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Document management — Portable document format —

Part 2:
PDF 2.0

Gestion de documents — Format de document portable —

Partie 2: PDF 2.0

ICS 35.240.30; 37.100.99

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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- Adobe Systems Incorporated, 345 Park Avenue, San Jose, California, 95110-2704, USA

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ISO 32000-2 was prepared by Technical Committee ISO/TC 171, Document management applications, Subcommittee SC 2, *Application issues*, Working Group 8, PDF, in cooperation with TC130, *Graphic technology*, and TC46 SC11, *Archives/records management*.

This is the second part of ISO 32000, under the general title *Document Management— Portable Document Format* — Part 2*:* PDF 2.0 and completely replaces Part 1.

Introduction

ISO 32000 and PDF

ISO 32000 specifies a digital form for representing documents called the Portable Document Format or usually referred to as PDF. PDF was developed and specified by Adobe Systems Incorporated beginning in 1993 and continuing until 2007 when this ISO standard was first prepared. The Adobe Systems version PDF 1.7 is the basis for ISO 32000 Part 1. This document is ISO 32000 Part 2 which is a self contained replacement for Part 1 and specifies PDF 2.0. See 6, "Version designations" for how the version numbers of PDF (1.0, 1.1, 1.2, ... 2.0) relate to one another.

Changes introduced in ISO 32000 Part 2

Starting with PDF 2.0 the term conforming reader is no longer used. Instead the terms interactive PDF processor, PDF reader and PDF writer are used and have a conditional conformance definition. See 2.1, "Conforming PDF documents" for further discussion of this change.

This specification includes the following new features:

- 13.7, "Rich media (PDF 2.0)" annotations which provides a framework for including rich media (e.g., video, audio, Flash and 3D);
- 12.8.3.4, "CAdES signatures as used in PDF (PDF 2.0)" (CAdES);
- 12.8.4, "Long term validation of signatures (PDF 2.0)" including
- 12.8.4.2, "Document Security Store (DSS)" and 12.8.5, "Document level time stamps (PDF 2.0)";
- 8.6.5.9, "Use of black point compensation";
- 12.12, "Reader requirements of interactive PDF processor (PDF 2.0)");
- 12.11, "Document requirements";
- 14.13, "Associated files (PDF 2.0)";
- Support for MathML-3.0 in structured documents. (14.8.5.9, "MathML-3.0 attribute associations" destination tagging (added Table 367, Entries in a structure element dictionary, Table 393, Standard reference attribute and 14.8.5.6, "Reference attributes");
- 12.7.4.6, "Barcode fields" in forms.

In addition the following lists the most important corrections, extensions and clarifications for existing features:

- Corrects for: many typing errors including bad symbols and truncated formulae, changes in normative references and the bibliography.
- Clarification for processing dashed and degenerate lines, clarification for processing text objects within the transparency framework, clarifications and enhancements for annotation appearances, stamp annotations extension and polyline annotation enhancement.
- Extensions for: extend output intents to pages, strengthened encryption including introduction of elliptical curve cryptography, more control over forms tab ordering, enforced viewer preferences, rich text in XFA, improvements to digital signatures for long term signatures, 3D viewing improvements including 3D projections, improvements to Bates numbering, revised blend formulae for ColorBurn and ColorDodge, additional structure tags to improve accessibility, requirement for metadata streams to be XMP and support for hyper links in rich text.
- Clarification for: PDF version numbering, resource inheritance, required and optional signature dictionary SubFilter keys, artefacts, Extensions, word breaking and page sizes, which file to show when first opening a collection, scope of header attributes, precedence of CID font widths, when a CIDToMap shall, should or

shall not be used with Type 2 CID fonts, deprecate sound and movie in favour of newer methods, rendering intent and ImageMask, precedence of Type 1 encoding methods, the wording used to define delimiters with respect to << and >>, Identity CMaps and CIDFonts, a special cases when closing and filling a path, that clipping follows filling rules and that the current path may be undefined and attempting to operate on it will generate an error.

