INTERNATIONAL STANDARD

ISO 24517-1

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Document management — Engineering document format using PDF —

Part 1: Use of PDF 1.6 (PDF/E-1)

Gestion de documents — Format de documents d'ingénierie utilisant le PDF —

Partie 1: Utilisation du PDF 1.6 (PDF/E-1)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 24517-1 was prepared by Technical Committee ISO/TC 171, *Document management applications*, Subcommittee SC 2, *Application issues*.

ISO 24517 consists of the following parts, under the general title *Document management — Engineering document format using PDF*:

— *Part 1: Use of PDF 1.6 (PDF/E-1)*

Introduction

The ISO 24517 series defines a file format for the exchange of engineering documents based on the PDF format for various communities working with engineering documentation. It is a multi-part standard with subsequent parts expected to address future workflow and data requirements. The ISO 24517 series improves document exchange, collaboration, and print accuracy within engineering workflows, both inside companies and with extended enterprises of partners, suppliers, customers, government organizations and citizens. It will enable organizations to streamline engineering workflows that incorporate diverse sets of complex documents, resulting in improved productivity and the ability to more quickly deliver better products to market. It defines the features of PDF that are required, recommended, restricted, or prohibited when creating, viewing, marking up, printing, analysing, and distributing engineering documents. It takes into consideration the differing needs of both interactive and non-interactive readers.

The ISO 24517 series specifies the proper use of PDF for on-screen display and printing of engineering documents. Printed engineering documents are assemblies of a page (or pages) created by different organizations which can be inter-departmental or inter-company. It also defines a framework for representing the logical structure and other semantic information of engineering documents within conforming files.

The ISO 24517 series is intended to provide a format for the development of various applications, such as products that read, render, write, print, and validate PDF conforming documents. Different products will incorporate various capabilities to prepare, interpret, and process conforming objects. Adobe Systems Incorporated makes the PDF specification publicly available. However, the inclusive, feature-rich nature of the format requires that additional constraints be placed on its use to make it suitable for engineering workflow documents.

PDF/E allows engineering professionals to reliably create, exchange, and review engineering documentation, including large format documents. PDF/E enables organizations to work more effectively when creating or exchanging engineering documentation.

AIIM, an accredited standards developing organization, maintains an ongoing series of application notes for guiding developers and users of this part of ISO 24517. These application notes are available at http://www.aiim.org/. AIIM will also retain copies of the specific non-ISO normative references of this part of ISO 24517 which are publicly available electronic documents.

Document management — Engineering document format using PDF —

Part 1: Use of PDF 1.6 (PDF/E-1)

1 Scope

This part of ISO 24517 specifies the use of the Portable Document Format (PDF) Version 1.6 for the creation of documents used in engineering workflows.

This part of ISO 24517 does not define the following:

— method of electronic distribution;

— method of creation or conversion from paper or electronic documents to the PDF/E format;

— specific technical design, user interface, or implementation;

— required computer hardware and/operating systems; or

— methods for validating the conformance of PDF/E files or readers.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ICC.1:2004-10 (Profile version 4.2.0.0), *Image technology colour management — Architecture, profile format, and data structure*, International Color Consortium (available from www.color.org)

Adobe PDF Reference, fifth edition version 1.6, ISBN 0-321-30474-8 (available from <http://www.npes.org/standards/toolspdfx.html>)

Errata for Adobe PDF Reference, fifth edition version 1.6, 31 August 2005 (available from <http://www.npes.org/standards/toolspdfx.html>)

Addendum on Blend Modes. Adobe Systems Incorporated, January 23, 2006 (available from <http://www.npes.org/standards/toolspdfx.html>)

XMP Specification, XMP™: *Adding Intelligence to Media*, Adobe Systems Incorporated, September 2005 (available from http://partners.adobe.com/public/developer/en/xmp/sdk/xmpspecification.pdf)

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
reader
software application that is able to read and process files

3.2
PDF/E-1 conforming reader
software application that is able to read and process PDF/E-1 files in accordance with this part of ISO 24517

3.3
interactive PDF/E-1 conforming reader
PDF/E-1 conforming reader that provides an enhanced level of functionality for some or all of the interactive features of PDF/E-1

