information, for example, "home button" rather than "button for home page," and use functional descriptions where applicable. `Longdesc` can be used to provide detailed information about graphical content where it is warranted. To facilitate access by older browsers that do not support `longdesc`, also provide an anchor link to that same data (`longdesc` takes a URI as it's value).

Unfortunately, firewalls and gateways can convert data types. Hence, the client may not receive the expected graphic.

7.14 Deprecated HTML elements and attributes

HTML version 4.0 identifies a set of style specific tags as deprecated (usage discouraged).[34] These include `<blink>`, `<font>`, `<b>`, `<i>`, `<u>`, `<strike>`, `<s>`, `<basefont>`, `<center>`, `<menu>`, `<listing>`, `<plaintext>`, `<XMP>`, and color attributes (e.g., background, text, link, vlink, alink, etc). Where the target environment allows (see 4.2), the well-engineered Web page should not use the deprecated tags to control formatting, but should use style sheets instead.

7.15 Physical location information

Physical addresses should be aligned with desired usage (i.e., various deliveries may not be possible to PO boxes). Full postal designation (with country) for mail and delivery services may require a street address. In addition, links to appropriate maps may be useful.

[34]Deprecated elements are defined as such by W3C recommendations; see http://www.w3.org for more information.

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To facilitate indexing by physical location[35], a well-engineered Web page may include the RMfields `<span class="longitude"> ... </span><span class="latitude"> ...</span>`, and for addresses specifying a street location, the RMfield `<span class="crossstreet"> </span>`. Cross street can be useful for fine-tuning in human navigation and for fine-tuning in mapping software.

Any Web site offering or effecting commercial transactions shall prominently display postal addresses and telephone numbers for follow-up inquiries.

7.16 Server technology independence

Depending on the target audience and the desired sophistication of the pages, a well-engineered Web page may or may not make use of server side capabilities such as server side include (SSI), active server page (ASP), or other capabilities. It is desirable, whenever possible, to produce pages that do not depend on server settings or capabilities. Two recommendations in this area include the following:

a) Avoid links to a directory in a relative reference. Instead point to the file within the directory. For example `<a href="detail/">` should be `<a href="detail/index.htm">`. The "default file" may vary from server to server, pages that reference directories may not be portable from one server to another.
b) Whenever important elements such as navigation elements are provided through server support, also provide these navigation controls directly, perhaps through a text menu at the bottom of the page. Because more server code is treated as comments by browsers, these pages will be usable across a wide range of servers even though their appearance may change.

The ultimate goal is to allow pages, whenever possible, to be moved from server to server, and even be moved onto CD-ROM for distribution without suffering from broken links.

7.17 Flushing search engines

Search engines may store part or all of indexed pages and may present this back as part of the search results. Use of the "description" meta tag provides a level of control over what is presented. However, the initial content of a Web page may be presented. This can continue to be available either via the index, or via caching that the search engine has done, even after the page has been removed from the site. The information incorporated in the "description," and early in the page should take this into account. Note that corrected or deleted material may continue to be available. Resubmission to search engines may facilitate replacement of these references.

Search engines should flush old page indexing information within one year, or as of the "expiration date" of the page.

[35]The Society of Automotive Engineers is developing a specification, SAE J2374, National Location Reference Specification [B57], along with related work on the Intelligent Transportation System that may be of interest for both WEP designers and indexing services dealing with location-based information.

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Annex A

(informative)

Bibliography

See http://dx.doi.org/10.1041/standard/2001/2002/references for a list of normative (see Clause 2 of this recommended practice) and informative reference URLs on-line, and most recent updates, where known.

[B1] Consumers International Recommendations for Consumer Protection.[36]

Consumers International has produced recommendations for consumer protection and online shopping.

[B2] IEEE Std 730™-2002, IEEE Standard for Software Quality Assurance Plans.[37]

Uniform, minimum acceptable requirements for the preparation and content of software quality assurance plans (SQAPs) are provided. This standard applies to the development and maintenance of critical software. For non-critical software, or for software that has already been developed, a subset of the requirements of this standard may be applied.

[B3] IEEE Std 828™-1998, IEEE Standard for Software Configuration Management Plans.

This standard establishes the minimum required contents of a software configuration management plan and defines the specific activities to be addressed and their requirements for any portion of a software product's life cycle.

[B4] IEEE Std 829™-1998, IEEE Standard for Software Test Documentation.

This standard provides material helpful in test planning, specification and reporting; it describes a set of basic test documents which are associated with the dynamic aspects of testing (that is, the execution of procedures and code). The standard defines the purpose, outline and content of each basic document. The standard does not call for specific testing methodologies, approaches, techniques, facilities, or tools, and does not specify the documentation of their use.

[B5] IEEE Std 830™-1998, IEEE Recommended Practice for Software Requirements Specifications.

The content and qualities of a good software requirements specification (SRS) are described and several sample SRS outlines are presented. This recommended practice is aimed at specifying requirements of software to be developed but also can be applied to assist in the selection of in-house and commercial software products. Guidelines for compliance with IEEE/EIA 12207.1-1997 [B16] are also provided.

[B6] IEEE Std 1003.1™-2001, IEEE Standard for Information Technology—Portable Operating System Interface (POSIX®).

[B7] IEEE Std 1016™-1998, IEEE Recommended Practice for Software Design Descriptions.

The necessary information content and recommendations for an organization for Software Design Descriptions (SDDs) are described. An SDD is a representation of a software system that is used as a medium for communicating software design information. This recommended practice is applicable to paper documents, automated databases, design description languages, or other means of description.

[36]Foe more information, please visit http://www.consumersinternational.org.

[37]The IEEE products referred to in this annex are trademarks belonging to the Institute of Electrical and Electronics Engineers, Inc.

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[B8] IEEE Std 1028™-1997 (R2002), IEEE Standard for Software Reviews.

This standard defines five types of software reviews, together with procedures required for the execution of each review type. It is concerned only with the reviews; it does not define procedures for determining the necessity of a review, nor does it specify the disposition of the results of the review. Review types include management reviews, technical reviews, inspections, walk-throughs, and audits.

[B9] IEEE Std 1058™-1998, IEEE Standard for Software Project Management Plans.

The format and contents of software project management plans, applicable to any type or size of software project, are described. The elements that should appear in all software project management plans are identified.

[B10] IEEE Std 1074™-1997, IEEE Standard for Developing Software Life Cycle Processes.

A process for creating a software life cycle process is provided. Although this standard is directed primarily at the process architect, it is useful to any organization that is responsible for managing and performing software projects.

[B11] IEEE Std 1219™-1998, IEEE Standard for Software Maintenance.

This standard describes the process for managing and executing software maintenance activities.

[B12] IEEE Std 1220™-1998, IEEE Standard for Application and Management of the Systems Engineering Process.

The interdisciplinary tasks, which are required throughout a system's life cycle to transform customer needs, requirements, and constraints into a system solution, are defined. In addition, the requirements for the systems engineering process and its application throughout the product life cycle are specified. The focus of this standard is on engineering activities necessary to guide product development while ensuring that the product is properly designed to make it affordable to produce, own, operate, maintain, and eventually to dispose of, without undue risk to health or the environment.

[B13] IEEE Std 1490™-1998, IEEE Guide (©IEEE)—Adoption of PMI Standard—A Guide to the Project Management Body of Knowledge (©PMI).

The subset of the Project Management Body of Knowledge that is generally accepted is identified and described in this IEEE guide on the adoption of the PMI standard. "Generally accepted" means that the knowledge and practices described are applicable to most projects most of the time, and that there is widespread consensus about their value and usefulness. It does not mean that the knowledge and practices should be applied uniformly to all projects without considering whether they are appropriate.

[B14] IEEE Std 2001™-1999, IEEE Recommended Practice for Internet Practices—Web Page Engineering—Intranet/Extranet Applications.

[B15] IEEE/EIA 12207.0-1996, IEEE/EIA Standard—Industry Implementation of International Standard ISO/IEC 12207:1995—(ISO/IEC 12207) Standard for Information Technology—Software Life Cycle Processes.

ISO/IEC 12207 provides a common framework for developing and managing software. IEEE/EIA 12207.0-1996 consists of the clarifications, additions, and changes accepted by the Institute of Electrical and Electronics Engineers (IEEE) and the Electronic Industries Association (EIA) as formulated by a joint project of the two organizations.

[B16] IEEE/EIA 12207.1-1997, IEEE/EIA Standard—Industry Implementation of International Standard ISO/IEC 12207:1995—(ISO/IEC 12207) Standard for Information Technology—Software Life Cycle Processes—Life Cycle Data.