- Clarification and terminology improvements among, Type1, TrueType, CFF and OpenType fonts. Improvements to structure elements including: artefacts (new entries toTable 374, Property list entries for artifacts), 14.8.4.4.2, "Line numbering"; additions to Table 377, Standard structure types for grouping elements; additions to Table 382, Standard structure types for inline-level structure elements, redaction added to Table 377, Standard structure types for grouping elements;
- added file thumbnails for embedded files (additional key to Table 44, Entries in a file specification dictionary);

PDF

The goal of PDF is to enable users to exchange and view electronic documents easily and reliably, independent of the environment in which they were created or the environment in which they are viewed or printed. At the core of PDF is an advanced imaging model derived from the PostScript® page description language. This PDF Imaging Model enables the description of text and graphics in a device-independent and resolution-independent manner at a complete, precise and professional level. To improve performance for interactive viewing, PDF defines a more structured format than that used by most PostScript language programs. Unlike Postscript, which is a programming language, PDF is based on a structured binary file format that is optimized for high performance in interactive viewing. PDF also includes objects, such as annotations and hypertext links, that are not part of the page content itself but are useful for interactive viewing and document interchange.

PDF files can be created natively in PDF form, converted from other electronic formats and since it supports a wide range of image and compression technologies, is a suitable format for documents digitized from paper, microform, or other hard copy formats. Businesses, governments, libraries, archives and other institutions and individuals around the world use PDF to represent considerable bodies of important information. Since its introduction in 1993, aided by the explosive growth of the Internet, PDF has become widely used for the electronic exchange of documents.

There are several specific applications of PDF that have evolved where limiting the use of some features of PDF and requiring the use of others, enhances the usefulness of PDF. This is an ISO standard for the full function PDF; the following standards are for more specialized uses. PDF/X (ISO 15930) is now the industry standard for the intermediate representation of printed material in electronic prepress systems for conventional printing applications. PDF/A (ISO 19005) is now the industry standard for the archiving of digital documents. PDF/E (ISO 24517) provides a mechanism for representing engineering documents and exchange of engineering data. PDF/VT (ISO 16612-2) is for high volume printing of personalized documents including variable data. PDF/UA (ISO 14289) defines a standard for accessible PDF document bringing the advantages of PDF to everyone, including those who use assistive technology.

As major corporations, government agencies, and educational institutions streamline their operations by replacing paper-based workflow with electronic exchange of information, the impact and opportunity for the application of PDF will continue to grow at a rapid pace.

PDF, together with software for creating, viewing, printing and processing PDF files in a variety of ways, fulfils a set of requirements for electronic documents including:

- preservation of document fidelity independent of the device, platform, and software,
- merging of content from diverse sources — Web sites, word processing and spreadsheet programs, scanned documents, photos, and graphics — into one self-contained document while maintaining the integrity of all original source documents,
- collaborative editing of documents from multiple locations or platforms,

- digital signatures to certify authenticity,
- security and permissions to allow the creator to retain control of the document and associated rights,
- accessibility of content to those with disabilities,
- extraction and reuse of content for use with other file formats and applications, and
- electronic forms to gather data and integrate it with business systems.

A repository of referenced documents has been established by AIIM (http://www.aiim.org/pdfrefdocs). Not all referenced documents can be found there because of copyright restrictions.

Document management – portable document format – Part 2: PDF 2.0

IMPORTANT — The electronic file of this document contains colours which are considered to be useful for the correct understanding of the document. Users should therefore consider printing this document using a colour printer.

1 Scope

This International Standard specifies a digital form for representing electronic documents to enable users to exchange and view electronic documents independent of the environment in which they were created or the environment in which they are viewed or printed. It is intended for the developer of software that creates PDF files (PDF writers), software that reads existing PDF files and (usually) interprets their contents for display (PDF readers), software that reads and displays PDF contents and interacts with the computer users to possibly modify and save the PDF file (interactive PDF processors) and PDF products that read and/or write PDF files for a variety of other purposes (PDF processors). (PDF writers and PDF readers are more specialized classifications of interactive PDF processors and all are PDF processors.)

This standard does not specify the following:

- specific processes for converting paper or electronic documents to the PDF format;
- specific technical design, user interface or implementation or operational details of rendering;
- specific physical methods of storing these documents such as media and storage conditions;
- methods for validating the conformance of PDF files or PDF processors;
- required computer hardware and/or operating system.

