



TechNote 0010:

Clarifications of ISO 19005, parts 1-3 for
developers of PDF/A creators and validators

PDF Association
Neue Kantstrasse 14
14057 Berlin, Germany
www.pdfa.org

Copyright © 2017

Table of Contents

Preface	3
ISO TC 171 SC 2 WG 5 review	3
Enumeration	3
Implementation limits	4
Implementation limits for integers in PDF/A-1 (A001)	4
Nesting level of Q/q in case of Form XObjects (A004)	5
Definition of length for Name and String objects (A005).....	5
Implementation limits for CIDs (A007)	6
Minimal real values in PDF/A-2 and 3 (A018)	6
Maximal real values in PDF/A-2 and 3 (A019).....	7
Resources dictionary	8
Explicitly defined named resources (A002).....	8
Inheritance of default colour spaces (A028)	9
Inheritance of Resource dictionaries (A003).....	9
Glyph metrics	11
Width consistency for unused glyphs (A006).....	11
Consistency of vertical font metrics (A008)	11
Private data.....	13
Validation of private data (A009).....	13
Unreferenced resources	14
Named resources not referenced in the content stream (A010).....	14
Named resources not used for rendering (A011, A015)	15
Appearance streams of widget annotations	16
Appearance streams for Button form fields (A012)	16
Appearance streams for Widget annotations (A022)	17
Form fields with multiple Widgets (A023)	18
Colour spaces	19
Version of the embedded ICC profile (A013)	19
Overprint mode for ICCBased CMYK (A024)	20
Use of DeviceGray in soft masks (A026)	20
Fonts	22
Use of OpenType fonts in PDF/A-1 (A014).....	22
CharSet/CIDSet requirements (A016).....	22
Referencing non-predefined CMaps from other CMaps (A025)	23
Metadata	24
Compressed non-document Metadata in PDF/A-1 (A017)	24
Validation of XMP properties (A020)	24
Validation of file provenance information (A021).....	25
Optional vs required valueType field in Extension schema (A029).....	26
Associated files.....	28
Associated files in PDF/A-3 (A027).....	28

Preface

This Technical Note was produced by the PDF Association's PDF Validation Technical Working Group (TWG).

The TWG developed this content in the context of an in-depth review of existing ISO 19005 (PDF/A) specifications conducted between October, 2014 and December, 2016. Ambiguities were identified by:

- Formally analyzing the PDF/A specifications in the process of implementing veraPDF
- Reviewing the performance of existing PDF/A validators
- Discussing the questions posted to the TWG mailing list

Consistent with the work of the PDF Validation TWG, the understandings specified in this TechNote have been realized in test files produced as part of the veraPDF Test Suite. The test files pertinent to these resolutions are available in the veraPDF Test Corpus located on GitHub: <https://github.com/veraPDF/veraPDF-corpus>.

ISO TC 171 SC 2 WG 5 review

The current document provides interpretation of the existing specifications, and does not change the text of those specifications.

In addition to the PDF Validation TWG's review, each ambiguity identified by the TWG was reviewed by the ISO Working Group (WG) responsible for ISO 19005. Although the ISO WG has, at this time, decided not to update existing parts of ISO 19005, it has accepted many of the TWGs proposals as described herein.

Enumeration

A021's enumeration was mistakenly duplicated in presentation to the ISO WG. A correction was applied in this document. Accordingly, the enumeration herein of A022 – A028 differs from the enumeration used in the TWG presentations to the ISO WG.

A011 and A015, originally presented to the ISO WG as separate concerns, have been merged.

Implementation limits

NOTE: PDF/A-next does not include implementation limits.

Implementation limits for integers in PDF/A-1 (A001)

Pertaining

PDF/A-1 - ISO 19005-1, 6.1.12

Background

The implementation limits for ISO 19005-1 files are specified in the PDF 1.4 Reference, Appendix C.1. The limits for integers are given as from -2,147,483,648 to +2,147,483,648, and for reals; from -32,767 to +32,767 (approximate).

However, PDF 1.4 allows specifying the object type as “number” meaning it can be either integer or real (see PDF 1.4 Reference, 3.2.2). It is thus unclear which implementation limits shall be effective.

Precise formulation of the problem

Tz operator arguments (and at least 30 other operators as well as 6 keys in the graphics state parameter dictionary, all keys in CalGray and CalRGB colour space dictionaries and so on) in the content stream are specified as “number” throughout PDF 1.4. It is not clear whether the argument value 40,000 would violate the implementation limits of PDF 1.4, and, thus, the requirements of ISO 19005-1.

ISO WG Resolution

The aim of implementation limits is to ensure that the document can be parsed. In this context, the semantic meaning of the Number object is irrelevant.

If a Number is expected according to the PDF specification, then both Integer and Real are accepted and implementation limits apply separately to an Integer and a Real object type. But if a Real is specified as an object type, then only implementation limits for Real apply.

Example

According to the PDF 1.4 Reference, Table 5.2, the argument of the Tz operator is specified as:

Operands	Operator	Description
scale	Tz	Set the horizontal scaling, Th, to (scale ÷ 100). scale is a number specifying the percentage of the normal width. Initial value: 100 (normal width).

In the case of "40000 Tz", the operand "40000" is parsed as an Integer, and thus, does not violate the implementation limits of ISO 19005-1. However, in the case of "40000.0 Tz" the operand is parsed as Real and breaks the validation limits. It is also understood that any implicit conversion logic from Integer to Real is implementation-specific and is outside of the scope of normative requirements.

Nesting level of Q/q in case of Form XObjects (A004)

Pertaining

PDF/A-1 - ISO 19005-1, 6.1.12, PDF/A-2 – ISO 19005-2, 6.1.13 and PDF/A-3 – ISO 19005-3, 6.1.13

Background

Operators q and Q are used to save and restore the current graphics state in the content stream. PDF 1.4 Reference, Annex C.1 limits the maximal number of nested q/Q pairs to 28.

In addition, any use of a **Form XObject** via **Do** operator implicitly involves additional save and restore operations, as well as execution of all operators from the **Form XObject** content stream.

Precise formulation of the problem

It is not clear if the implementation limit or maximal number of nested q/Q pairs considers nested Form XObjects, or is applicable only to the q/Q pairs found within an isolated content stream.