3.4
non-interactive PDF/E-1 conforming reader
PDF/E-1 conforming reader that provides no enhanced level of functionality for the interactive features of PDF/E-1

3.5
electronic document
electronic representation of a page-oriented aggregation of text and graphic data, and metadata useful to identify, understand, and render that data, that can be reproduced on paper or optical microform without significant loss of its information content

3.6
EOF marker
end-of-file marker
five character sequence denoted as "**%%EOF**" marking the end of a PDF file

3.7
EOL marker
end-of-line marker
one or two character sequence marking the end of a line of text, consisting of a **CARRIAGE RETURN** character (0Dh) or a **LINE FEED** character (0Ah) or a **CARRIAGE RETURN** followed immediately by a **LINE FEED**

3.8
PDF
Portable Document Format
file format defined in *Portable Document Format Version 1.6* and its *Errata*

3.9
writer
software application that is able to write files

3.10
PDF/E-1 conforming file
PDF/E-1 file
file encompassing all requirements of this part of ISO 24517

4 Notations

For the purposes of this part of ISO 24517, references to "*PDF Reference*" are to the *Adobe PDF Reference, fifth edition version 1.6,* as modified by *Errata for PDF Reference, fifth edition version 1.6,* and by *Addendum on Blend Modes* as identified in Clause 2.

PDF operators, PDF keywords, the names of keys in PDF dictionaries, and other predefined names are written in bold sans serif font; operands of PDF operators or values of PDF dictionary keys are written in italic sans serif font.

EXAMPLE 1 The *Default* value for the **TR2** key.

Token characters used to delimit objects and describe the structure of PDF files, as defined in *PDF Reference*, 3.1, may be identified by their ISO/IEC 10646 character name written in uppercase in bold sans serif font followed by a parenthetic two digit hexadecimal character value with the suffix "h".

EXAMPLE 2 **CARRIAGE RETURN** (0Dh).

Text string characters in content streams, as defined by *PDF Reference*, 3.8.1, may be identified by their ISO/IEC 10646 character name written in uppercase in bold sans serif font followed by a parenthetic four-digit hexadecimal character code value with the prefix "U+".

EXAMPLE 3 **EN SPACE** (U+2002).

5 PDF/E-1 conforming files and readers

This part of ISO 24517 specifies the use of the PDF file format for the exchange of digital data representing a compound entity.

A PDF/E-1 conforming file is a PDF file in which those features necessary for the exchange of a compound entity are in accordance with this part of ISO 24517. A PDF/E-1 conforming file may also include other valid PDF features that do not affect display or function of the compound entity.

PDF/E-1 conformance is identified by use of the **pdfe:ISO_PDFEVersion** property as defined in 13.3. The value of the **ISO_PDFEVersion** key in the document information dictionary shall be *PDF/E-1* for a PDF/E-1 conforming file. Neither the version number in the header of a PDF file, nor the value of the **Version** key in the **Catalog** of a PDF file indicates that a file is in accordance with this part of ISO 24517.

NOTE 1 These values are specified in Table 1 of 13.3.

Although *PDF Reference* permits compliance with earlier versions of PDF, features described in versions of the PDF specification earlier than 1.6, but not described in *PDF Reference*, shall not be used in a PDF/E-1 conforming file.

A PDF/E-1 conforming writer is a software application that is able to write files in accordance with the requirements of this part of ISO 24517.

A PDF/E-1 conforming reader is a software application that shall be able to read and appropriately process all PDF/E-1 files in a manner conforming to the requirements for PDF/E-1 files as defined in this part of ISO 24517.

A PDF/E-1 conforming reader may parse PDF files that are not PDF/E-1 conforming files. The behaviour of a PDF/E-1 conforming reader on non-conforming files is beyond the scope of this part of ISO 24517.