The primary purpose of this standard is to define well-formed PDF documents (conforming PDF files). PDF documents serve as a communications channel between an author who creates PDF documents, typically with the help of software applications, and the person consuming the PDF document, typically using software applications to view it on display screens, to print it to paper or for some other function. PDF documents serve a producer/consumer paradigm.

In carefully specifying what constitutes a well-defined PDF document, it is natural to describe why a particular feature is to be included in the file and what effect it is designed to have on PDF processing software. So, although the primary objective of this standard is to describe the content of conforming PDF documents, it also serves secondary purposes of defining conformance for PDF processors, defining exactly how a PDF component shall be constructed, suggesting why a producer may choose to use the various PDF constructs, as well as what behaviour it shall elicit from software consuming that PDF file.

Conformance for PDF processors is a conditional conformance requirement. Basically, ***if*** a processor supports a feature, it shall do so in a manner that conforms to this standard, but the choice of which specific set of features a particular PDF processor supports is not specified.

PDF files represent electronic documents and, over the years since 1993, it has been natural to add features that take advantage of PDF's electronic nature and the power of computer viewing devices. The size of the PDF documentation has more than tripled since its first introduction and the number of features that a PDF processor is expected to support has grown to be large. This reduces the appropriateness of requiring processors to support all features.

2 Conformance

2.1 Conforming PDF documents

Conforming PDF files shall adhere to all requirements of this standard and a conforming file is not obligated to contain any feature other than those explicitly required by this standard.

NOTE 1 The proper mechanism by which a file can presumptively identify itself as being a PDF file of a given version level is described in 7.5.2, "File header".

2.2 Conforming readers

This standard removes the definition of conforming reader which existed in ISO 32000-1.

The subset standards for PDF, such as PDF/X (ISO 15930), PDF/A (ISO 19005), PDF/E (ISO 24517), PDF/VT (ISO 16612) and PDF/UA (ISO 14289), define the term *conforming reader* because they want to restrict the processing of documents conforming to those standards to strict processing rules. The generality of PDF 2.0 and the variety of processing needs prevents that notion from being a useful one for this standard.

2.3 PDF processors

A PDF processor is any software, hardware or any other active agent that writes, reads, updates or otherwise processes a PDF file which conforms to this standard, and does so in a manner that conforms to this standard. Two specialized PDF processors are PDF writers, that create PDF documents, and PDF readers that consume PDF documents typically for display or for printing. An interactive PDF processor interacts with a computer user while processing the PDF file and as a consequence may read or write PDF files. In this standard, when it is important to distinguish what is written into a PDF file, the more specialized term PDF writer will be used, when it is important to distinguish the act of reading from the contents of a PDF file, the term PDF reader will be used and when it is important to distinguish the act of user interaction while processing a PDF file, the term interactive PDF processor will be used. When those distinctions are not so clear or meaningful the more general term PDF processor will be used.

2.3.1 Conformance of PDF processors

If a PDF writer creates a new PDF file the file created shall conform to this part of this International Standard. If a PDF writer adds or amends objects in a pre-existing PDF file then the added or amended elements shall conform to the file format requirements of this part of this International Standard, and shall be consistent with related existing elements.

With the exception of linearized PDF files, all PDF files should be read using the trailer and cross-reference table as described in 7.5, "File structure". Reading a non-linearized file in a serial manner is not reliable because of the way objects are to be processed after an incremental update. As part of the standard security that a PDF writer can add to a PDF (see 7.6.3, "Standard security handler"), a PDF may have one or more passwords associated with it as well as a set of flags specifying which operations shall be permitted when the document is opened with user access (7.6.3.2, "Standard encryption dictionary", 21, "Additional encryption dictionary entries for the standard security handler", **P** key). A PDF processor shall respect and honour those permissions and the passwords when it opens a document for processing.

The most prominent PDF processors are those that process PDF documents for human viewing both on display screens and on printed paper and they shall support all page content processing as specified by this standard and elaborated in the following clauses.