This part of the standard provides guidance for recording life cycle data resulting from the life cycle processes of IEEE/EIA 12207.0-1996.

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[B17] IEEE/EIA 12207.2-1997, IEEE/EIA Standard—Industry Implementation of International Standard ISO/IEC 12207:1995—(ISO/IEC 12207) Standard for Information Technology—Software Life Cycle Processes—Implementation Considerations.

Part 2 of the standard provides implementation consideration guidance for the normative clauses of IEEE/EIA 12207.0-1996. The guidance is based on software industry experience with the life cycle processes presented in IEEE/EIA 12207.0-1996.

[B18] IETF RFC 1123:1989, Requirements for Internet Hosts—Application and Support.[38]

This RFC enumerates standard protocols that a host connected to the Internet must use, and it incorporates, by reference, the RFCs and other documents describing the current specifications for these protocols. It corrects errors in the referenced documents and adds additional discussion and guidance for an architect.

This document is one of a pair that defines and discusses the requirements for host system implementations of the Internet Protocol suite. This RFC covers the applications layer and support protocols. Its companion RFC, Requirements for Internet Hosts—Communications Layers [INTRO:1] covers the lower layer protocols: transport layer, IP layer, and link layer.

These documents are intended to provide guidance for vendors, architects, and users of Internet communication software. They represent the consensus of a large body of technical experience and wisdom, contributed by members of the Internet research and vendor communities.

[B19] IETF RFC 1766:1995, Tags for the Identification of Languages.

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements.

[B20] IETF RFC 1866:1995, Hypertext Markup Language—2.0.

[B21] IETF RFC 2396:1998, Uniform Resource Identifiers (URI): Generic Syntax.

A Uniform Resource Identifier (URI) is a compact string of characters for identifying an abstract or physical resource. This document defines the generic syntax of URI, including both absolute and relative forms, and guidelines for their use; it revises and replaces the generic definitions in IETF RFC 1738:1994 and IETF RFC 1808:1995.

This document defines a grammar that is a superset of all valid URI, such that an implementation can parse the common components of a URI reference without knowing the scheme-specific requirements of every possible identifier type. This document does not define a generative grammar for URI; that task will be performed by the individual specifications of each URI scheme.

[B22] IETF RFC 2774:2000, An HTTP Extension Framework.

A wide range of applications have proposed various extensions of the HTTP protocol. Current efforts span an enormous range, including distributed authoring, collaboration, printing, and remote procedure call mechanisms. These HTTP extensions are not coordinated, since there has been no standard framework for defining extensions and thus, separation of concerns. This document describes a generic extension mechanism for HTTP, which is designed to address the tension between private agreement and public specification and to accommodate extension of applications using HTTP clients, servers, and proxies. The proposal associates each extension with a globally unique identifier, and uses HTTP header fields to carry the extension identifier and related information between the parties involved in the extended communication.

[B23] IETF RFC 2965:2000, HTTP State Management Mechanism.

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements.

[38]IETF RFC documents are available at http://www.ietf.org/rfc.

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[B24] International DOI Foundation.[39]

The Digital Object Identifier (DOI) is an identification system for intellectual property in the digital environment. Developed by the International DOI Foundation on behalf of the publishing industry, its goals are to provide a framework for managing intellectual content, link customers with publishers, facilitate electronic commerce, and enable automated copyright management.

[B25] ISO 8601:2000, Data Elements and Interchange Formats—Information Interchange—Representation of Dates and Times.

[B26] ISO 9241-1:1997, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 1: General Introduction.

[B27] ISO 9241-2:1992, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 2: Guidance on Task Requirements.

[B28] ISO 9241-3:1992, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 3: Visual Display Requirements.

[B29] ISO 9241-4:1998, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 4: Keyboard Requirements.

[B30] ISO 9241-5:1998, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 5: Workstation Layout and Postural Requirements.

[B31] ISO 9241-6:1999, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 6: Guidance on the Work Environment.

[B32] ISO 9241-7:1998, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 7: Requirements for Display with Reflections.

[B33] ISO 9241-8:1997, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 8: Requirements for Displayed Colours.

[B34] ISO 9241-9:2000, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 9: Requirements for Non-Keyboard Input Devices.

[B35] ISO 9241-10:1996, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 10: Dialogue Principles.

[B36] ISO 9241-11:1998, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 11: Guidance on Usability.

[B37] ISO 9241-12:1998, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 12: Presentation of Information.

[B38] ISO 9241-13:1998, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 13: User Guidance.

[B39] ISO 9241-14:1997, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 14: Menu Dialogues.

[39]For more information please visit http://www.doi.org.

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[B40] ISO 9241-15:1997, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 15: Command Dialogues.

[B41] ISO 9241-16:1999, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 16: Direct Manipulation Dialogues.

[B42] ISO 9241-17:1998, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs)—Part 17: Form Filling Dialogues.

The 17 parts encompassing the ISO 9241 standard address all factors that bear on a computer system's overall ergonomic quality, including hardware, software, task design, and the usage environment.

[B43] ISO/IEC 8879:1986, Information Processing—Text and Office Systems—Standard Generalized Markup Language (SGML).[40]

[B44] ISO/IEC 11179-1:1999, Information Technology—Specification and Standardization of Data Elements—Part 1: Framework for the Specification and Standardization of Data Elements.

[B45] ISO/IEC 11179-2:2000, Information Technology—Specification and Standardization of Data Elements—Part 2: Classification for Data Elements.

[B46] ISO/IEC 11179-3:1994, Information Technology—Specification and Standardization of Data Elements—Part 3: Basic Attributes of Data Elements.

[B47] ISO/IEC 11179-4:1995, Information Technology—Specification and Standardization of Data Elements—Part 4: Rules and Guidelines for the Formulation of Data Definitions.

[B48] ISO/IEC 11179-5:1995, Information Technology—Specification and Standardization of Data Elements—Part 5: Naming and Identification Principles for Data Elements.

[B49] ISO/IEC 11179-6:1997, Information Technology—Specification and Standardization of Data Elements—Part 6: Registration of Data Elements.

The ISO/IEC 11179 series of standards specifies basic aspects of data element composition, including metadata. The standard applies to the formulation of data element representations and meaning as shared among people and machines; it does not apply to the physical representation of data as bits and bytes at the machine level.

[B50] ISO/IEC 11581-1:2000, Information Technology—User System Interfaces and Symbols—Icon Symbols and Functions—Part 1: Icons—General.

[B51] ISO/IEC 11581-2:2000, Information Technology—User System Interfaces and Symbols—Icon Symbols and Functions—Part 2: Object Icons.

[B52] ISO/IEC 11581-3:2000, Information Technology—User System Interfaces and Symbols—Icon Symbols and Functions—Part 3: Pointer Icons.

[B53] ISO/IEC 11581-6: 1999, Information Technology—User System Interfaces and Symbols—Icon Symbols and Functions—Part 6: Action Icons.

The ISO/IEC 11581 series of standards apply to icons that are displayed on computer screens. These icons represent data objects or computer system functions that users can manipulate and interact with.

[40]SO/IEC publications are available from the ISO Central Secretariat, Case Postale 56, 1 rue de Varembé, CH-1211, Genève 20, Switzerland/Suisse (http://www.iso.ch/). ISO/IEC publications are also available in the United States from Global Engineering Documents, 15 Inverness Way East, Englewood, Colorado 80112, USA (http://global.ihs.com/). Electronic copies are available in the United States from the American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, USA (http://www.ansi.org/).

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[B54] ITU Recommendation E.123 (02/01), Notation for national and international telephone numbers, e-mail addresses and Web addresses.[41]

[B55] Nielsen, Gettys, Baird-Smith, Prud'hommeaux, Lie, and Lilley; "Network Performance Effects of HTTP/1.1, CSS1, and PNG," *Computer Communication Review*, Vol. 27, No. 4, October 1997.

[B56] OECD Guidelines for Consumer Protection[42]

The Organization for Economic Cooperation and Development (OECD) has produced Guidelines for Consumer Protection in the Context of Electronic Commerce, available as downloadable PDF.