Rendering of PDF/E-1 conforming files shall be performed as defined in the *PDF Reference* and as restricted by this part of ISO 24517. To the extent that the *PDF Reference* and this part of ISO 24517 permit more than one rendering of a PDF/E-1 conforming file, a PDF/E-1 conforming reader may use embedded job ticket or metadata information to control the rendering of the file more precisely. Furthermore, interactive PDF/E-1

conforming readers may provide user interface elements to control dynamic features of PDF/E-1 such as optional content, three dimensional (3D) and multimedia.

NOTE 2 A PDF/E-1 conforming file is not obligated to use any PDF feature other than those explicitly required by the *PDF Reference* or this part of ISO 24517.

6 Syntax

6.1 File header

The **%** character of the file header shall occur at byte offset 0 of the file.

6.2 File trailer

The file trailer dictionary shall contain the **ID** keyword. The value for the **ID** entry shall be an array of length two, containing two non-empty string objects.

6.3 Document ID

If the document catalog contains an **Encrypt** entry, the value for the **ID** entry in the document trailer and the strings contained in the **ID** array shall be direct.

NOTE This provision ensures that the **ID** entry can always be located and read when the document is encrypted. A circular dependency condition arises when encryption algorithms use the document **ID** strings and those strings are indirect, because the *PDF Reference* states that all indirect objects outside the encryption dictionary itself require encryption. These problems are further compounded when object streams are present in the file, because the **ID** strings could be embedded inside an encrypted object stream.

6.4 Cross-reference tables and cross-reference streams

Any indirect object whose offset is not referenced in a cross-reference table or cross-reference stream shall be exempt from all requirements of this part of ISO 24517. A PDF/E-1 conforming reader shall not use any such objects in any sort of processing or presentation of a PDF/E document.

6.5 Document information dictionary

A document information dictionary may be defined in a PDF/E-1 conforming file. If defined, its elements shall be consistent with analogous XMP metadata properties defined in the *XMP Specification* as specified in Clause 13.

6.6 String objects

Hexadecimal strings shall contain an even number of non-white-space characters, each in the range **0** to **9**, **A** to **F**, or **a** to **f**.

6.7 Stream objects

The value of the **Length** key specified in the stream dictionary shall match the number of bytes in the file following the **LINE FEED** character after the **stream** keyword and preceding the EOL marker before the **endstream** keyword.

NOTE 1 These requirements remove potential ambiguity regarding the ending of stream content.

A stream object dictionary shall not contain the **F**, **FFilter**, or **FDecodeParams** keys.

NOTE 2 These keys are used to point to document content external to the file. The explicit preclusion of these keys has the implicit effect of disallowing external content that can create external dependencies and hinder portability efforts.

6.8 Linearized PDF

Linearization shall be permitted but any linearization information supplied within a file may be ignored by PDF/E-1 conforming readers.

6.9 Implementation limits

PDF/E-1 conforming files shall not violate the following implementation limits for objects outside of stream data or comments (as defined in *PDF Reference*, 3.1.2).

All integer values shall be in the range [-2^{31}, $(2^{31} - 1)$].

All decimal numbers shall be within the range representable by IEEE single-precision floating-point numbers.

The length of a name object shall be at least one byte and at most 127 bytes.

Indirect object numbers shall be at least one and at most 8 388 607.

The number of colourants or tint components in a **DeviceN** colour space shall be at least one and at most 32.

The value of a CID (character identifier) shall be at least zero and at most 65 535.

NOTE 1 By complying with these limits, a PDF/E-1 conforming file is compatible with the widest possible range of readers.

NOTE 2 The restriction on the size of integers imposes a limit on the size of a linearized PDF/E file of $(2^{31} - 1)$ bytes, due to the fact that the **T** entry in the linearization dictionary is an integer equal to the size of the file.

7 Graphics

7.1 General

Restrictions placed on both PDF/E-1 conforming files and reader are described in 7.2 to 7.13. They are intended to address the rendering of graphical page contents, including text and font issues.

7.2 Output intent

A PDF/E-1 conforming file may specify the colour characteristics of the device on which it is intended to be rendered by using a PDF/E-1 **OutputIntent**. A PDF/E-1 **OutputIntent** is an **OutputIntent** dictionary, as defined by *PDF Reference*, 10.10.4, that is included in the file's **OutputIntents** array and has *ISO_PDFE1* as the value of its **S** key and a valid ICC profile stream as the value of its **DestOutputProfile** key.