2.3.1.1 PDF processors for printing

When a PDF processor renders a PDF page, it shall render the page contents as defined in this standard. The complete page contents begins with the streams or array of streams which are the value of the Content key of each page dictionary (7.7.3.3, "Page objects") and then continues with all referenced graphics objects (8.2,

"Graphics objects"). When doing so, the PDF processor shall respect the default optional content definitions (8.11, "Optional content"), if any. A PDF processor shall also render the appropriate appearance stream for all annotations (12.5.5, "Appearance streams") which have appearance streams designated for this purpose.

2.3.1.2 PDF processors for viewing

When a PDF processor displays a PDF document on an electronic display screen it shall conform to all the rules for printing (see 2.5.1.1, "PDF processors for printing") and for interactive PDF processors the requirement is extended to include all interactive aspects of optional content (8.11, "Optional content"). In addition, a PDF processor should support as many additional features as possible as identified by Table 282, "Requirement types" in 12.11, "Document requirements".

2.4 PDF document established notations

Due to the historical development of PDF and the requirement to remain backward compatible with existing PDF files, the notations used for keys and numbers in PDF files use United States English conventions. For example, within a PDF you will encounter the key **Alternate** whereas ISO's standard English would use the term Alternative. Likewise PDF files use the key **Color** rather than ISO's standard English term Colour. Real numbers that contain a decimal radix separator use the PERIOD (2Eh) character and not the COMMA (2Ch) as used in ISO's standard English… . In addition, no spaces are to be introduced into a number.

3 Normative references

The following referenced documents are indispensable for the application of this document. In order to avoid confusion as to what may or may not be included within a PDF file conforming to this standard, the versions of all subordinate documents are dated references. For dated references, only the edition cited applies. Where dated references could not be determined, the latest edition of the referenced document (including any amendments) applies. An attempt is being made to keep copies of all references, that do not have copyright restrictions prohibiting it, available for free download on the following website: http://www.aiim.org/pdfrefdocs.

ISO 639-2:1998, *Codes for the representation of names of languages -- Part 2: Alpha-3 code.*

ISO 3166-1:2006, *Codes for the representation of names of countries and their subdivisions -- Part 1: Country codes.*

ISO 3166-2:2007, *Codes for the representation of names of countries and their subdivisions -- Part 2: Country subdivision code.*

ISO/IEC 8824-1:2008, *Abstract Syntax Notation One (ASN.1): Specification of basic notation.*

ISO/IEC 9541-1:1991, Information technology – Font information interchange – Part 1: Architecture.

ISO 10646:2011, Information technology — Universal Multiple-Octet Coded Character Set (UCS).

ISO/IEC 10918-1:1994, *Digital Compression and Coding of Continuous-Tone Still Images* (informally known as the JPEG standard, for the Joint Photographic Experts Group, the ISO group that developed the standard).

ISO/IEC 11544:1993/Cor 2:2001, *Information technology – Coded representation of picture and audio information — Progressive bi-level image compression* (JBIG2).

ISO/IEC 14496-22:2009, Information technology -- Coding of audio-visual objects -- Part 22: Open Font Format

ISO 15076-1:2005, Image technology colour management - Architecture, profile format and data structure - Part 1:Based on ICC.1:2004-10.

ISO/IEC 15438:2006, Information technology – Automatic identification and data capture techniques – PDF417 bar code symbology specification.

ISO/IEC 15444-2:2004, *Information Technology — JPEG 2000 Image Coding System: Extensions.*

ISO 15930-1:2001, Graphic technology — Prepress digital data exchange — Use of PDF — Part 1: Complete exchange using CMYK data (PDF/X-1 and PDF/X-1a)

ISO 15930-3:2003, Graphic technology — Prepress digital data exchange — Use of PDF — Part 3: Complete exchange suitable for colour-managed workflows (PDF/X-3)

ISO 15930-4:2003, Graphic technology — Prepress digital data exchange using PDF — Part 4: Complete exchange of CMYK and spot colour printing data using PDF 1.4 (PDF/X-1a)

ISO 15930-6:2003, Graphic technology — Prepress digital data exchange using PDF — Part 6: Complete exchange of printing data suitable for colour-managed workflows using PDF 1.4 (PDF/X-3)

ISO 15930-7:2010 Graphic technology — Prepress digital data exchange using PDF — Part 7: Complete exchange of printing data (PDF/X-4) and partial exchange of printing data with external profile reference (PDF/X-4p) using PDF 1.6

ISO 15930-8:2010 Graphic technology — Prepress digital data exchange using PDF — Part 8: Partial exchange of printing data using PDF 1.6 (PDF/X-5)

ISO/IEC 16022:2006, Information technology – Automatic identification and data capture techniques – Data Matrix bar code symbology specification.