[B57] SAE J2374, Location Referencing Message Specification, July 1999.[43]

The Location Referencing Message Specification (LRMS) is intended to provide a practical approach to standardization for location referencing within a mixed data set environment, i.e., where more than one kind of spatial data set exists, and where spatial references between these data sets must be made. Although some Intelligent Transportation Systems (ITS) applications in local areas may be satisfied by having one common data set for which location references may be implemented in any number of ways many ITS applications will have broad interoperability requirements within the nation or a region. For example, a vehicle driven from California to Florida in the U. S. should be able to receive and understand spatial references for traffic information or routing instructions throughout the trip. Similarly, information sent from a vehicle to a central site should be understood in any city regardless of the kinds of data sets in use, whether they are public or private, or how locations are referenced internally to particular data sets. The LRMS can be applied to ITS systems involving mobile vehicles on roads, rails, and waterways. It can also be applied to location references to and from central sites to non-mobile sites such as kiosks, other central sites, or pedestrians. The broadest scope of the LRMS is therefore intermodal spatial data set interoperability at the national level and across all of ITS. Given the great variety of ITS systems, it is expected that individual LRMS profiles will generate location referencing standards for subsets of ITS applications.

[B58] W3C HTML Validation Service.[44]

This is an easy-to-use HTML validation service based on an SGML parser. It checks HTML documents for compliance with W3C HTML recommendations and other HTML standards.

[B59] W3C NOTE-datetime (W3C Technical Note entitled "Date and Time Formats").[45]

This document defines a profile of ISO 8601:2000 [B25], which describes a large number of date/time formats. To reduce the scope for error and the complexity of software, it is useful to restrict the supported formats to a small number. This profile defines a few date/time formats, likely to satisfy most requirements.

[B60] W3C REC-html32, W3C Recommendation—HTML 3.2 Reference Specification, 14 January 1997.[46]

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

[41]ITU publications are available from the International Telecommunications Union, Place des Nations, CH-1211, Geneva 20, Switzerland/Suisse (http://www.itu.int/).

[42]For further information please visit http://www.oecd.org.

[43]SAE publications are available from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096, USA (http://www.sae.org/).

[44]For more information please visit http://validator.w3.org.

[45]For more information please visit http://www.w3.org/ TR/NOTE-datetime.

[46]For more information please visit http://www.w3.org/TR/REC-html32.html.

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The HyperText Markup Language (HTML) is a simple markup language used to create hypertext documents that are portable from one platform to another. HTML documents are SGML documents with generic semantics that are appropriate for representing information from a wide range of applications. This specification defines HTML version 3.2. HTML 3.2 aims to capture recommended practice as of early 1996 and as such to be used as a replacement for HTML 2.0 (see IETF RFC 1866:1995 [B20]).

[B61] W3C REC-xml-19980210, W3C Recommendation Extensible Markup Language (XML) version 1.0.[47]

XML (Extensible Markup Language) is a simple and very flexible language based on SGML. Although originally envisaged to meet the challenges involved in large-scale publishing, XML is set to play an increasingly important role in the markup of a wide variety of data on the Web. XML will deliver information to the user agents in a form that allows automatic processing after receipt, help people find the information they want by providing a wealth of XML metadata—information about information, and help many Web-based applications. XML will make it easier for information consumers and producers to find each other. Many tasks involving search or information exchange can be automated with XML, providing a common framework for representing information, so everyone should benefit.

[B62] W3C Resource Description Framework (RDF) Schema Specification 1.0, W3C Candidate Recommendation 27 March 2000.[48]

The Resource Description Framework (RDF) is a specification currently under development within the W3C metadata activity. RDF is designed to provide an infrastructure to support metadata across many Web-based activities. RDF is the result of a number of metadata communities bringing together their needs to provide a robust and flexible architecture for supporting metadata on the Internet and the World Wide Web (WWW). Example applications include site maps, content ratings, stream channel definitions, search engine data collection (Web crawling), digital library collections, and distributed authoring.

[B63] W3C Web HTTP Performance Overview.[49]

This page is devoted to information about how to improve HTTP/1.1 performance. Most of the results are derived from experiences with Jigsaw, Apache, and the "libwww" implementations of HTTP/1.1.

[B64] Web Robot Exclusions.[50]

Web Robots are programs that traverse the Web automatically. Some people call them Web Wanderers, Crawlers, or Spiders.

[47]For more information please visit http://www.w3.org/TR/REC-xml.

[48]For more information please visit http://www.w3.org/TR/2000/CR-rdf-schema-20000327.

[49]For more information please visit http://www.w3.org/Protocols/HTTP/Performance.

[50]For more information please visit http://www.robotstxt.org/wc/robots.html.

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Annex B

(informative)

Potential areas of future or additional work

This recommended practice addresses a wide range of elements, and offers significant value and suggestions for improvement. Below are additional areas identified for future recommended practices. Persons with additional suggestions, or who wish to help develop these are encouraged to contact the IBPwg via (http://dx.doi.org/10.1041/standard/2001).

- Security considerations for transfer of pages, limiting access, etc.
- Application of Resource Description Framework (RDF).
- Site authentication. Provide a mechanism to determine that the location providing the information is properly identified (refer back to digital signature).
- Indexing. Add recommended practices to Clauses 5 and 6 on indexing (consider ASC X3.285—Standard for Metamodel for Shareable Data—and related resource description work).
- Recommendations on static vs. dynamic page trade-offs.
- Recommendations concerning Web-page development process.
- Definition of metrics for well-engineered Web site success rating.
- Include additional XML, XSL specific recommendations.
- Use of simplified English/limited vocabulary to facilitate access/translation.
- Incorporation or reference to e-commerce considerations.
- Consider adding information associated with “new” material on a Web page or Web site. This may include suggestions for identifying the new information to the user as well as recommendations concerning the period of time that the material may be considered new. The appropriate place may be to have it associated with the date of last update in 7.4 or with navigation aids in 7.7.
- Develop an approach to writing this recommended practice such that Annex G becomes the base standard, and much of the current body becomes annex type amplification of the new base standard.
- Specify format for longitude and latitude as used in 7.15.
- Review the use of schemas, TREX, RELAX, and DAMl, in the context of DTD specification and validation of site markup language(s). This might include validation for (some) specifications of this standard.

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Annex C

(normative)

XML tags and HTML attribute values

Clauses in this recommended practice recommend or require the use of specific tags to delineate information that is intended for both human- and machine-readable operations (Mfield, RMfields). To ensure tags that can be processed by legacy HTML browsers, it is suggested that the `CLASS` or `ID` attribute be used in conjunction with `SPAN`, `DIV`, or other tags to designate these fields in HTML. `ID` can be used as a target for links to a page segment (i.e., URL/page#securitydesignation) in HTML version 4.0-compliant browsers (note, popular browsers at the time of this recommended practice did not support this use of `ID`). Corresponding TAGs will also be needed for references in XML documents. XML-enabled browsers, specialized tools, firewalls, and other applications will be able to use these indications to implement related policies or provide extended services. Cascading style sheets can be used to provide for distinctive rendering of these, where useful.

Here are the tag elements or attribute value specified in this recommended practice:

HTML attribute value	XML tag	Mfield, RMfield text example	Subclause
"securitydesignation"	<securitydesignation>	Internal Use Only	7.3
"pagedate"	<pagedate>	1999-09-09	7.4
"datemodified"	<datemodified>	1998-01-01	7.4
"contentdate"	<contentdate>	1776-07-04	7.4
"nextupdate"	<nextupdate>	1999-12-31	7.4
"expirationdate"	<expirationdate>	2000-02-29	7.4
"dateretired"	<dateretired>	2010-08-12	7.4
"phone"	<phone>	+01-202-371-0101	7.5.1
"origin"	<origin>	London, Ontario, CA	7. 5.4
"objectsize"	<objectsize>	128 Mbytes	7.6
"linkverified"	<linkverified>	1998-10-30	7.8
"offsite"	Link attribute "offsite"	 …	7.10.2
"onsite"	Link attribute "onsite"	 …	7.10.2
"latitude"	<latitude>	42.357	7.15
"longitude"	<longitude>	72.3215	7.15
"crossstreet"	<crossstreet>	Avenue of the Americas	7.15
<meta name="guideline" content=URI />		<meta name="guideline" content="computer.org/2001/2002">	1.3.1, 4.1.10
<meta name="intended for use" content= list of country codes />		<meta name="intended for use" content="us,uk" />	4.2.10

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For example, in the case of `<h3 id="securitydesignation"> Internal Use Only </h3>`[51]. This can also be used to ensure a unique style of presentation, and as a target for external links (see 4.2.3). In this example, `h3` is the HTML tag selected for the `id` attribute, this could have been used with other tags, including the `SPAN` or `DIV` tag if presentation characteristics are not a factor. This example also uses "id" rather than "class" since only one security designation should exist per page. For XML this would be `<securitydesignation>Internal Use Only</securitydesignation>`.

With XML, further validation is possible using the appropriate DTD.

[51]It would be preferable to use ID rather than class in this application to distinguish this value in a page as unique and provide for external linkage and unique CSS presentation; however some current browsers do not support these HTML 4.0 behaviors.