PDF Validation TWG proposal

As each form XObject constitutes its own graphics context it must be considered in isolation. ISO 19005-1 6.1.2 should be read as if it included the following paragraph:

The implementation limits for the number of nested q/Q pairs assume that each content stream is considered in isolation, ignoring the potential cumulative effect of nesting form XObjects.

ISO WG Resolution

ISO 19005-1, ISO 19005-2 and ISO 19005-3 should be read as if the Proposal (above) was part of the specification.

Definition of length for Name and String objects (A005)

Pertaining

PDF/A-1 - ISO 19005-1, 6.1.12, PDF/A-2 – ISO 19005-2, 6.1.13 and PDF/A-3 – ISO 19005-3, 6.1.13

Background

PDF 1.4 Reference, Annex C.1 specifies the maximal allowed length of a Name object (127) and a String object (4095).

However, there are several ways to encode the same byte sequence as a Name or String object using special escape sequences: #HH in case of Names and \ddd in case of Strings. Strings also can be encoded in a hexadecimal format, where each byte is represented as two hexadecimal characters.

In addition, PDF 1.4 specifies how to encode Unicode strings as Name or String objects. Again, the byte sequence representing a Unicode string may have a length different from the length of the original Unicode string.

PDF 1.4, 3.2.4, in the paragraph after Table 3.3, suggests a clarification of the Name object length:

“The length of a name is subject to an implementation limit; see Appendix C. The limit applies to the number of characters in the name’s internal representation. For example, the name /A#20B has four characters (/, A, space, B), not six.”

This clarification itself contains a typographical error, as the leading slash character (‘/’) is not a part of the internal Name representation. This was corrected in ISO 32000-1, 7.3.5, in the paragraph following Note 3.

Precise formulation of the problem

It is not clear how the length of the Name and the String objects is defined with respect to the normative implementation limits.

PDF Validation TWG proposal

As suggested by ISO 32000-1, the length of a Name and a String object shall be defined as a length of its internal representation. Accordingly, ISO 19005-1, 6.1.12 should be read as if it included the following paragraph at the end of the subclause:

The length of a Name or a String object is defined as the length of its internal byte representation resulting from decoding all escape sequences used to represent the Name or a String in the PDF file, or decoding the hexadecimal representation of a String.

ISO WG Resolution

ISO 19005-1, ISO 19005-2 and ISO 19005-3 should be read as if the Proposal (above) was part of the specification.

Implementation limits for CIDs (A007)

Pertaining

PDF/A-1 - ISO 19005-1, 6.1.12, PDF/A-2 – ISO 19005-2, 6.1.13 and PDF/A-3 – ISO 19005-3, 6.1.13

Background

The implementation limits for ISO 19005-1 files are specified in PDF 1.4 Reference, Appendix C.1. The maximal value of a CID (character identifier) is specified as 65,535.

The algorithm for decoding the argument of the text show operators into a sequence of CID values is defined by the CMap object associated with any Type0 (composite) font. The CMap specification itself does not limit the range of CID values. However, all commonly used glyph collections contain less than 65,535 glyphs

Precise formulation of the problem

It is not clear whether the implementation limit for CID values is applicable to the CID values of glyphs used in the content streams, or to CMap data itself independently of the arguments of text showing operators to which they apply. It is also not clear whether fonts used only in rendering mode 3 are exempt from this requirement.

ISO WG Resolution

The implementation limit for CID values is applied to a CMap syntax to guarantee that the CMap stream can be parsed.

Minimal real values in PDF/A-2 and 3 (A018)

Pertaining

PDF/A-2 - ISO 19005-2, 6.1.13 and PDF/A-3 – ISO 19005-3, 6.1.13

Background

ISO 19005-2, 6.1.13 states:

“A conforming file shall not contain any real number closer to zero than $\pm 1.175 \times 10^{-38}$.”

However, in ISO 32000-1, Annex C, Table C.1. a similar implementation limit is formulated as:

“ $\pm 1.175 \times 10^{-38}$ - Nonzero real values closest to 0 (approximate). Values closer than these are automatically converted to 0.”

In other words, the clause should be interpreted as a precision recommendation in comparison of real values, rather than a ‘shall’ requirement. Converting real values that are too close to zero, to 0.0, does not normally lead to any ambiguities noticeable by a human eye. It is also a standard practice to use a certain precision in any implementation using real-valued arithmetic.

Precise formulation of the problem

The specification of a minimal possible non-zero absolute value of a real number is a specification of an acceptable precision in real value arithmetic rather than a ‘shall’ requirement.

ISO WG Resolution

Non-zero values between the positive and negative thresholds are not permitted in ISO 19005-2 and ISO 19005-3 since this is clearly defined in these standards.

Maximal real values in PDF/A-2 and 3 (A019)

Pertaining

PDF/A-2 - ISO 19005-2, 6.1.13 and PDF/A-3 – ISO 19005-3, 6.1.13

Background

ISO 19005-2, 6.1.13 copies the list of limits from ISO 32000-1 and lists them explicitly. The problem is that in ISO 32000 the maximum real value is "3.403 x 10³⁸ (approximately)" whereas the "approximately" has been dropped in ISO 19005-2.

The value in question is likely to be 3.4028234×10^{38} , which is the maximum value that may be represented in 32-bit floating point (IEEE754). Larger values, including values allowed by ISO 19005-2, require 64-bit numbers for accurate representation. This example of a page content stream demonstrates the issue:

```
1 0 0 1 3402900000000000000000000000000000000000000000000000000000000000.0 0 cm
```

```
1 0 0 1 -3402900000000000000000000000000000000000000000000000000000000000.0 0 cm
```

```
1 0 0 rg 32 32 531 778 re f
```

This is valid in ISO 32000-2, and should display a red rectangle on the page, but it cannot be correctly handled by any viewer that uses 32-bit floating point arithmetic.

Precise formulation of the problem

The maximal real value is given (slightly) incorrectly in the implementation limits of ISO 19005-2.

ISO WG Resolution

The requirement itself is unambiguous; implementation is outside the scope of the ISO WG.

Resources dictionary

Explicitly defined named resources (A002)

Pertaining

PDF/A-2 - ISO 19005-2, 6.2.2 and PDF/A-3 - ISO 19005-3, 6.2.2

Background

The Resources dictionary is used to define the named resources, such as images and fonts, that are used in a content stream. However, ISO 32000-1, 7.8.3 states:

“PDF files written obeying earlier versions of PDF may have omitted the Resources entry in all form XObjects and Type 3 fonts used on a page. All resources that are referenced from those forms and fonts shall be inherited from the resource dictionary of the page on which they are used. This construct is obsolete and should not be used by conforming writers.”

Both ISO 19005-2 and ISO 19005-3 forbid this practice, and require that any of the named resources used in the content stream be defined by the Resources dictionary explicitly associated with that content stream.

NOTE: The Resources dictionary is not required if the content stream does not reference any named resources.

Precise formulation of the problem

The first sentence of the last paragraph of clause 6.2.2 states:

“A content stream that references other objects, such as images and fonts that are necessary to fully render or process the stream, shall have an explicitly associated Resources dictionary as described in ISO 32000-1:2008, 7.8.3.”

It does not mention whether the named resources shall be defined in this explicitly associated Resources dictionary, and is thus ambiguous.

PDF Validation TWG proposal

As the intention of both ISO 19005-2 and 19005-3 is to forbid the practice of defining resources implicitly, it would be better to clarify this explicitly.

Accordingly, subclause 6.2.2 in ISO 19005-1 and ISO 19005-2 should be read as if it included the following sentence after the first sentence in the last paragraph of 6.2.2:

Such a Resources dictionary shall define all named resources referenced by this content stream.

ISO WG Resolution

ISO 19005-2 and ISO 19005-3 should be read as if the Proposal (above) was part of the specification.

NOTE: The ISO WG accepted the proposal for PDF/A-next.

Inheritance of default colour spaces (A028)

Pertaining

PDF/A-2 - ISO 19005-2, 6.2.2, PDF/A-3 - ISO 19005-3, 6.2.2

Background

ISO 19005-2 and ISO 19005-3 include a clause specifying that each content stream shall define all required resources in an explicitly associated Resources dictionary:

“A content stream that references other objects, such as images and fonts that are necessary to fully render or process the stream, shall have an explicitly associated Resources dictionary as described in ISO 32000-1:2008, 7.8.3.”

However, it is not clear whether default colour spaces are also covered by this clause.

Precise formulation of the problem

It is not clear if subclause 6.2.2 is also applicable to the default colour spaces, or, in other words, if the default colour spaces, if used, shall always be defined in the explicitly associated Resources dictionary.

PDF Validation TWG proposal

ISO 19005-2 and ISO 19005-3 should be read as if the following text was added to the end of 6.2.2:

Any default colour space as specified in ISO 32000-1, 8.6.5.6 shall also be defined in the explicitly associated resources dictionary. A conforming reader shall ignore any resources not defined in this resources dictionary.

NOTE 3: This provision explicitly prohibits an obsolete construct of inheriting the omitted Resources entry in form XObjects and Type3 fonts from the resources dictionary on the page where they are used.

ISO WG Resolution

ISO 19005-2 and ISO 19005-3 should be read as if the Proposal (above) was part of the specification.

Inheritance of Resource dictionaries (A003)

Pertaining

PDF/A-2 - ISO 19005-2, 6.2.2 and PDF/A-3 - ISO 19005-3, 6.2.2

Background

The inheritance mechanism for page Resources dictionaries has been a source of ambiguities in several implementations.

ISO 32000-1, 7.8.3 describes several ways of associating the Resources dictionary with a content stream. In particular, the page tree defines a special inheritance mechanism (ISO 32000-1, 7.7.3.4) for associating Resources dictionaries with page content:

“Some of the page attributes shown in Table 30 are designated as inheritable. If such an attribute is omitted from a page object, its value shall be inherited from an ancestor node in the page tree. If the attribute is a required one, a value shall be supplied in an ancestor

node. If the attribute is optional and no inherited value is specified, the default value shall be used.”

And, ISO 32000-1, Table 30:

Resources – dictionary – (Required, inheritable)

Precise formulation of the problem

The term “explicitly associated Resources dictionary” in ISO 19005-2 and ISO 19005-3, clause 6.2.2 is not defined in either PDF/A or PDF specifications. In particular, it is not clear whether the Resources dictionaries inherited via a Pages tree are considered “explicitly associated”, or not.

ISO WG Resolution

ISO 19005-2 and 19005-3 use the term “explicitly associated Resources dictionary” exclusively for **Resources** entry in a Page dictionary, a Tiling Pattern dictionary, a Form XObject dictionary (including Annotation appearance streams), or a Type3 font dictionary.

NOTE: This requirement will be made more explicit in PDF/A-next.

Glyph metrics

Width consistency for unused glyphs (A006)

Pertaining

PDF/A-1 - ISO 19005-1 (Cor. 2), 6.3.6

Background

ISO 19005-1 requires consistent glyph metrics to ensure predictable font rendering regardless of whether a given reader uses the metrics in the font dictionary or those in the font program. This requirement was clarified in Corrigendum 2 to be applicable only to fonts used for rendering:

“For every font embedded in a conforming file and used for rendering, the glyph width information in the font dictionary and in the embedded font program shall be consistent.”

The meaning of the term “used for rendering” is implicitly defined in subclause 6.3.4 “Embedded font programs”, and includes fonts used in page content streams, Form XObject streams, appearance streams of annotations including forms, content streams of Type3 font glyphs and streams of tiling patterns. This subclause also explicitly states that if a font is used only in rendering mode 3, it may not be embedded.

Precise formulation of the problem

It is not clear if the glyphs not used for rendering (or used only in rendering mode 3) are subject to the width consistency requirement if other glyphs of the same font are used for rendering.

PDF Validation TWG proposal

Inconsistent metrics for font glyphs do not affect the visual appearance of the PDF document if the font glyphs in question are not used for rendering. The TWG proposed a clarification of this subclause to require consistent width information only for those font glyphs used for rendering, as defined by subclause 6.3.4. Further, the TWG proposed that font glyphs used only in rendering mode 3 be exempt from the widths consistency requirement, even if other glyphs of the same font are used for rendering with rendering modes other than 3.

Accordingly, subclause 6.3.6 in ISO 19005-1 (Corr. 2) should be read as if it was replaced with:

For every font embedded in a conforming file, the glyph width information in the font dictionary and in the embedded font program shall be consistent for every glyph used for rendering with a rendering mode other than 3. Glyphs that are used only with rendering mode 3 are exempt from this requirement.

ISO WG Resolution

ISO 19005-1 (Corr. 2) should be read as if the Proposal (above) was part of the specification.

NOTE: This proposal was accepted in principle for PDF/A-next.

Consistency of vertical font metrics (A008)

Pertaining

PDF/A-1 - ISO 19005-1, 6.3.6, PDF/A-2 – ISO 19005-2, 6.2.11.5, and PDF/A-3 – ISO 19005-3, 6.2.11.5

Background

Although ISO 19005-1, 6.3.6 is called “Font metrics” it covers only glyph widths, which are horizontal metrics. However, vertical metrics may also be present in the embedded TrueType/OpenType programs, and their consistency with the information present in the font descriptor dictionary is equally important.

Precise formulation of the problem

The requirement for consistency of vertical metrics between font dictionary and the “fhea” and “fmtx” tables of embedded TrueType font program is not covered by ISO 19005-1, but is critical to ensuring predictability of font rendering in vertical mode.

PDF Validation TWG proposal

Add the following paragraph at the end of ISO 19005-1 6.3.6:

*If a composite (Type0) font is used for rendering in vertical writing mode and if the associated embedded font program contains information about vertical metrics of the glyphs, this information shall also be consistent with values of the **DW2** and **W2** keys in the font descriptor dictionary.*

ISO WG Resolution

Consistency for glyph metrics in vertical writing mode is out of scope in ISO 19005-1, ISO 19005-2 and ISO 19005-3. Accordingly, validators of these parts of ISO 19005 are not obliged to validate documents in this regard.

NOTE: The proposed paragraph was accepted for PDF/A-next.

Private data

Validation of private data (A009)

Pertaining

PDF/A-1 - ISO 19005-1, 6.1.1

Background

ISO 19005-1 documents may store private information under custom keys not specified by the PDF 1.4 Reference. Such data is for private use by specific applications and shall not be used for PDF rendering. However, as private data is still based on PDF object structures, it is subject to low-level syntax requirements described in ISO 19005-1, 6.1 “File structure”.

In addition, all custom keys used to define private data should follow the requirements of PDF 1.4 Reference, Annex E “PDF Name Registry”. However, as these requirements are irrelevant for the visual appearance of PDF documents, they are outside of the scope of ISO 19005.

Finally, ISO 19005-1, 6.1.4 states:

“Any object whose offset is not referenced in the cross-reference table shall be exempt from all requirements of this part of ISO 19005.”

Indirectly, this implies that any object referenced in the cross-reference table is subject to the requirements of clause 6.1.

Precise formulation of the problem

It is not clear whether objects referenced in the cross-reference table, but not reached from the document’s root dictionary via the first-class names defined in PDF 1.4 Reference are subject to the requirements of ISO 19005-1, 6.1.

PDF Validation TWG proposal

As the aim of ISO 19005-1, 6.1 is to ensure that the object structure of the PDF document can be parsed unambiguously, it is proposed that the specification be read as if it includes an explicit statement to the effect that private data is still subject to requirements of all subclauses of 6.1 including, in particular:

6.1.6 String objects

6.1.7 Stream objects

6.1.8 Indirect objects

6.1.10 Filters

6.1.11 Embedded files

6.1.12 Implementation limits

Accordingly, ISO 19005-1 should be read as if it included the following sentence at the end of 6.1.4:

A conforming PDF/A-1 document may contain any custom data not specified by PDF Reference. However, this data shall not be used for rendering by a conforming reader and shall still comply to the requirements of clauses 6.1.2 - 6.1.11.

ISO WG Resolution

ISO 19005-1 should be read as if the Proposal (above) was part of the specification.

Unreferenced resources

Named resources not referenced in the content stream (A010)

Pertaining

PDF/A-1 - ISO 19005-1/Corr.2, 6.2.10, PDF/A-2 - ISO 19005-2, 6.2.2 and PDF/A-3 - ISO 19005-3, 6.2.2

Background

The resource dictionary of any content stream in the PDF document may contain resources that are not referenced within the content stream, and, thus, do not affect rendering of the content stream.

Corrigendum 2 to ISO 19005-1 as well as ISO 19005-2 and 19005-3 contain a special clause to exclude such resources from further requirements:

“Any named resource present in a resources dictionary, but whose name is not referenced from the associated content stream, is not used for rendering and therefore shall be exempt from all requirements of this part of ISO 19005.”

Precise formulation of the problem

Read literally, the paragraph added in Corrigendum 2 exempts the unreferenced resources from all requirements of ISO 19005-1, 6.1, thus permitting the use of LZW compression and violating implementation limits. As a side effect, this interpretation might introduce ambiguity in low-level parsing of the PDF document. The same clause (and thus, the same problem) occurs in ISO 19005-2, 6.2.2 and ISO 19005-3, 6.2.2.

PDF Validation TWG proposal

To ensure predictability in base object parsing of a conforming PDF document, ISO 19005-1/Corr. 2 should be read as if this paragraph:

“Any named resource present in a resources dictionary, but whose name is not referenced from the associated content stream, is not used for rendering and therefore shall be exempt from all requirements of this part of ISO 19005.”

was replaced with this paragraph:

Any named resource present in a resources dictionary, but whose name is not referenced from the associated content stream, is not used for rendering and therefore shall be exempt from all requirements of this part of ISO 19005 except for clauses 6.1.2 to 6.1.11.

Similarly, ISO 19005-2 and ISO 19005-3 should read as if the same clause (the last sentence in 6.2.2) was replaced with:

Any named resource present in a resources dictionary, but whose name is not referenced from the associated content stream, is not used for rendering and therefore shall be exempt from all requirements of this part of ISO 19005 except for clauses 6.1.2 to 6.1.13.

ISO WG Resolution

ISO 19005-1, ISO 19005-2 and ISO 19005-3 should be read as if the Proposal (above) was part of the specification.

In addition to clause 6.1, such unreferenced resources shall be compliant with the corresponding PDF specifications (ISO 32000-1 for ISO 19005-2 and ISO 19005-3; ISO 32000-2 for PDF/A-Next).

NOTE: This proposal was accepted in principle for PDF/A-next.

Named resources not used for rendering (A011, A015)

Pertaining

PDF/A-1 - ISO 19005-1/Corr.2, 6.2.10

Background

ISO 19005-1/Corr. 2 contains a clause that excludes resources unreferenced from the corresponding content stream from further requirements:

“Any named resource present in a resources dictionary, but whose name is not referenced from the associated content stream, is not used for rendering and therefore shall be exempt from all requirements of this part of ISO 19005.”

However, some resources may be referenced from the content stream, but not actually used for rendering. For example, in a sequence of commands

```
/CS1 cs %set colour space to the resource /CS1
```

```
/CS2 cs %reset it to a different resource /CS2
```

the named colour space “CS1” is not actually used for rendering. Similarly, device colors can be set, but never used for rendering. For example, in a sequence of commands such as:

```
1 0 0 0 k 1 0 0 rg
```

the DeviceCMYK color is not actually used for rendering.

Precise formulation of the problem

It is not clear if the named resources referenced from the associated content stream, but not used for rendering, are exempt from other requirements. Similarly, it is not clear if the requirements on the use of device colour spaces are applicable to device colour spaces referenced in the content stream, but not used for rendering.

ISO WG Resolution

Setting the resource in a current graphics state means it is already used and, thus, is subject to all requirements of ISO 19005-1.

The colours shall also be specified (even if not used for rendering) in a device-independent manner according to 19005-1, 6.2.3.1; 19005-2, 6.2.4.1 and ISO 19005-3, 6.2.4.1.

Appearance streams of widget annotations

Appearance streams for Button form fields (A012)

Pertaining

PDF/A-1 - ISO 19005-1/Corr.2, 6.5.3, PDF/A-2 - ISO 19005-2, 6.3.3 and PDF/A-2 - ISO 19005-2, 6.3.3

Background

Widget annotations are used to represent visual appearance and interactivity for PDF form fields. The PDF 1.4 Reference does not require appearance streams of Widget annotations to be present in the document, leaving it to PDF readers to generate this appearance based on the form field value and other properties. To avoid this ambiguity, ISO 19005 requires appearance streams of Widget annotations to be present and unambiguously defined via the **N** key in the annotation appearance dictionary (so-called normal appearance).

This has been stated in the initial version of ISO 19005-1, 6.9:

“Every form field shall have an appearance dictionary associated with the field's data. A conforming reader shall render the field according to the appearance dictionary without regard to the form data.”

and in ISO 19005-1, 6.5.3:

“If an annotation dictionary contains the **AP** key, the appearance dictionary that it defines as its value shall contain only the **N** key, whose value shall be a stream defining the appearance of the annotation.”

As Widget annotations representing some form fields such as, for example, radio buttons, have several states and require a separate appearance stream for each state, the original text was corrected in ISO 19005-1/Corr. 2, 6.5.3:

“For all annotation dictionaries containing an **AP** key, the appearance dictionary that it defines as its value shall contain only the **N** key. If an annotation dictionary's **Subtype** key has a value of Widget and its FT key has a value of Btn, the value of the **N** key shall be an appearance subdictionary; otherwise the value of the **N** key shall be an appearance stream.”

Precise formulation of the problem

The change to ISO 19005-1, 6.5.3 introduced in Corrigendum 2 and integrated into ISO 19005-2 and ISO 19005-3 is not fully correct, as pushbutton fields, which also have Button field type (*Btn* value of the **FT** key), have no permanent value and, thus, only one appearance stream can be associated with them.

ISO WG Resolution

The button fields may also have multiple appearance states. Accordingly, the push button, as with any field of type *Btn*, shall always have an appearance subdictionary as the value of the **N** key, even if it has only a single entry.

Appearance streams for Widget annotations (A022)

Pertaining

PDF/A-1 - ISO 19005-1, 6.9

Background

ISO 19005-1 does not require all annotations to have appearance streams. However, it does require that all form fields shall have an appearance stream (or streams) associated with the field:

“Every form field shall have an appearance dictionary associated with the field's data. A conforming reader shall render the field according to the appearance dictionary without regard to the form data.”

The PDF 1.4 Reference, 8.4.5 says that:

“Interactive forms (see Section 8.6, “Interactive Forms”) use widget annotations (PDF 1.2) to represent the appearance of fields and to manage user interactions.”

The PDF 1.4 Reference here implies that any Widget annotation is required to have an appearance dictionary, even though this is not stated in normative terms.

Precise formulation of the problem

It is not clear if any Widget annotation is required to have an annotation dictionary in 19005-1 compliant documents.

PDF Validation TWG proposal

Interpret ISO 19005-1, 6.9, 4th paragraph:

“Every form field shall have an appearance dictionary associated with the field's data. A conforming reader shall render the field according to the appearance dictionary without regard to the form data.”

as if it stated:

Every Widget annotation shall have an appearance dictionary. This guarantees that every form field has an appearance dictionary associated with the field's data. A conforming reader shall render the field according to the appearance dictionary without regard to the form data.

ISO 19005-1 validators

An ISO 19005-1 validator shall FAIL otherwise conforming files in which a widget annotation lacks an appearance dictionary.

ISO WG Resolution

ISO 19005-1 should be read as if the Proposal (above) was part of the specification.

Form fields with multiple Widgets (A023)

Pertaining

PDF/A-1 - ISO 19005-1, 6.5.3 (Corr. 2), PDF/A-2 - ISO 19005-2, 6.3.3 and PDF/A-3 - ISO 19005-3, 6.3.3

Background

The requirement to have multiple appearance streams for all form fields of type *Btn* is formulated in Corrigendum 2 to ISO 19005-1 and copied to ISO 19005-2 and ISO 19005-3 as follows:

“For all annotation dictionaries containing an **AP** key, the appearance dictionary that it defines as its value shall contain only the **N** key. If an annotation dictionary’s **Subtype** key has a value of *Widget* and its **FT** key has a value of *Btn*, the value of the **N** key shall be an appearance subdictionary, otherwise the value of the **N** key shall be an appearance stream.”

This formulation does not address cases in which a form (such as a radio button) has both multiple widgets associated with it and is defined in the **Kids** array. In this case, the *Widget* dictionary and the *Form field* dictionary are not merged, and it doesn’t make sense to refer to the **FT** key of the annotation dictionary.

Precise formulation of the problem

This formulation misses the case when a form (such as a radio button) has multiple widgets associated to it and defined in the **Kids** array.

PDF Validation TWG proposal

The paragraph in question should be read as if it stated:

*For all annotation dictionaries containing an **AP** key, the appearance dictionary that it defines as its value shall contain only the **N** key. If an annotation dictionary’s **Subtype** key has a value of *Widget* and its parent form field dictionary has the **FT** key value equal to *Btn*, the value of the **N** key shall be an appearance subdictionary, otherwise the value of the **N** key shall be an appearance stream.*

*NOTE For *Widget* annotations, the parent form field dictionary may be merged with the annotation dictionary or, otherwise, is referenced by the *Parent* key in the annotation dictionary.*

ISO 19005-1, -2 and -3 validators

An ISO 19005-1, -2 or -3 validator shall PASS an otherwise valid ISO 19005 document if it contains a *Widget* annotation dictionary with a **Parent** key referring to a parent form field of type *Button*, and if the value of the **N** key in this widget annotation dictionary refers to an appearance subdictionary.

ISO WG Resolution

ISO 19005-1, ISO 19005-2 and ISO 19005-3 should be read as if the Proposal (above) was part of the specification.

Colour spaces

Version of the embedded ICC profile (A013)

Pertaining

PDF/A-1 - ISO 19005-1, 6.2.3.2

Background

Per ISO 19005-1, 6.2.3.2, ICC profiles embedded in ISO 19005-1 documents are subject to requirements of the PDF 1.4 Reference:

“All ICCBased colour spaces shall be embedded as ICC profile streams as described in PDF Reference 4.5.”

NOTE: the reference to “PDF Reference 4.5” in ISO 19005-1 is a typo; “PDF Reference 1.4” is intended.

In its turn, the PDF 1.4 Reference, 4.5.4 restricts the versions of ICC profiles that can be used in the text after Table 4.16

“The ICC specification is an evolving standard. The ICCBased colour spaces supported in PDF 1.3 are based on ICC specification version 3.3; those in PDF 1.4 are based on the ICC specification ICC.1:1998-09 and its addendum ICC.1A:1999-04.”

These ICC specifications are also identified by their so-called internal version, placed in the ICC profile header. This internal version is “2.1” for ICC specification version 3.3, “2.2” for ICC.1:1998-09 and “2.3” for its addendum ICC.1A:1999-04. In 2001 ICC published also another standard ICC.1:2001-04, which has an internal version “2.4” and which is backward compatible with all earlier ICC specifications with major version 2.

Precise formulation of the problem

ISO 19005-1 does not allow the use of ICC.1:2001-04 (internal version 2.4), which is backward-compatible with any colour management system that supports ICC profiles of version 2.1-2.3.

PDF Validation TWG proposal

As any conforming ISO 19005-1 reader shall process ICC profiles with internal major version 2, such ICC profiles should be allowed in ISO 19005-1.

ISO 19005-1 should be read as if this paragraph followed the first paragraph of ISO 19005-1 6.2.3.2:

In addition to the versions of ICC specifications supported by the PDF Reference 1.4, 4.5.4, ICC profiles based on ICC.1:2001-04 (internal version 2.4.0) is also permitted.

ISO WG Resolution

ISO 19005-1 should be read as if the Proposal (above) was part of the specification.

Overprint mode for ICCBased CMYK (A024)

Pertaining

PDF/A-2 - ISO 19005-2, 6.2.4.3 and PDF/A-3 -ISO 19005-3, 6.2.4.3

Background

As a special use of ICCBased colour spaces, ISO 32000-1 specifies so-called implicit conversion of ICCBased colour spaces in 8.6.5.7 as follows:

“In cases where a source colour space accurately represents the particular output device being used, a conforming reader should avoid converting the component colour values but use the source values directly as output values. ... When this type of implicit conversion is done, all of the semantics of the device colour space shall also apply, even though they do not apply to CIE-based spaces in general. In particular, the nonzero overprint mode shall determine the interpretation of colour component values in the space.”

As this interpretation of overprint mode output is device dependent, such a case is not permitted in ISO 19005-2 and ISO 19005-3, 6.2.4.3:

“Overprint mode (as set by the OPM value in an ExtGState dictionary) shall not be one (1) when an ICCBased CMYK colour space is used and when overprinting for stroke or fill or both is set to true.”

Precise formulation of the problem

The wording of this clause is not precise. For example, it is not clear whether the use of ICCBased CMYK colour space for stroke is permitted in the case when overprinting for fill is set to true (and the OPM value is 1).

PDF Validation TWG proposal

ISO 19005-2 and ISO 19005-3, 6.2.4.3 should be read as if the paragraph stated:

Overprint mode (as set by the OPM value in an ExtGState dictionary) shall not be one (1) when an ICCBased CMYK colour space is used for stroke and overprinting for stroke is set to true, or when ICCBased CMYK colour space is used for fill and overprinting for fill is set to true, or both.

ISO WG Resolution

ISO 19005-2 and ISO 19005-3 should be read as if the Proposal (above) was part of the specification.

NOTE: This proposal was accepted in principle for PDF/A-next.

Use of DeviceGray in soft masks (A026)

Pertaining

PDF/A-2 - ISO 19005-2, 6.2.4.3 and PDF/A-3 - ISO 19005-3, 6.2.4.3

Background

All parts of ISO 19005 prohibit the use of Device colour spaces without a well-defined mapping to a device-independent colour model, either via the use of default colour spaces or by specifying the document's output intents, as specified in ISO 3200-1, 14.11.6.

Soft mask image dictionaries are required to have DeviceGray as a value of the ColorSpace entry. However, in this case the colour values define shape rather than colour, and the use of DeviceGray in such a case does not introduce any device-dependency in PDF processing.

Precise formulation of the problem

The use of DeviceGray colour space in soft mask images should be allowed in ISO 19005.

PDF Validation TWG proposal

ISO 19005-2 and ISO 19005-3, 6.2.4.3 should be read as if the 3rd paragraph:

“DeviceGray shall only be used if a device independent DefaultGray colour space has been set when the DeviceGray colour space is used, or if a PDF/A OutputIntent is present.”

was replaced with:

DeviceGray shall only be used if a device independent DefaultGray colour space has been set when the DeviceGray colour space is used, or if a PDF/A OutputIntent is present, or as a value of the ColorSpace entry in soft mask image dictionaries.

ISO WG Resolution

ISO 19005-2 and ISO 19005-3 should be read as if the Proposal (above) was part of the specification.

NOTE: This proposal was accepted in principle for PDF/A-next.

Fonts

Use of OpenType fonts in PDF/A-1 (A014)

Pertaining

PDF/A-1 - ISO 19005-1, 6.3.4

Background

Although OpenType fonts are not specified in the PDF 1.4 Reference, and are not permitted in documents conforming to ISO 19005-1 (see ISO 19005-1, 5.1 “General”), the PDF 1.4 Reference, 5.8, Table 5.22 formally permits any type of font to be present in the PDF document:

“Key – **FontFile3**

Subtype – otherName

Description – Font or CIDFont program represented in some future format, identified by otherName as the font file subtype.”

Precise formulation of the problem

A literal reading of ISO 19005-1 and the PDF 1.4 Reference does not forbid the use of OpenType fonts. Moreover, the use of “otherName” as a font type creates an ambiguity in specifying font types that are permitted in ISO 19005-1 documents.

ISO 19005-1, -2 and -3 validators

An ISO 19005-1, -2 or -3 validator shall FAIL an otherwise valid ISO 19005 document if it contains a Font or CIDFont program with a **Subtype** entry unsupported by the applicable PDF specification.

ISO WG Resolution

Although the PDF 1.4 Reference permits the use of *OpenType* as a value in the **Subtype** entry, the OpenType file format is not recognized in the PDF 1.4 Reference, and thus shall result in a ISO 19005-1 validation error due to an unsupported font file format.

CharSet/CIDSet requirements (A016)

Pertaining

PDF/A-2 - ISO 19005-2, 6.2.11.4.2 and PDF/A-3 – 19005-3, 6.2.11.4.2

Background

Font subsets may have special entries in their font descriptor dictionaries that identify the glyph subsets: **CharSet** (for Type1 fonts), **CIDSet** (for CID fonts). Despite a clear requirement for these entries to...

“...list the character names of all glyphs present in the font program, regardless of whether a glyph in the font is referenced or used by the PDF or not...”

... confusion persists. Many authoring tools list only glyphs used for rendering, and no rendering systems tested by the veraPDF consortium between November 2014 and December 2016 used this entry to alter rendering logic.

In addition, these entries are only optional in ISO 19005-2 and ISO 19005-3.

Precise formulation of the problem

Requirements on the use of **CharSet** and **CIDSet** entries in font dictionaries of subsetted fonts cause a lot of confusion and are not actually used in practice.

ISO WG Resolution

These keys are deprecated in PDF 2.0. However, existing standards unambiguously define **CharSet** and **CIDSet** entries; the text of these specifications does not change.

Referencing non-predefined CMaps from other CMaps (A025)

Pertaining

PDF/A-2 - ISO 19005-2, 6.2.11.3.3 and PDF/A-3 - ISO 19005-3, 6.2.11.3.3

Background

As specified in ISO 32000-1, CMap streams may reference other CMaps, either predefined or embedded via the “usecmap” operator in the embedded CMap file. In this case this referenced CMap should be also specified as a value of the /UseCMap entry in the CMap dictionary.

In addition, to avoid any device-specific behavior, ISO 19005-2 and ISO 19005-3 require that any non-predefined CMap be embedded into the PDF document:

“All CMaps used within a PDF/A-2 file, except those listed in ISO 32000-1:2008, 9.7.5.2, Table 118, shall be embedded in that file as described in ISO 32000-1:2008, 9.7.5.”

However, ISO 19005-2 doesn’t seem to allow referencing one embedded CMap from another:

“A CMap shall not reference any other CMap except those listed in ISO 32000-1:2008, 9.7.5.2, Table 118.”

Precise formulation of the problem

The current wording in ISO 19005-2 and ISO 19005-3 does not allow referencing an embedded custom CMap from another CMap. It’s not clear if this is permitted or not.

ISO WG Resolution

The “usecmap” operator inside the embedded CMap shall only refer to the predefined CMaps. Referring to other embedded CMaps might cause ambiguities, and shall be avoided.

Metadata

Compressed non-document Metadata in PDF/A-1 (A017)

Pertaining

PDF/A-1 - ISO 19005-1, 6.7.2

Background

All requirements in ISO 19005-1 pertaining to XMP metadata address only the document level XMP package (the **Metadata** entry in the document's catalog), and font metadata. In addition, font metadata requirements contain only 'should' clauses.

However, the following sentence in ISO 19005-1, 6.7.2 seems to apply to all XMP Metadata streams in the PDF document:

“Metadata object stream dictionaries shall not contain the Filter key.”

Precise formulation of the problem

It is not clear if ISO 19005-1 requires *all* XMP Metadata streams or just the document level Metadata stream in ISO 19005-1 documents to be uncompressed (i.e., contain no **Filter** key)

PDF Validation TWG proposal

ISO 19005-1, 6.7.2 should be read as if this sentence:

“Metadata object stream dictionaries shall not contain the **Filter** key.”

read as follows:

*All Metadata object stream dictionaries in the PDF document, as defined in PDF Reference, 9.2.2, shall not contain the **Filter** key.*

ISO 19005-1 validators

ISO 19005-1 validators shall FAIL otherwise compliant 19005-1 files that include compressed metadata streams, and perform all other XMP-related checks only for document level metadata.

ISO WG Resolution

ISO 19005-1 should be read as if the Proposal (above) was part of the specification.

NOTE: All other "shall" clauses of ISO 19005-1 concern only the document Metadata stream referenced from the Catalog dictionary. This has been changed in ISO 19005-2 and ISO 19005-3, which add additional requirements for non-document level Metadata streams.

Validation of XMP properties (A020)

Pertaining

PDF/A-1 - ISO 19005-1, 6.7.2, PDF/A-2 - ISO 19005-2, 6.6.2.3.1 and PDF/A-3 - ISO 19005-3, 6.6.2.3.1

Background

ISO 19005-1, ISO 19005-2 and ISO 19005-3 require that all metadata properties shall use either predefined schemas from relevant XMP specifications or extension schemas defined in the XMP package.

In ISO 19005-1, 6.7.2:

“Properties specified in XMP form shall use either the predefined schemas defined in XMP Specification, or extension schemas that comply with XMP Specification, and 6.7.8.”

In ISO 19005-2 and ISO 19005-3, 6.6.2.3.1:

“All properties specified in XMP form shall use either the predefined schemas defined in the XMP Specification, ISO 19005-1 or this part of ISO 19005, or any extension schemas that comply with 6.6.2.3.2.”

There are several issues:

It is not clear what the term “shall use predefined schemas” means. Should only the type of the properties be correct? Or is it that any additional restrictions on the values of such properties shall also be honored? It should also be noted that all conditions imposed on values of predefined properties are given in textual form for humans, not in any kind of machine-readable form like an XML schema.

As of now, extension schemas remain a very difficult technical mechanism of specifying the custom properties, and very few implementations can use them correctly.

Precise formulation of the problem

The “shall” requirement for any metadata property to comply with either predefined schemas from XMP specifications or with an extension schema, is itself ambiguous and causes substantial technical difficulties and questions in implementations.

PDF Validation TWG proposal

XMP values shall be validated by only considering their type. Other semantic meaning that can possibly be inferred by the name or description of the property shall be disregarded.

ISO 19005-1, -2 and -3 validators

ISO 19005-1, -2 and -3 validators shall only validate XMP values based on their type. The exact validation rules for basic types are as follows:

- Boolean – as defined in the XMP Specification
- Integer – as defined in the XMP Specification
- Real – as defined in the XMP specification
- Text, ProperName, URI, URL, AgentName, Rational, RenditionClass, XPath – any string
- MimeType – as defined in RFC 2046
- Date – as defined by ISO 8601

ISO WG Resolution

ISO 19005-1, ISO 19005-2 and ISO 19005-3 should be read as if the Proposal (above) was part of the specification.

NOTE: This proposal was accepted in principle for PDF/A-next.

Validation of file provenance information (A021)

Pertaining

PDF/A-2 - ISO 19005-2, 6.6.6 and PDF/A-3 - ISO 19005-3, 6.6.6

Background

ISO 19005-2 and ISO 19005-3 include a “should” requirement for file provenance information as a sequence of user actions recorded in the xmpMM:History property.

This “should” requirement, however, contains a “shall” requirement, specifically, that if such list of user actions is present, it shall specify action, parameters and when fields.

In many cases user actions do not include parameters, and it is not clear why this field is always required.

Precise formulation of the problem

The “shall” requirement for any user actions recorded in xmpMM:History property to have the properties field seems to be both too restrictive and inherently confusing, as many user actions do not have any additional parameters.

PDF Validation TWG proposal

Requirements on the xmpMM:History property are application requirements, and are thus irrelevant to ISO 19005 validation.

ISO WG Resolution

ISO 19005-2 and ISO 19005-3 should be read as if the Proposal (above) was part of the specification.

NOTE: This proposal was accepted in principle for PDF/A-next.

Optional vs required valueType field in Extension schema (A029)

Pertaining

PDF/A-1 - ISO 19005-1, 6.7.8 / Corr. 2 (2nd sentence at the end of NOTE 1), PDF/A-2 - ISO 19005-2, 6.6.2.3.2 (last sentence in last paragraph) and PDF/A-3 - ISO 19005-3, 6.6.2.3.2 (last sentence in last paragraph)

Background

ISO 19005 allows the use of custom schemas in XML metadata to contain a list of custom properties along with a definition of custom value types. ISO 19005 requires that these schemas are defined via the ISO 19005-specified extension schema syntax.

Corrigendum 2 to ISO 19005-1 adds the following:

“If a schema that is defined in 6.7.8 is used, all fields defined in that schema's definition in the respective table in 6.7.8 shall be present.”

ISO 19005-2 and ISO 19005-3 reformulates the requirement as follows:

“All fields described in each of the tables in 6.6.2.3.3 shall be present in any extension schema container schema.”

Read literally, both formulations require that all entries for the ISO 19005 schema value type, including pdfaSchema:valueType, to be present in an ISO 19005 extension schema.

NOTE: this field is not needed, if the Extension Schema uses only predefined value types.

Precise formulation of the problem

If the extension schema does not use custom value types it is unclear as to whether the schema structure is nonetheless required to contain (in this case) empty pdfaSchema:valueType fields.

PDF Validation TWG proposal

ISO 19005-1 Corr. 2, ISO 19005-2 and ISO 19005-3 should be as if the following text was present right before 6.6.2.3.3 (ISO 19005-2 and ISO 19005-3) or as a second paragraph in ISO 19005-1, 6.7.8:

If an Extension Schema does not define any custom value types, the field "pdfaSchema:valueType" in any instance of "PDF/A Schema value type" shall be either missing or empty, and no instance of "PDF/A ValueType value type" and/or "PDF/A Field value type" shall be present.

If "pdfaSchema:valueType" is present and not empty, for each entry an instance of "PDF/A ValueType value type" with all fields shall be present and not empty with the exception of "pdfaType:field", which may be present.

If an Extension Schema does not define any custom fields, the field "pdfaType:field" in any instance of "PDF/A ValueType value type" shall be either missing or empty and no instance of "PDF/A Field value type" shall be present.

If "pdfaType:field" is present and not empty, for each entry an instance of "PDF/A Field value type" with all fields shall be present and not empty.

ISO 19005-1, -2 and -3 validators

In the cases described above, ISO 19005-1, -2 and -3 validators shall allow missing pdfaSchema:valueType and pdfaType:field properties in the Extension Schema definition, and in such cases, treat them as an equivalent of an empty array.

ISO WG Resolution

ISO 19005-1, -2 and -3 should be read as if the Proposal (above) was part of the specification.

Associated files

Associated files in PDF/A-3 (A027)

Pertaining

PDF/A-3 - ISO 19005-3, E.2

Background

ISO 19005-3 allows embedded files that include a stated association and role with respect to an object in the PDF document (e.g., catalog, page, form XObject, annotation, structure element). The association occurs via an **AF** key as specified in ISO 19005-3, Annex E. However, the intention to require the **AF** key is not clearly present in Annex E.

Precise formulation of the problem

The intention to have each embedded file associated with at least one object in the PDF document is not clearly specified in ISO 19005-3.

PDF Validation TWG proposal

ISO 19005-3, E.2. should be read as if the first paragraph:

“In order to enable identification of the relationship between the file specification dictionary and the content that is referring to it, a new (required) key has been defined and its presence (in the dictionary) is required.”

is replaced with:

*In order to enable identification of the relationship between the file specification dictionary and the content that is referring to it, a new (required) key, **AFRelationship**, has been defined (see ISO 32000-2, Table 43) and its presence in the file specification dictionary is required (see Table E.1).*

*Each embedded file shall represent the data associated with the entire document or its parts. In particular, each file specification dictionary shall be present in at least one of the arrays referred by the **AF** key as specified in E.3-E.8.*

In addition, the clause should be read as if it included a new Note 3 directly following Note 2:

Note 3. The same file specification dictionary may be present in multiple AF arrays, for example, when an embedded file is associated with a multipage table.

ISO WG Resolution

ISO 19005-3 should be read as if the Proposal (above) was part of the specification.

NOTE: As Associated Files are specified in ISO 32000-2, this text was rewritten in PDF/A-next.