If a file's **OutputIntents** array contains more than one entry, then all entries that contain a **DestOutputProfile** key shall have as the value of that key the same indirect object, which shall be a valid ICC profile stream.

NOTE This subclause is not in conflict with similar requirements in ISO 19005-1 because multiple **OutputIntent** dictionaries are allowed by both.

7.3 Colour spaces

7.3.1 General

All colours shall be specified in a device-independent manner, either directly by the use of a device independent colour space, or indirectly by the use of an **OutputIntent**. A PDF/E-1 conforming file may use any colour space specified in *PDF Reference*, except as restricted in 7.3.2 to 7.3.4.

NOTE Specifying colour in the device-independent manner described in 7.3 enables predictable colour-rendering based on a colorimetric definition and without reliance on assumptions or information external to the PDF/E-1 conforming file. It also provides a mechanism whereby a colorimetric definition can be associated with device-dependent colour data.

7.3.2 ICCBased colour spaces

All ICCBased colour spaces shall be embedded as ICC profile streams as described in *PDF Reference*, *4.5.4.*

A PDF/E-1 conforming reader shall render **ICCBased** colour spaces as specified by ICC.1:2004-10 and shall not use the **Alternate** colour space specified in an ICC profile stream dictionary.

7.3.3 Uncalibrated colour spaces

A PDF/E-1 conforming file may use either the **DeviceRGB** or **DeviceCMYK** colour space but shall not use both. If an uncalibrated colour space is used in a file then that file shall contain a PDF/E-1 **OutputIntent**, as defined in 7.2. **DeviceRGB** may be used only if the file has a PDF/E-1 **OutputIntent** that uses an **RGB** colour space. **DeviceCMYK** may be used only if the file has a PDF/E-1 **OutputIntent** that uses a **CMYK** colour space.

When rendering a **DeviceGray** colour specification in a file whose **OutputIntent** is an **RGB** profile, a PDF/E-1 conforming reader shall convert the **DeviceGray** colour specification to **RGB** by the method described in *PDF Reference*, 6.2.1.

When rendering a **DeviceGray** colour specification in a file whose **OutputIntent** is a **CMYK** profile, a PDF/E-1 conforming reader shall convert the **DeviceGray** colour specification to **DeviceCMYK** by the method described in *PDF Reference*, 6.2.2.

When rendering colours specified in a device-dependent colour space a PDF/E-1 conforming reader shall use the file's PDF/E-1 **OutputIntent** dictionary, as defined in 7.2, as the source colour space.

7.3.4 Separation and DeviceN colour spaces

A PDF/E-1 conforming file shall not make use of **DeviceN** colour spaces with an **NChannel** subtype.

A PDF/E-1 conforming reader shall obey the following rules when rendering colour spaces based on **DeviceN** or **Separation** colour spaces.

— If the named colourants in the colour space are all from the list **Cyan**, **Magenta**, **Yellow**, **Black**, the file has an **OutputIntent**, and that **OutputIntent** is a **CMYK** profile, then the colourants shall be treated as components of the colour space specified by the PDF/E-1 **OutputIntent** dictionary, as defined in 7.2, and the alternate colour space shall not be used.

— If the output device does not support the **Separation** colour space or **DeviceN** colorants, the **Alternate** colour space shall be used.

The **Alternate** colour space of a **Separation** or **DeviceN** colour space shall obey all restrictions on colour spaces specified in 7.3.2 and 7.3.3.

7.3.5 3D content

3D content is specified in an unqualified RGB colour space; a PDF/E-1 conforming reader is not required to colour manage 3D content. However, a PDF/E-1 conforming reader that does colour manage 3D content shall follow the rules specified in 7.3.3 for handling **DeviceRGB** colours. The colour management shall be performed after the 3D content is rendered. If the reader cannot render the 3D content and uses the normal appearance of the 3D annotation, the provisions described in 7.3.2 to 7.3.4 shall be applied.

NOTE This means that the PDF/E-1 specification does not ensure consistent colour-rendering of 3D content across devices and reader applications.