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Annex D

(informative)

Metadata for indexing and classification

D.1 Dublin Core metadata proposals

Current information about these elements is located at: http://dublincore.org/.

The definitions utilize a formal standard for the description of metadata elements. This formalization helps to improve consistency with other metadata communities and enhances the clarity, scope, and internal consistency of the Dublin Core metadata element definitions.

Each Dublin Core element is defined using a set of ten attributes from the ISO/IEC 11179 series of standards (see [B44] through [B49]) for the description of data elements. These include:

— Name: The label assigned to the data element.
— Identifier: The unique identifier assigned to the data element.
— Version: The version of the data element.
— Registration Authority: The entity authorized to register the data element.
— Language: The language in which the data element is specified.
— Definition: A statement that clearly represents the concept and essential nature of the data element.
— Obligation: Indicates if the data element is required to always or sometimes be present (contain a value).
— Datatype: Indicates the type of data that can be represented in the value of the data element.
— Maximum Occurrence: Indicates any limit to the repeatability of the data element.
— Comment: A remark concerning the application of the data element.

Fortunately, six of the above ten attributes are common to all the Dublin Core elements. These are, with their respective values:

Version:	1.1
Registration Authority:	Dublin Core Metadata Initiative
Language:	en
Obligation:	Optional
Datatype:	Character String
Maximum Occurrence:	Unlimited

The above attributes will not be repeated in the next group of definitions, however, they do represent part of the formal element definitions.

The definitions provided here include both the conceptual and representational form of the Dublin Core elements. The Definition attribute captures the semantic concept and the Datatype and Comment attributes capture the data representation.

Each Dublin Core definition refers to the resource being described. A resource is defined in IETF RFC 2396:1998 [B21] as “anything that has identity.” For the purposes of Dublin Core metadata, a resource will typically be an information or service resource, but may be applied more broadly.

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Element: Title

Name: Title

Identifier: Title

Definition: A name given to the resource.

Comment: Typically, a Title will be a name by which the resource is formally known.

Element: Creator

Name: Creator

Identifier: Creator

Definition: An entity primarily responsible for making the content of the resource.

Comment: Examples of a Creator include a person, an organization, or a service. Typically, the name of a Creator should be used to indicate the entity.

Element: Subject

Name: Subject and Keywords

Identifier: Subject

Definition: The topic of the content of the resource.

Comment: Typically, a Subject will be expressed as keywords, key phrases, or classification codes that describe a topic of the resource. Recommended best practice is to select a value from a controlled vocabulary or formal classification scheme.

Element: Description

Name: Description

Identifier: Description

Definition: An account of the content of the resource.

Comment: Description may include but is not limited to: an abstract, table of contents, reference to a graphical representation of content, or a free-text account of the content.

Element: Publisher

Name: Publisher

Identifier: Publisher

Definition: An entity responsible for making the resource available.

Comment: Examples of a Publisher include a person, an organization, or a service. Typically, the name of a Publisher should be used to indicate the entity.

Element: Contributor

Name: Contributor

Identifier: Contributor

Definition: An entity responsible for making contributions to the content of the resource.

Comment: Examples of a Contributor include a person, an organization, or a service. Typically, the name of a Contributor should be used to indicate the entity.

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Element: Date

Name: Date

Identifier: Date

Definition: A date associated with an event in the life cycle of the resource.

Comment: Typically, Date will be associated with the creation or availability of the resource. Recommended best practice for encoding the date value is defined in a profile of ISO 8601:2000 [B25] [W3CDTF] and follows the YYYY-MM-DD format.

Element: Type

Name: Resource Type

Identifier: Type

Definition: The nature or genre of the content of the resource.

Comment: Type includes terms describing general categories, functions, genres, or aggregation levels for content. Recommended best practice is to select a value from a controlled vocabulary (for example, the working draft list of Dublin Core Types [DCT1]). To describe the physical or digital manifestation of the resource, use the FORMAT element.

Element: Format

Name: Format

Identifier: Format

Definition: The physical or digital manifestation of the resource.

Comment: Typically, Format may include the media-type or dimensions of the resource. Format may be used to determine the software, hardware or other equipment needed to display or operate the resource. Examples of dimensions include size and duration. Recommended best practice is to select a value from a controlled vocabulary (for example, the list of Internet Media Types [MIME] defining computer media formats).

Element: Identifier

Name: Resource Identifier

Identifier: Identifier

Definition: An unambiguous reference to the resource within a given context.

Comment: Recommended best practice is to identify the resource by means of a string or number conforming to a formal identification system. Example formal identification systems include the Uniform Resource Identifier (URI) [including the Uniform Resource Locator (URL)], the Digital Object Identifier (DOI), and the International Standard Book Number (ISBN).

Element: Source

Name: Source

Identifier: Source

Definition: A Reference to a resource from which the present resource is derived.

Comment: The present resource may be derived from the Source resource in whole or in part. Recommended best practice is to reference the resource by means of a string or number conforming to a formal identification system.

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Element: Language

Name: Language

Identifier: Language

Definition: A language of the intellectual content of the resource.

Comment: Recommended best practice for the values of the Language element is defined by IETF RFC 1766:1995 [B19] [RFC1766] which includes a two-letter Language Code (taken from the ISO 639 standards (see ISO 639-1:2002 and ISO 639-2:1998) [ISO639]), followed optionally, by a two-letter country code (taken from ISO 3166-1:1997 [ISO3166]). For example, “en” for English, “fr” for French, or “en-uk” for English used in the United Kingdom.

Element: Relation

Name: Relation

Identifier: Relation

Definition: A reference to a related resource.

Comment: Recommended best practice is to reference the resource by means of a string or number conforming to a formal identification system.

Element: Coverage

Name: Coverage

Identifier: Coverage

Definition: The extent or scope of the content of the resource.

Comment: Coverage will typically include spatial location (a place name or geographic coordinates), temporal period (a period label, date, or date range) or jurisdiction (such as a named administrative entity). Recommended best practice is to select a value from a controlled vocabulary (for example, the Thesaurus of Geographic Names [TGN]) and that, where appropriate, named places or time periods be used in preference to numeric identifiers such as sets of coordinates or date ranges.

Element: Rights

Name: Rights Management

Identifier: Rights

Definition: Information about rights held in and over the resource.

Comment: Typically, a Rights element will contain a rights management statement for the resource, or reference a service providing such information. Rights information often encompasses Intellectual Property Rights (IPR), Copyright, and various Property Rights. If the Rights element is absent, no assumptions can be made about the status of these and other rights with respect to the resource.

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Annex E

(normative)

Robot exclusion

Current information on the Robot Exclusion specifications may be obtained at: http://www.robotstxt.org/wc/robots.html (see Web Robot Exclusions [B64]).

This approach is "voluntary," and requires respect from Web-indexing engines. They have been defined since 1994, so it is expected that most engines will respect both methods (although initially the site-level controls were more broadly recognized).

E.1 Page-level exclusion

The Robots META tag allows HTML authors to indicate to visiting robots if a document may be indexed, or used to harvest more links. No server administrator action is required.

In this simple example:

```
<metaname="ROBOTS" content="NOINDEX, NOFOLLOW" />
```

a robot should neither index this document, nor analyze it for links.

E.2 Site-level exclusions and control

The method used to exclude robots from a site of a selected set of pages is to create a file on the server that specifies an access policy for robots. This file must be accessible via HTTP on the local URL "/robots.txt."

The file consists of one or more records separated by one or more blank lines (terminated by CR,CR/NL, or NL). Each record contains lines of the form

```
<field>:<optionalspace><value><optionalspace>
```

where the field name is case insensitive.

Comments can be included in the file using IEEE Std 1003.1-2001 [B6]. Shell conventions are as follows: the "#" character is used to indicate that preceding space (if any) and the remainder of the line up to the line termination, is discarded. Lines containing only a comment are discarded completely, and therefore do not indicate a record boundary.

The record starts with one or more user-agent lines, followed by one or more disallow lines, as detailed in E.2.1. Unrecognized headers are ignored.

E.2.1 User-agent

The value of this field is the name of the robot for which the record is describing an access policy. If more than one user-agent field is present, the record describes an identical access policy for more than one robot. At least one field needs to be present per record. The robot should be liberal in interpreting this field. A case-

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insensitive substring match of the name without version information is recommended. If the value is "*," the record describes the default access policy for any robot that has not matched any of the other records. It is not allowed to have multiple such records in the "/robots.txt" file.

E.2.2 Disallow

The value of this field specifies a partial URL that is not to be visited. This can be a full path, or a partial path; any URL that starts with this value will not be retrieved. For example, `Disallow: /help` disallows both "/help.html" and "/help/index.html," whereas `Disallow: /help/` would disallow "/help/index.html" but allow "/help.html." Any empty value indicates that all URLs can be retrieved. At least one disallow field needs to be present in a record.

The presence of an empty "/robots.txt" file has no explicit associated semantics, it will be treated as if it was not present, i.e., all robots will consider themselves welcome. Only a single/robots.txt may be defined. Entries in the file can not use wild cards or regular expressions in the `disallow:` field, and there is no `allow:` field defined.

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Annex F

(informative)

Privacy statement text

Privacy policies developed for Web sites (see 4.2.6) should take into account the jurisdiction(s) where a Web site is present, as well as the target or authorized users of the site. A number of principles for privacy policies and statements have been adopted by various organizations and government authorities. Some references to these include:

U. S. Department of Commerce Safe Harbor site:
http://www.export.gov/safeharbor/index.html
The safe harbor effort identifies a basis for U. S. Headquartered organizations to respond to the European Privacy Directive.

European Commission
Standard Contractual Clauses for the transfer of personal data to third countries under Directive 95/46/EC.
http://europa.eu.int/comm/internal_market/ en/dataprot/news/index.htm

And on the more general topic of Data Protection:

http://europa.eu.int/comm/internal_market/ en/dataprot/index.htm

U. S. Legislation & Federal Trade Commission action on privacy (esp. Children's Online Privacy Protection Act: COPPA)
http://www.ftc.gov/privacy/index.html
(Information about individuals under 13 years old.)

OECD Guidelines on the Protection of Privacy and Transborder Flows of Personal Data
http://www1.oecd.org/dsti/sti/it/secur/prod/PRIV- EN.HTM

The following listed principles are the safe harbor principles developed through discussions between the U. S. Dept. of Commerce and the European Union, as a basis for addressing EC Directive 95/46/EC.

Organizations must comply with the seven safe harbor principles. The principles require the following:

Notice: Organizations must notify individuals about the purposes for which they collect and use information about them. They must provide information about how individuals can contact the organization with any inquiries or complaints, the types of third parties to which it discloses the information and the choices and means the organization offers for limiting its use and disclosure.

Choice: Organizations must give individuals the opportunity to choose (opt out) whether their personal information will be disclosed to a third party or used for a purpose incompatible with the purpose for which it was originally collected or subsequently authorized by the individual. For sensitive information, affirmative or explicit (opt in) choice must be given if the information is to be disclosed to a third party or used for a purpose other than its original purpose or the purpose authorized subsequently by the individual.

Onward Transfer (Transfers to Third Parties): To disclose information to a third party, organizations must apply the notice and choice principles. Where an organization wishes to transfer information to a third party that is acting as an agent (1), it may do so if it makes sure that the third party subscribes to the safe harbor principles or is subject to the Directive or another adequacy finding. As an alternative, the organization can

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enter into a written agreement with such third party requiring that the third party provide at least the same level of privacy protection as is required by the relevant principles.

Access: Individuals must have access to personal information about them that an organization holds and be able to correct, amend, or delete that information where it is inaccurate, except where the burden or expense of providing access would be disproportionate to the risks to the individual's privacy in the case in question, or where the rights of persons other than the individual would be violated.

Security: Organizations must take reasonable precautions to protect personal information from loss, misuse, and unauthorized access, disclosure, alteration, and destruction.

Data integrity: Personal information must be relevant for the purposes for which it is to be used. An organization should take reasonable steps to ensure that data is reliable for its intended use, accurate, complete, and current.

Enforcement: In order to ensure compliance with the safe harbor principles, there must be

a) Readily available and affordable independent recourse mechanisms so that each individual's complaints and disputes can be investigated and resolved and damages awarded where the applicable law or private sector initiatives so provide;
b) Procedures for verifying that the commitments companies make to adhere to the safe harbor principles have been implemented; and
c) Obligations to remedy problems arising out of a failure to comply with the principles.

Sanctions must be sufficiently rigorous to ensure compliance by the organization. Organizations that fail to provide annual self certification letters will no longer appear in the list of participants and safe harbor benefits will no longer be assured.

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Annex G

(informative)

Requirements checklist

G.1 Introduction to the requirements checklist

The primary requirements in this recommended practice take precedence over this summary listing. Please check specific clauses for better understanding and interpretation.

This annex contains a checklist of items that are required by IEEE Std 2001-2002 for well-engineered Web sites. The statements of the requirements are listed as stated in the main document. Minimal modifications to the wordings of certain statements were made so that the statements were clear when taken from their original context.

The checklist groups the requirements by their clauses/subclauses in the main document. Where several subclauses each contain only a few requirements, the requirements of several subclauses are grouped together. When requirements from more than one subclause are grouped together, the clause/subclause containing each requirement is given with the requirement.

G.2 Conforming Web page generation tool (1.3.2)

A conforming Web page generation tool satisfies all of the following conditions:

a) It produces pages that conform to the XHTML DTD recommendation of the W3C, and for other HTML or XML DTDs, it documents which DTDs it supports and how to use this function.
b) Conforming tools shall respect the DTD selection of the user.
c) For versions HTML 3.2 and higher, or XML, it supports Cascading Style Sheets (CSS) 1.0 or higher, or supports XSL and, in either case, documents the use of this function and identifies which recommendations are supported.
d) It can generate pages that conform to all of the requirements, recommendations, and options of this recommended practice. Tools may allow for creation of non-conforming pages as a user option (in which case the IEEE 2001 tag cannot be included on the page).
e) It supports validation against the user-selected DTD.

G.3 Normative references (Clause 2)

This recommended practice shall be used in conjunction with the following publications. When the following specifications are superseded by an approved revision, the revision shall apply. See Annex A for informative bibliographic references. Uniform Resource Locators (URLs) provided in this recommended practice are current as of the date submitted for publication. See http://dx.doi.org/10.1041/standard/2001/2002/references for a list of normative and informative reference URLs on-line.

36 CFR 1194 –Electronic and Information Technology Accessibility Standards, Federal Register Dec. 21, 2000; Code of Federal Regulations (CFR).

Authoring Tool Accessibility Guidelines 1.0, W3C Recommendation 3 February 2000, Guidelines required by Web page generation tools to support accessibility requirements.

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Cascading Style Sheets, level 1, W3C Recommendation 17 Dec. 1996, revised 11 Jan 1999.

HTML 4.01 Specification, W3C Recommendation 24 December 1999.

ISO 639-1:2002, Codes for the Representation of Names of Languages—Part 1: Alpha-2 Code.

ISO 639-2:1998, Codes for the Representation of Names of Languages—Part 2: Alpha-3 Code.

ISO 3166-1:1997, Codes for the Representation of Names of Countries and their Subdivisions—Part 1: Country Codes.

ISO 4217:2001, Codes for the Representation of Currencies and Funds.

W3C REC-CSS2-19980512, W3C Recommendation Cascading Style Sheets, level 2 CSS2 Specification—W3C Recommendation, 12 May 1998.

W3C WAI Web Content 19990505, W3C Recommendation Web Content Accessibility Guidelines 1.0, WAI Page Author Guidelines—W3C, 5 May1999.

XHTML™ 1.0: The Extensible HyperText Markup Language, A Reformulation of HTML 4 in XML 1.0, W3C Recommendation 26 January 2000.

G.4 Design practices (Clause 4)

a) The well-engineered Web site project plan shall incorporate consideration of the implications of both minimum and maximum Web site life expectancies.
b) Well-engineered Web sites shall have an identified set of metrics that can be evaluated to determine the well-engineered Web site success in delivering specific information to individuals who need that information.
c) Navigation aids, buttons, user readable body metadata, and other items commonly appearing on multiple well-engineered Web pages shall be consistent with respect to having a common look and feel as well as a common location within the well-engineered Web page.
d) Design shall take into consideration the characteristics of the client and server environment.
e) Test cases shall be designed considering the user interaction with the Web site. Some testing effort shall stress performance and scalability features supported by servers that will be used when the site is in operation.
f) Well-engineered Web site design shall consider the recommended security practices contained in IEEE Project 2002 once it is published as an approved IEEE Standard.
g) Well-engineered Web pages shall have an identified page date, expiration date, and contact point.

G.5 Target-user community (4.1.1)

a) Web site designers shall identify and document one or more targeted user communities.
b) The evaluation shall include the client environments of these target-user communities. Diversity of browsers in use, complementary capabilities (e.g., script, byte code, graphics, etc), and the bandwidth of connectivity shall be included in this environmental evaluation.
c) The selection of implementation tools (e.g., servers, generators, and selected “levels” of HTML, CSS, XML, scripting, etc) shall be based on this evaluation of the target-client communities.
d) The designer shall document the targeted environment range for the Web site for future reference.

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e) The documentation shall include statements about the page formats generated, including HTML version (and in some cases excluded functionality), CSS version, XML version and XML DTD(s), graphics formats, scripting and/or byte code executable versions and/or limitations, human-language considerations (as well as character sets), bandwidth considerations, and other characteristics from this recommended practice or as identified during the design phase.

G.6 Other subclauses under 4.1 (General Requirements)

a) Well-engineered Web site design shall include a clear way to identify the areas of the Web site that have changed without the need for navigating the entire site (see 4.1.2).
b) Metrics for evaluation of well-engineered Web sites shall be derived from evaluation by the target-user community and information to be conveyed (see 4.1.3).
c) The well-engineered Web site project plan, if prepared, shall document requirements for scheduled well-engineered Web page maintenance and/or well-engineered Web site expiration (see 4.1.4).
d) Proofreading and quality assurance shall be applied to static as well as dynamically generated pages (see 4.1.10).
e) Development testing of well-engineered Web sites shall be designed to address issues such as:
    1) Well-engineered Web pages shall display as designed.
    2) Well-engineered Web sites shall provide security controls such as passwords and firewalls if required.
    3) Well-engineered Web pages shall be tested for conformance to IEEE Std 2001-2002 using an existing verification tool to verify compliance where appropriate (see 4.1.10).
f) Operational testing of well-engineered Web sites shall be designed to address issues such as:
    1) Well-engineered Web pages shall display as intended.
    2) Well-engineered Web pages shall not require excessive scrolling.
    3) Well-engineered Web sites shall provide required security controls.
    4) Well-engineered Web pages shall be tested for conformance to accessibility requirements.
    5) The Web site shall meet all defined user requirements.
    6) New user requirements that evolve from design initiation through final delivery shall be documented.
    7) All links shall work correctly (see 4.1.10).
g) Managed pages shall include one or more meta tags indicating the guidelines or standards applicable to this page. The format for the meta tag shall be "`<meta name="guideline" content=URI of guideline />`" (see 4.1.11).

G.7 Environment selection (4.2)

a) Well-engineered Web pages shall separate the presentation from the content, to the extent that it is feasible (see 4.2.2).
b) The trade-off between accommodating a greater range of target-client browsers using page-specific characteristics and the maintenance advantage of page-independent presentation offered by style sheets, shall be included in well-engineered Web site design (see 4.2.2).
c) Web page generation tools shall support CSS as an external style sheet (see 4.2.2).
d) Consideration shall be given to the legacy and anticipated evolution of the user-community environment in terms of hardware and software capabilities (see 4.2.4).
e) Consideration shall be given to anticipated or likely changes in technology to minimize the need to re-engineer Web sites to accommodate these changes (see 4.2.4).
f) Part of the design process shall include documenting when, if ever, such facilities will be used (see 4.2.5).

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g) Tools shall not include client-side scripting unless that option has been selected by the author (see 4.2.5).
h) The site shall notify user that scripting is required for some functions (see 4.2.5).
i) Selection of specific tools and/or versions of implementations here shall be considered in both the context of the target-client environments and the life cycle management of the well-engineered Web site (see 4.2.5).

G.8 Privacy policies (4.2.6)

a) Privacy considerations shall include organizational policies, legal context, and an awareness of potential network integrity issues.
b) Well-engineered Web sites shall address the range of access across jurisdictional boundaries in identifying the information to be provided and protections to be applied.
c) All information collected from a user that would identify the user shall be discarded when the user terminates the session prior to the delivery of the prescribed item.
d) Anonymity shall be allowed upon user choice, at the eventual cost of not providing the service or the information offered.
e) End-user data collection (e.g., e-mail address, username, etc) shall not be gathered without explicit consent. In some countries, this is related to legal issues.
f) Well-engineered Web sites shall follow legal and industry guidelines on the collection, notification, and retention of information related to users.
g) Indexing of well-engineered Web pages by conforming Web page generation tools shall adhere to the robot exclusion guidelines (see Annex E).

G.9 Content accessibility (4.2.7)

a) The target-user community evaluation shall take into account the likely existence (or future existence) of individuals who will need to access the information or services of the site and who have limited sight, color blindness, mobility impairments, audio impairments, or require other special considerations as well as ergonomic requirements for general ease-of-access and ease-of-use for users.
b) Well-engineered Web pages shall conform to Web Content Accessibility Guidelines.
c) Well-engineered Web pages shall avoid color combinations that cause problems for individuals with color blindness in its various forms.
d) Use of the 216 “Web safe” colors is recommended. These colors are selected, in hex terms, with RGB values of 00, 33, 66, 99, CC or FF only.
e) Well-engineered Web page text to background luminance—contrast shall exceed 33% (better than 67% recommended). The luminance for any specific RGB color can be computed as:

luminance = 0.3 x Red + 0.59 x Green + 0.11 x Blue

f) Sites required to meet 36 CFR 1194 shall assure they meet the requirements of Annex I of this recommended practice, which duplicates the relevant sections of 36 CFR 1194.
g) Well-engineered Web pages shall not include flashing or blinking objects which have a blinking frequency or flicker rate greater than 2 Hz without consideration for photosensitive epilepsy impact. Frequency greater than 55 Hz is acceptable under 36 CFR 1194.22(j).
h) Where timeout is applied to user response forms, a mechanism shall be provided to allow a user to indicate more time is required.
i) Forms shall use label and tab order designations to allow persons using assistive technology to access the fields and functionality required to complete and submit the forms.

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j) Well-engineered Web pages shall use the `TABINDEX` attribute in conjunction with the `A`, `AREA`, `BUTTON`, `INPUT`, `TEXTAREA`, and `OBJECT` elements where this provides a logical sequencing to access these elements.
k) Where a set of pages contain common initial links, and/or duplicate links, `TABINDEX` shall be used to present unique links for this page first.
l) To allow the user to avoid duplicate links, `TABINDEX` shall be used to present duplicates after all links have been sequenced once, and a "refresh" link provided to reset the series without traversing the duplicates.
m) For forms that have more than one logical section, for example, personal information, billing information, ship-to information, `FIELDSET` and `LEGEND` elements shall be used to identify these sections.
n) Form fields shall have associated `LABEL` elements.
o) Repetitive navigation links shall be assigned a `TABINDEX` value of zero.
p) Well-engineered Web pages where the primary page content does not start immediately in the `BODY` element shall define a `DIV` element with the attribute ID="content" to enclose the primary content.

G.10 Maintenance (4.2.9)

Well-engineered Web site maintenance planning shall consider, as a minimum, the following factors:

a) Eliminating obsolete information or services.
b) Updating the status of information or services.
c) Changing and periodically validating links to related information.
d) Changing client or server environments that may require or warrant well-engineered Web site re-engineering.
e) Changing policy (e.g., organizational, regulatory, legislative, etc) that may require changes in information content, protection, designation, or access.
f) Updating well-engineered Web sites to remain in compliance with applicable standards.
g) If style sheets are not available, the well-engineered Web site design shall use an alternate method for indicating page classifications.

G.11 Appropriate content (4.2.10)

a) Content of a site shall be considered in the context of ethical and legal considerations recognizing that these may vary throughout the jurisdictions and cultural environments where the site is accessible.
b) Exclusion of content, selective delivery, or limited access shall be implemented to reflect such evaluation.
c) Specific consideration shall be given to content that may not be appropriate for minors, and to topics or pictorial content that is deemed offensive (or illegal) for distribution in given environments.
d) The site design process shall recognize that the legal and cultural norms of one jurisdiction may not apply in other jurisdictions.

G.12 Scripting languages and Java

a) Any Web page using client-side scripts must provide the same functionality on the page without the scripts in order to be considered accessible (see 4.3.1).
b) To be accessible, a page containing an applet must be capable of operating without the applet (see 4.3.2).

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G.13 Server, HTTP, and site considerations (Clause 5)

a) Well-engineered Web page sites shall incorporate a cache expiration date that reflects the rate of change of the data being provided (see 5.2).
b) Well-engineered Web sites shall not disable caching unless the rate of content change relevant to the users is high, the data is unique to a specific user, or data security/sensitivity warrant such treatment (see 5.3).
c) Servers shall incorporate robot exclusion elements (see Annex E) based upon the implications of indexing external to the site (see 5.5).
d) The use of robot technology within a Web site to create indexes or searching well-engineered Web sites shall respect these guidelines (see 5.5).
e) Submission of well-engineered Web pages to validation tools shall be done in a way that is consistent with the proprietary nature of the information content (see 5.6.1).
f) E-mail to "Webmaster@domain" shall provide a point of contact for the site (see 5.7).
g) The point of contact e-mail address shall exist and be actively monitored for messages in keeping with the criticality of the site(s) (see 5.7).
h) Redirection or refresh of a page shall not inhibit a user's ability to navigate to prior pages (see 5.8).
i) Users shall be allowed to return to the page from which they initiated a hyperlink (see 5.8).

G.14 Web site center page (5.11)

a) Well-engineered Web sites shall include a site center page.
b) This site may be part of a larger site construct, and if so the site center shall contain a link to that overall site.
c) The site center page shall either contain, or point to:
    1) Links to all "top level pages" (home pages) for this site.
    2) The responsible Webmaster by name or title (with e-mail contact).
    3) The person(s) responsible for content, by name or title with e-mail contact(s).
    4) The applicable IP considerations (copyright, trademark, etc) (see 7.2).
    5) The applicable privacy statement(s) (see Annex F).
    6) The applicable indexing/authoring information (see 5.12).
    7) The organization responsible for this site and it's corporate or higher-level affiliation, including a link to the appropriate top level pages for these entities.
    8) Applicable warranty, terms and conditions, terms of use.
    9) Date of last content update for this site center page or policy pages indicated by this page.
    10) Statement of purpose as to the site's intent and reason for being.
    11) Location and/or a pointer to physical location information (see 7.15), as well as phone number, fax number, physical address, and related information.

G.15 Site index and search (5.12)

a) Well-engineered Web sites shall include an index of all pages relevant to the target audience.
b) The site index shall be accessible, following the requirements of 4.2.7.
c) Web indexes maintained within a managed site shall consider the implications of referencing pages beyond the maintained responsibility of the site.
d) If the search results contain references from outside the Web site, such site references shall be listed separately from the references within the Web site, and shall be clearly identified as being outside the Web site.

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G.16 Header information (Clause 6)

a) All header data shall be a conscious item for inclusion by the Web page developer(s), and of direct value in meeting the information or service objectives for the target-user community.
b) Well-engineered Web pages shall have initial lines `<Content-Type ...>` as typically provided by the server for static Web pages, but which may be required for dynamically generated Web pages. `<!DOCTYPE ...>` indicates the DTD applicable for this page (see 6.1).
c) The page title shall include useful and distinctive indication of the contents (see 6.2).
d) Well-engineered Web pages shall incorporate appropriate metadata to provide for accurate cataloguing and indexing of pages for the environment in which the pages are accessible (see 6.3).
e) Well-engineered Web pages shall not provide duplicate data to search engines or indexing systems, other than divergent spellings or grammatical forms (see 6.3).
f) Well-engineered Web pages shall present keywords in priority order and without duplication (e.g., `<meta name="keywords" content="keyword1, keyword2"/>`) (see 6.3.2).
g) The Dublin Core Metadata (see Annex D for a recent version) shall be used for fields of information that are of value in indexing or cataloguing the well-engineered Web page (see 6.3.3).
h) Well-engineered Web site design shall include consideration of content-selection mechanisms (see 6.3.4).
i) The use of metadata and content included for the purpose of content selection (indexing) shall not be misleading (see 6.3.4).
j) Well-engineered Web sites shall incorporate robot exclusion elements (see Annex E) as the method for indicating pages to be indexed or searched by automated means and those to be excluded (see 6.3.5).
k) To facilitate accurate indexing, and ease of access for users, well-engineered Web pages shall include the `LANG` metatag declaring the primary language environment(s) for each page (see 6.3.7).

G.17 Body information (Clause 7)

a) Well-engineered Web pages shall not knowingly include copyright-protected information without appropriate permission from the copyright holder (see 7.2.1).
b) A Well-engineered Web page shall include a page date as an RMfield (`<pagedate>`, or `<... class="pagedate">`) (see 7.4).
c) Each well-engineered Web page shall include an expiration date as an Mfield or RMfield (`<expirationdate>`, or `<...class="expirationdate">`) (see 7.4).
d) All dates, including the above, shall be presented with four-digit years. If time is included, the time zone shall be specified (see 7.4).
e) Well-engineered Web sites shall take into account international and cultural requirements of the target-user community as part of the design process (see 7.5).
f) All well-engineered Web pages containing telephone numbers shall provide sufficient context for use of the number (see 7.5.1).
g) ITU Recommendation E.123 (02/01) [B54] shall be used (see 7.5.1).
h) Contact numbers shall be accessible for those who are visually impaired or deaf (see 7.5.1).
i) Country or place of origin shall use the two-letter country code identifier from ISO 3166-1:1997 for an RMfield or an Mfield (see 7.5.4).
j) Well-engineered Web page pages shall declare their language of presentation using the `lang` attribute as appropriate (see 7.5.5).
k) The declaration of the language of presentation shall be the native language of the well-engineered Web page (see 7.5.5).
l) The two letter codes identified in ISO 639-1:2002 and ISO 639-2:1998 shall be used to indicate common languages, which may be followed by a hyphen and a two-letter (ISO 3166-1:1997) country code to denote variants (see 7.5.5).

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m) Well-engineered Web pages shall use measurement unit(s) applicable to their target-user communities, which should include metric in many cases (see 7.5.7).
n) The monetary units defined in ISO 4217:2001 shall be used (see 7.5.7).
o) If advertising is accepted on a site, it shall be in keeping with the legal and ethical considerations of the targeted user community (see 7.5.8).
p) Well-engineered Web pages data elements shall be responsive to the business, information, or service objectives of the page (see 7.6).
q) A link shall be provided in each well-engineered Web page to get to one or more appropriate pages for more general information relevant to this site (see 7.7).
r) All links shall work correctly (see 7.7).
s) It shall be easy to navigate from any Web page back to the home page (e.g., a button should be provided to return to the home page every 1-2 screens) (see 7.7).
t) Use of cookies shall be a design decision (see 7.11).
u) Tools shall verify that use of cookies is intended for a given site. In this case, the use of cookies shall be described and the user given an option of receiving these cookies as an explicit action (see 7.11).
v) Well-engineered Web sites that use cookies, Web beacons, or other technologies which collect information on customer usage, shall have a privacy statement available from their site center or general information page(s) that explains their use of such technology (see 7.11).
w) Well-engineered Web sites shall disclose if usage of prior site information is collected, and if information is shared with other organizations (see 7.11).
x) If cookies are required and the required cookies are not received, the site shall provide relevant feedback to the user as an error message (see 7.11).
y) Frames shall not be used to mislead the user about the source, ownership or other aspects of frame contents (see 7.12).
z) Frame presentation of third party content shall only be done when full consideration is given to the copyright, presentation, appropriate commercial use, permissions and other legal and ethical aspects of such encapsulation (see 7.12).
aa) The _blank target, or other means of creating new windows, shall not interfere with the user's ability to return to their page history (see 7.12).
ab) All graphic elements shall contain declared height/width display size, permitting the immediate allocation of page layout for these and concurrent rendering (see 7.13).
ac) Images shall not be used to present text in an alternative style (see 7.13).
ad) Any Web site offering or effecting commercial transactions shall prominently display postal addresses and telephone numbers for follow-up inquiries (see 7.15).

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Annex H

(informative)

Color combinations—numerical and visual color tables

Subclause 4.2.7 provides guidelines on color combinations to be avoided to facilitate access by color blind individuals.[52]

The two tables in this annex have two rows (warm & cool) and five columns, each cell containing a set of Web-safe colors (decimal values in the first table, hexadecimal in the second). Colors that need to be differentiated shall not be selected from the same cell or adjacent column. For large areas of text on a colored background, there should be three columns between the selected colors. For example, colors from "Column A" should only be put in contrast with colors from "Column F." Colors used for "trim" or accents do not necessarily require the same degree of differentiation as the colors being used as visual cues. The color chart is indicated by the following page: http://dx.doi.org/10.1041/standard/2001/2002/index.

[52]For more information about color considerations, see the reference at : http://dx.doi.org/10.1041/standard/2001/2002/index.

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Decimal table of color combinations to avoid

	A	B	C	D	E
Warm	255-255-204	255-255-153	102-255-51	51-255-0	255-153-102	102-153-102	153-102-51	255-51-0	102-51-0
	204-255-204	204-255-153	51-255-51	0-255-0	204-153-102	51-153-102	102-102-51	204-51-0	51-51-0
	153-255-204	153-255-153	0-255-51	102-204-153	153-153-102	0-153-102	51-102-51	153-51-0	0-51-0
	102-255-204	102-255-153	255-255-0	51-204-153	255-204-0	255-153-51	102-153-51	0-102-51	255-0-102	102-0-0
	51-255-204	51-255-153	204-255-0	0-204-153	204-204-0	204-153-51	51-153-51	255-102-0	255-0-51	51-0-0
	0-255-204	0-255-153	153-255-0	102-204-102	153-204-0	153-153-51	0-153-51	204-102-0	204-0-51	
		255-255-102	102-255-0	51-204-102	102-204-0	255-153-0	102-153-0	153-102-0	153-0-51	
		204-255-102	255-204-153	0-204-102	51-204-0	204-153-0	51-153-0	102-102-0	255-0-0	
		153-255-102	204-204-153	204-204-51	0-204-0	153-153-0	0-153-0	51-102-0	204-0-0	
		102-255-102	153-204-153	153-204-51			255-102-102	0-102-0	153-0-0	
		51-255-102	255-204-102				204-102-102	255-51-102		
		0-255-102	204-204-102				255-102-51	255-51-51		
		255-255-51	153-204-102				204-102-51	204-51-51		
		204-255-51	255-204-51					153-51-51		
		153-255-51								
Cool	255-255-255	255-204-204	204-153-255	255-102-255	255-51-204	51-102-255	0-102-102	153-0-204	102-51-102
	204-255-255	204-204-204	153-153-255	204-102-255	204-51-204	0-102-255	153-51-204	102-0-204	51-51-102
	153-255-255	153-204-204	102-153-255	153-102-255	255-51-153	102-102-204	102-51-204	51-0-204	0-51-102
	102-255-255	102-204-204	51-153-255	102-102-255	255-0-255	51-102-204	51-51-204	0-0-204	102-51-51
	51-255-255	51-204-204	0-153-255	255-102-204	204-0-255	0-102-204	0-51-204	204-0-153	51-51-51
	0-255-255	0-204-204	204-153-204	204-102-204	153-0-255	153-102-153	204-51-153	153-0-153	0-51-51
		255-153-255	153-153-204	153-102-204	102-0-255	102-102-153	153-51-153	102-0-153	102-0-102
		255-153-204	102-153-204	255-102-153	51-0-255	51-102-153	102-51-153	51-0-153	51-0-102
		255-153-153	51-153-204	204-102-153	0-0-255	0-102-153	51-51-153	0-0-153	0-0-102
			0-153-204	255-51-255	255-0-204	153-102-102	0-51-153	204-0-102	102-0-51
			153-153-153	204-51-255	204-0-204	102-102-102	204-51-102	153-0-102	51-0-51
			102-153-153	153-51-255	255-0-153	51-102-102	153-51-102		0-0-51
			51-153-153	102-51-255					0-0-0
			0-153-153	51-51-255					
				0-51-255					

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Hexadecimal table of color combinations to avoid

	A	B	C	D	E
Warm	FFFFCC	FFFF99	66FF33	33FF00	66CC33	FF9966	669966	996633	FF3300	663300
	CCFFCC	CCFF99	33FF33	00FF00	33CC33	CC9966	339966	666633	CC3300	333300
	99FFCC	99FF99	00FF33	66CC99	00CC33	999966	009966	336633	993300	003300
	66FFCC	66FF66	FFFF00	33CC99	FFCC00	FF9933	669933	006633	FF0066	660000
	33FFCC	33FF99	CCFF00	00CC99	CCCC00	CC9933	339933	FF6600	FF0033	330000
	00FFCC	00FF99	99FF00	66CC66	99CC00	999933	009933	CC6600	CC0033	
		FFFF66	66FF00	33CC66	66CC00	FF9900	669900	996600	990033	
		CCFF66	FFCC99	00CC66	33CC00	CC9900	339900	666600	FF0000	
		99FF66	CCCC99	CCCC33	00CC00	999900	009900	336600	CC0000	
		66FF66	99CC99	99CC33			FF6666	006600	990000	
		33FF66	FFCC66				CC6666	FF3366		
		00FF66	CCCC66				FF6633	FF3333		
		FFFF33	99CC66				CC6633	CC3333		
		CCFF33	FFCC33					993333		
		99FF33								
Cool	FFFFFF	FFCCFF	FFCCCC	CC99FF	FF66FF	FF33CC	3366FF	006666	9900CC	663366
	CCFFFF	CCCCFF	CCCCCC	9999FF	CC66FF	CC33CC	0066FF	9933CC	6600CC	333366
	99FFFF	99CCFF	99CCCC	6699FF	9966FF	FF3399	6666CC	6633CC	3300CC	003366
	66FFFF	66CCFF	66CCCC	3399FF	6666FF	FF00FF	3366CC	3333CC	0000CC	663333
	33FFFF	33CCFF	33CCCC	0099FF	FF66CC	CC00FF	0066CC	0033CC	CC0099	333333
	00FFFF	00CCFF	00CCCC	CC99CC	CC66CC	9900FF	996699	CC3399	990099	003333
			FF99FF	9999CC	9966CC	6600FF	666699	993399	660099	660066
			FF99CC	6699CC	FF6699	3300FF	336699	663399	330099	330066
			FF9999	3399CC	CC6699	0000FF	006699	333399	000099	000066
				0099CC	FF33FF	FF00CC	996666	003399	CC0066	660033
				999999	CC33FF	CC00CC	666666	CC3366	990066	330033
				669999	9933FF	FF0099	336666	993366		000033
				339999	6633FF					000000
				009999	3333FF					
					0033FF					

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Annex I

(normative)

36 CFR 1194 connections

I.1 36 CFR 1194 (U. S. Government agency requirements)

U. S. Government agencies are required to apply standards defined at www.access-board.gov/sec508/508standards.htm. These may also apply in some situations to U. S. Government contractors, vendors to U. S. Government agencies, and potentially others subject to U. S. Government requirements. See subsections 1194.21 (applications software, including applets/plugins) and 1194.22 (Web based information) of 36 CFR 1194. Many clauses of this recommended practice will facilitate ease of use and accessibility by diverse users. Subclause 4.7.2 is focused specifically on access for those with disabilities, and includes recommended practices beyond those defined in the normative Web Consortium's WAI guidelines.

I.1.1 36 CFR 1194.21 Software applications and operating systems

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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I.1.2 36 CFR 1194.22 Web-based Intranet and Internet information and applications

a) A text equivalent for every non-text element shall be provided (e.g., via “alt,” “longdesc,” or in element content).
b) Equivalent alternatives for any multimedia presentation shall be synchronized with the presentation.
c) Web pages shall be designed so that all information conveyed with color is also available without color, for example from context or markup.
d) Documents shall be organized so they are readable without requiring an associated style sheet.
e) Redundant text links shall be provided for each active region of a server-side image map.
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.
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.
i) Frames shall be titled with text that facilitates frame identification and navigation.
j) Pages shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.
k) A text-only page, with equivalent information or functionality, 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.
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.
m) When a Web page requires that an applet, plug-in, or other application be present on the client system to interpret page content, the page must provide a link to a plug-in or applet that complies with items a) through l) of I.1.1.
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.
o) A method shall be provided that permits users to skip repetitive navigation links.

NOTE—Browsers have default tabindex sequences which may be quite satisfactory (ergo no need to mandate this attribute). Requiring accesskey's for hot links may create limitations on page branching factors without improving access. However, for form fields, “accesskeys” parallel the “mouseless” traversal available in windows and this does facilitate access.

The “content” division (using ID) will allow users with assisted technology to go directly to the page content without having to traverse repetitive, or unrelated page elements (consider repetitive headers, indexes, menus, etc).

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

NOTES TO 36 CFR 1194.22

1—The Board interprets paragraphs a) through k) of I.1.2 as consistent with the following priority 1 checkpoints of W3C WAI Web Content 19990505:

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36 CFR 1194.22 paragraph	WCAG 1.0 checkpoint
a)	1.1
b)	1.4
c)	2.1
d)	6.1
e)	1.2
f)	9.1
g)	5.1
h)	5.2
i)	12.1
j)	7.1
k)	11.4

2—Paragraphs l), m), n), o), and p) of this section are different from WCAG 1.0. Web pages that conform to WCAG 1.0, level A (i.e., all priority 1 checkpoints) must also meet paragraphs l), m), n), o), and p) of this section[53] to comply with this section. WCAG 1.0 is available at http://www.w3.org/TR/1999/WAI-WEBCONTENT-19990505.

3—Other subclauses of this recommended practice that make 36 CFR 1194-related recommendations include: 4.1.1, 5.8, 5.12, 7.7, and 7.12.

[53]"This section" refers to 36 CFR 1194. Note that 4.7.2 of this recommended practice makes recommendations that address 36 CFR 1194 paragraphs l), m), n), o), and p).

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