ISO/IEC 16262:2011, Information technology -- Programming languages, their environments and system software interfaces -- ECMAScript language specification. (AKA JavaScript. Also available as ECMA Script 5.1 from ECMA).

ISO 16684-1:2011, Extensible metadata platform (XMP) specification -- Part 1: Data model, serialization and core properties.

ISO/IEC 18004:2006, Information technology – Automatic identification and data capture techniques – QR Code 2005 bar code symbology specification.

ISO 19005-1:2005, Document management — Electronic document file format for long-term preservation -- Part 1: Use of PDF 1.4 (PDF/A-1).

ISO 19005-2:2011, Document management — Electronic document file format for long-term preservation -- Part 2: Use of ISO 32000-1 (PDF/A-2).

ISO 24517-1:2008, Document management — Engineering document format using PDF — Part 1: Use of PDF 1.6 (PDF/E-1).

IEC 61966-2.1 AMD .1 Ed 1.0.:2003, Colour Measurement and Management in Multimedia Systems and Equipment, Part 2.1: Default RGB Colour Space–sRGB.

ANSI X3.4-1986, Information Systems - Coded Sets 7-Bit American National Standard Code for Information Interchange (7-bit ASCII), American National Standards Institute.

ANSI X9.62-2005, Public Key Cryptography For The Financial Services Industry: The Elliptic Curve Digital Signature Algorithm (ECDSA), American National Standards Institute.

NOTE 1 The following documents can be found at AIIM at http://www.aiim.org/pdfrefdocs as well as at the Adobe Systems Incorporated Web Site http://www.adobe.com/go/pdf_ref_bibliography.

Adobe Acrobat 3D JavaScript Reference, Version 9.1 (August 2009), Adobe Systems Incorporated.

Acrobat ActionScript 3.0 API Reference, (August 2008), Adobe Systems Incorporated.

Adobe Glyph List, Version 2.0, (September 2002), Adobe Systems Incorporated.

Adobe Glyph List for New Fonts, Version 1.6, (January 2006), Adobe Systems Incorporated.

Adobe JavaScript for Acrobat API Reference, Version 9.1, (August 2009), Adobe Systems Incorporated.

Adobe PDF Signature Build Dictionary Specification v.1.4, (March 2008), Adobe Systems Incorporated.

Adobe PRC Format Specification, version 8137, Adobe Systems Incorporated. (PRC is being developed as the public standard ISO 14739-1.)

Adobe SWF File Format Specification, Version 10, (November 2008), Adobe Systems Incorporated.

Adobe TIFF Revision 6.0, Final, (June 1992), Adobe Systems Incorporated.

Adobe Type 1 Font Format., Version 1.1, (February 1993), Addison-Wesley, ISBN 0-201-57044-0.

Adobe XML Architecture, Forms Architecture (XFA) Specification, version 2.0, (October 2003), Adobe Systems Incorporated.

Adobe XML Architecture, Forms Architecture (XFA) Specification, version 2.2, (June 2005), Adobe Systems Incorporated.

Adobe XML Architecture, Forms Architecture (XFA) Specification, version 2.4, (September 2006), Adobe Systems Incorporated

Adobe XML Architecture, Forms Architecture (XFA) Specification, version 2.5, (June 2007), Adobe Systems Incorporated..

Adobe XML Architecture, XML Forms Architecture (XFA) Specification, version 3.1, (November 2009), Adobe Systems Incorporated.

Adobe XML Forms Data Format Specification, version 3.0, (August 2009), Adobe Systems Incorporated.

Adobe *XMP: Extensible Metadata Platform, Part 2: Standard Schemas,* (July 2010), Adobe Systems Incorporated. (See ISO 16684-1 for the XMP core standard.)

Adobe *XMP: Extensible Metadata Platform, Part 3: Storage in Files,* (July 2010), Adobe Systems Incorporated. (See ISO 16684-1 for the XMP core standard.)

NOTE 2 The following Adobe Technical Notes can be found at the AIIM website at http://www.aiim.org/pdfrefdocs as well as at the Adobe Systems Incorporated Web Site (http://www.adobe.com) using the general search facility, entering the Technical Note number.

Adobe Technical Note #5004, Adobe Font Metrics File Format Specification, Version 4.1, (October 1998), Adobe Systems Incorporated.

NOTE 3 Adobe font metrics (AFM) files are available through the Type section of the ASN Web site.

Adobe Technical Note #5014, Adobe CMap and CID Font Files Specification, Version 1.0, (October 1996), Adobe Systems Incorporated.

Adobe Technical Note #5015, Type 1 Font Format Supplement, (May 1994), Adobe Systems Incorporated.

Adobe Technical Note #5078, Adobe-Japan1-4 Character Collection for CID-Keyed Fonts, (February 2008), Adobe Systems Incorporated.

Adobe Technical Note #5079, Adobe-GB1-4 Character Collection for CID-Keyed Fonts, (February 2007), Adobe Systems Incorporated.

Adobe Technical Note #5080, Adobe-CNS1-5 Character Collection for CID-Keyed Fonts, (February 2007), Adobe Systems Incorporated.

Adobe Technical Note #5087, Multiple Master Font Programs for the Macintosh, (February 1992), Adobe Systems Incorporated.

Adobe Technical Note #5088, Font Naming Issues, (April 1993), Adobe Systems Incorporated.

Adobe Technical Note #5092, CID-Keyed Font Technology Overview, (September 1994), Adobe Systems Incorporated.

Adobe Technical Note #5093, Adobe-Korea1-2 Character Collection for CID-Keyed Fonts, (May 2003), Adobe Systems Incorporated.

Adobe Technical Note #5094, Adobe CJKV Character Collections and CMaps for CID-Keyed Fonts, (February 2007), Adobe Systems Incorporated.

Adobe Technical Note #5097, Adobe-Japan2-0 Character Collection for CID-Keyed Fonts, (May 2003), Adobe Systems Incorporated.

Adobe Technical Note #5116, Supporting the DCT Filters in PostScript Level 2, (November 1992), Adobe Systems Incorporated.

Adobe Technical Note #5176, The Compact Font Format Specification, version 1.0, (December 2003), Adobe Systems Incorporated.

Adobe Technical Note #5177, The Type 2 Charstring Format, March 2000), Adobe Systems Incorporated.

Adobe Technical Note #5620, Portable Job Ticket Format, Version 1.1, (April 1999), Adobe Systems Incorporated.

Adobe Technical Note #5660, Open Prepress Interface (OPI) Specification, Version 2.0, (January 2000), Adobe Systems Incorporated.

Adobe Technical Note #16417, Using FlashVars to pass variables to a SWF, (May 2011), Adobe Systems Incorporated.

NOTE 4 The following documents are available as Federal Information Processing Standards Publications.

FIPS PUB 186-3, Digital Signature Standard, describes DSA signatures, (June 2009), Federal Information Processing Standards.

FIPS PUB 197, Advanced Encryption Standard (AES), (November 2001), Federal Information Processing Standards.

NOTE 5 The following documents are available as Internet Engineering Task Force RFCs.

RFC 1321, The MD5 Message-Digest Algorithm, (April 1992), Internet Engineering Task Force (IETF).

RFC 1808, Relative Uniform Resource Locators, (June 1995), Internet Engineering Task Force (IETF).

RFC 1950, ZLIB Compressed Data Format Specification, Version 3.3, (May 1996), Internet Engineering Task Force (IETF).

RFC 1951, DEFLATE Compressed Data Format Specification, Version 1.3, (May 1996), Internet Engineering Task Force (IETF).

RFC 2045, Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies,