



Version 4 of the Ghent PDF Workgroup Specifications based on PDF/X-1a

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2. **Version 4 Specification Details – Excluding Packaging**

This chapter does not describe any of the packaging specifications; these are described another chapter. The reason for this is that the packaging specifications are not PDF/X compliant and that the difference with all other specifications is still substantial.

2.1. ***Terminology and Guidelines***

This chapter defines what the rules are for a compliant PDF file. The first section lists common requirements; requirements valid for all specifications. The second section lists requirements that are valid for a subset of the specifications.

Throughout the requirements the official names of the specifications are used to refer to them. These names and their explanation are defined in a separate document: "Specification Naming Convention".

The verb "shall" is used for mandatory requirements. If a PDF file is generated such a requirement must be followed. During preflight a violation of such a requirement must result in a preflight error.

The verb "should" is used for suggested requirements. If a PDF file is generated it is suggested that such a requirement is followed. During preflight it is required that a violation of such a requirement results in an informational message.

Notes are informative, not normative. They explain why the requirement exists, make the requirement more concrete, etc. but they do not change the requirement.

The requirements listed are the ideal; they describe what the document receivers represented by the Ghent PDF Workgroup would like to detect in incoming PDF documents. Even though requirements are described as accurately as possible, requirements can be achieved or checked for in multiple ways.

The specifications do not incorporate any fixes. The fixing of problems during creation, processing or verification of PDF files lies outside the scope of this specification of the Ghent PDF Workgroup.

2.2. Common Definitions

2.2.1. Positioning inside/outside of page box

An objects lies inside a page box if its bounding box lies inside or overlaps with the page box. An objects lies completely outside a page box if its bounding box lies completely outside the page box.

It is acceptable in this specification if the bounding box of the object itself is taken into account. Applications can go further in determining the visibility, e.g. because it is a rectangle completely around the page box, because part of the object is clipped or hidden by other objects, etc.

2.2.2. Print elements

A PDF file may contain two classes of elements: those intended for final print reproduction (print elements), and those not intended for final print reproduction (non-print elements).

Except as specified below, print elements are those drawn or referenced (directly or indirectly), using keys and values defined in PDF Reference, from:

- the Contents stream(s) of Page objects; or
- the AP stream of any TrapNet or PrinterMark annotation placed on any page.

Image XObjects that are only referenced from within the Alternates array of an Image XObject are non-print elements.

All other elements within the file are non-print elements.

2.2.3. Spot color

A spot color is a colorant name of a Separation or DeviceN color space which is not equal to Cyan, Magenta, Yellow, Black, All or None.

2.2.4. Using a color or a font

A color, spot color or a font is used when it is referenced, directly or indirectly, from the page content (which includes all form and image XObjects, Patterns, Shadings and Type3 CharProcs).

2.2.5. Equality of ICC profiles

ICC profiles shall be treated as identical if MD5 hash values for the two profiles are the same. MD5 values are read from the value of the Profile ID field within

each profile, if present and if not set as zero. If no MD5 value is included in each profile then a value shall be calculated following the methodology set out in 7.2.18 of ISO 15076.

2.2.6. Page boxes

The media box defines the boundaries of the physical medium on which the page is to be printed. It may include any extended area surrounding the finished page for bleed, printing marks, or other such purposes. It may also include areas close to the edges of the medium that cannot be marked because of physical limitations of the output device. Content falling outside this boundary can safely be discarded without affecting the meaning of the PDF file.

The crop box defines the region to which the contents of the page are to be clipped (cropped) when displayed or printed. Unlike the other boxes, the crop box has no defined meaning in terms of physical page geometry or intended use; it merely imposes clipping on the page contents. However, in the absence of additional information (such as imposition instructions specified in a JDF or PJTF job ticket), the crop box determines how the page's contents are to be positioned on the output medium.

The bleed box defines the region to which the contents of the page should be clipped when output in a production environment. This may include any extra bleed area needed to accommodate the physical limitations of cutting, folding, and trimming equipment. The actual printed page may include printing marks that fall outside the bleed box.

The trim box defines the intended dimensions of the finished page after trimming. It may be smaller than the media box to allow for production-related content, such as printing instructions, cut marks, or color bars.

2.2.7. Comparing values

Values have to be compared with their full precision. E.g. if a requirement only applies to text less than or equal to 12pt, text of 12.0001pt is exempt from the requirement.

2.3. Common Requirements

This section describes requirements that are applicable to all version 4 Ghent PDF Workgroup specifications (except packaging).

2.3.1. PDF/X Compliancy

A PDF file shall be compliant to the ISO PDF/X-1a:2001 standard as defined by ISO 15930-1.

Note: The other requirements of this document do not replace (some of) the PDF/X requirements, on the contrary: a valid PDF file shall comply with the PDF/X and the GWG requirements. As an example, compression using JPEG2000 or JBIG2 or embedding as OpenType fonts are not allowed even if it is not explicitly mentioned.

The major version number of an ICC profile used shall not be higher than 2.

Note:

The PDF Reference and the PDF/X specification refer to specific versions of the ICC specification. As a result, certain versions of ICC profiles are not allowed in PDF/X compliant files. E.g. PDF/X-1a:2001 references *Adobe Portable Document Format, version 1.3* and *ICC.1:1998-09*.

The ICC specification states: "... A minor version change can happen with compatible changes. An example of a minor version number change may be the addition of new optional tags." Consequently, the GWG believes it is safe to state that a consumer of an ICC profile must be prepared to successfully process/use a profile with a higher minor version (but the same major version number) than it was built for. By definition a minor version update to the ICC spec does not introduce incompatible changes. In addition, looking at what actually changed between minor versions of the ICC spec, the stuff one finds is: - clarifications - new optional tags - new examples (for example with regard to C source code) none of which prohibit successful use of a 'newer' ICC profile by an older ICC profile consumer as long as it is only the minor version number that changed.

The conclusion is therefore that only the major version number of an ICC profile must be evaluated when determining whether a PDF conforms to a GWG specification. The minor version number shall be ignored.

2.3.2. File Encoding & Compression

To minimize file size, the data (streams) – excluding XMP metadata streams – in a PDF file should be compressed where possible. The compression used shall of course follow the PDF/X standard.

Compression should not be used on any XMP metadata stream used inside the PDF file so that such metadata is readily accessible.
Object compression as introduced by version 1.5 of the PDF format shall not be used in a PDF file.

Note: There is no longer a restriction on the use of ASCII encoding in PDF files.

Note: These general compression requirements also apply to images, removing the need for separate requirements.

2.3.3. Crop Box

A PDF file shall have no crop box defined or shall have a crop box set to the same size as the Media Box so that the entire media size is visible when the PDF file is opened in Adobe Acrobat or Adobe Reader.

2.3.4. Objects off the Page

A PDF file should not contain objects that are completely outside of the MediaBox.

2.3.5. Page Scaling

A PDF file shall not use the page scaling factor (UserUnits) introduced in PDF 1.6. This ensures that a page will be printed with the same scale factor as it is displayed in Adobe Acrobat or Adobe Reader.

2.3.6. Halftone Function

A PDF file should not use any Halftone dictionaries or streams. Note that a graphics state parameter (also known as extended graphics state) dictionary may contain HT2 key provided its value is /Default.

2.3.7. Transparency

The SMask key shall not be used in an ExtGState object or in an Image XObject with any value other than None. A Group object shall not be included in a Form XObject if it includes an S key with a value of Transparency. The following keys, if present in an ExtGState object, shall have the following values:

- BM Normal or Compatible
- CA 1.0
- ca 1.0

Note that this forbids transparency being present in a PDF file while still allowing the usage of PDF transparency operators as long as they don't create an actual transparency (meaning that so called "null-transparency" is allowed).

2.3.8. OpenType Fonts

A PDF file shall not contain embedded OpenType fonts; directly embedding OpenType fonts was introduced in PDF 1.6.

Note: this does not preclude the use of OpenType fonts in applications as long as those applications embed those fonts in the PDF as Type1 or TrueType (CID or simple fonts).

2.3.9. Font Embedding

A PDF file shall not contain a reference to the .notdef glyph from any of the text drawing operators in any content stream.

Note: the requirements on PDF/X-1a font embedding also apply, even if those were not rigorously tested before.

Note: The requirements on use of .notdef is not applicable (i.e. no preflight hit shall be given) if the glyph is not used.

2.3.10. Font Widths

PDF Reference requires that glyph widths in the Widths array of a font resource be consistent with the widths encoded within the body of an embedded font program. In the same way, PDF Reference requires that the glyph widths given by the DW and W keys in a CIDFont dictionary be consistent with the widths given in a horizontal-writing CIDFont program.

Note: The requirements on consistent text width are not applicable (i.e. no preflight hit shall be given) if the glyph is not used.

2.3.11. Courier Font

A PDF file should not contain fonts whose name is exactly 'Courier'. This requirement does not apply to objects which lie completely outside the Trim Box.

Note: Variants such as 'Courier New' are allowed.

2.3.12. Overprint

Black text smaller than or equal to 12 points should not be set to knock-out. Grayscale objects should not be set to overprint. White text shall not be set to overprint. White line-art should not be set to overprint.

None of these requirements apply to objects which lie completely outside the Trim Box.

In this context, black text is defined as any text object having a stroke or fill using

- DeviceCMYK with a value of 0.0, 0.0, 0.0, 1.0; or
- Separation Black with a value of 1.0; or
- DeviceN using the Black colorant with a value of 1.0, any other colorants - ignoring None components - all with a value of 0; or
- DeviceGray with a value of 0.0

In this context, a white text or line-art is defined as any vector or text object having a stroke or fill using

- any of the color spaces DeviceCMYK where the value of all colorants is 0.0; or
- Separation or DeviceN where the value of all colorants which are not *None* are 0.0; or
- DeviceGray with a value of 1.0

Note: It is accepted that small black text defined in DeviceGray with the size of 12pt and below will either be flagged for being set to overprint or set to knockout. Black text using DeviceCMYK or Separation Black is not subject to this conflict.

2.3.13. Separation All

A PDF file should not use the separation color space "All". This requirement does not apply to objects which lie completely outside the Trim Box.

2.3.14. 16-bit Images

Images using 16 bits per sample shall not be used in PDF files.

2.3.15. Layers

The document catalog dictionary of the PDF file shall not contain a key with the name OCPProperties.

Note: this effectively forbids the use of optional content (layers).



2.3.16. Use of Specific Annotation type

A PDF file shall only use annotations of the following types: "Text", "Link", "FreeText", "Line", "Square", "Circle", "Highlight", "Underline", "Squiggly", "Strike-out", "Stamp", "Ink", "Popup", "FileAttachment" and "Widget".
No other annotation types shall be used.

Note: In addition, the PDF/X requirements on annotations still apply, e.g. that all annotations have to lie outside the Trim, Bleed and Art Box (if the boxes are defined).

2.4. **Specific Requirements**

This section describes requirements that are different across the version 4 Ghent PDF Workgroup specifications. Possible causes are:

- The requirement is mandatory for one subset of the specifications but suggested for another subset
- The requirement is applicable to only a subset of the specifications
- The requirement requires different options for different specifications

Each of the following requirements is subdivided into different sections as needed to state the different requirements for different subsets of the specifications.

2.4.1. **Page Size and Orientation**

For: SheetCmyk, SheetSpotHiRes, SheetSpotLoRes, CmykVeryHiRes, SpotVeryHiRes, ScreenPrintCmyk, ScreenPrintSpot

The page size and page orientation (as determined by the TrimBox) for all pages of a PDF file should be equal.

For: WebCmykHiRes, WebCmykNews, WebSpotHiRes, WebSpotNews

The page size and page orientation (as determined by the TrimBox) for all pages of a PDF file shall be equal.

2.4.2. **Use of Empty Pages**

For: SheetCmyk, SheetSpotHiRes, SheetSpotLoRes, CmykVeryHiRes, SpotVeryHiRes, ScreenPrintCmyk, ScreenPrintSpot

A PDF file should not contain pages that are completely empty (have no page objects present on them).

For: MagazineAds, NewspaperAds, WebCmykHiRes, WebCmykNews, WebSpotHiRes, WebSpotNews

A PDF file shall not contain pages that are completely empty (have no page objects present on them).

An empty page is defined as one without any print element on them, or where all print elements lie completely outside the Trim Box.

2.4.3. **Number of Pages**

For: MagazineAds, NewspaperAds

The number of pages in a PDF file shall be exactly one (1).

2.4.4. Ink Coverage

For: All specifications

The guidelines for ink coverage described below can be implemented in different ways. One well known implementation restricts the checks on ink coverage to simple, non-overlapping objects (i.e. it does not check images and gradients nor does it take into account what happens when overprinting objects overlap). This type of implementation is sufficient for compliancy but different vendors may use better implementations to provide additional value to the verification process.

This requirement does not apply to objects which lie completely outside the Trim Box.

Note: For the purpose of compliancy testing it is sufficient that a preflighting tool identifies the fill or stroke of a text or vector object or an imagemask object exceeds the specified ink coverage threshold, and the tool is free to ignore or incorporate the effects of being completely obscured by some other object or clipped completely. Furthermore, for the purpose of this version of the specification it is neither required for a compliant tool to analyze whether an image exceeds the ink coverage threshold nor whether ink coverage is exceeded due to the combined effect of overprinting objects.

For: NewspaperAds, WebCmykNews, WebSpotNews

Ink coverage of any element should not exceed 245%.

A PDF file should not contain CMYK text where K is more than 85% and the TAC is more than or equal to 220%.

For: MagazineAds, WebCmykHiRes, WebSpotHiRes,

Ink coverage of any element should not exceed 305%.

A PDF file should not contain CMYK text where K is more than 85% and the TAC is more than or equal to 280%.

For: SheetCmyk, SheetSpotHiRes, SheetSpotLoRes, CmykVeryHiRes,
SpotVeryHiRes, ScreenPrintCmyk, ScreenPrintSpot

Ink coverage of any element should not exceed 340%.

A PDF file should not contain CMYK text where K is more than 85% and the TAC is more than or equal to 280%.

2.4.5. Spot Color Naming

For: NewspaperAds, WebSpotNews

A PDF file should not use spot colors whose name ends on one of the suffixes 'C', 'CV', 'CVC', 'CVU', 'CVS', 'CVP', 'M'

Note: A commonly used suffix is 'U' (representing uncoated stock).

For: WebSpotHiRes, SheetSpotHiRes, SheetSpotLoRes, SpotVeryHiRes, ScreenPrintSpot

A PDF file should not use spot colors whose name ends on of one the suffixes 'U', 'CV', 'CVC', 'CVU', 'CVS', 'CVP', 'M'

Note: A commonly used suffix is 'C' (representing coated stock).

2.4.6. Use of Spot Colors

For: WebSpotHiRes, WebSpotNews, SheetSpotHiRes, SheetSpotLoRes, SpotVeryHiRes, ScreenPrintSpot

A PDF file should not use spot colors.

For: MagazineAds, WebCmykHiRes, WebCmykNews, SheetCmyk, CmykVeryHiRes, ScreenPrintCmyk

A PDF file shall not use spot colors.

For: NewspaperAds

A PDF file shall not use more than 1 spot color.

2.4.7. Ambiguous Spot Colors

For: NewspaperAds, WebSpotHiRes, WebSpotNews, SheetSpotHiRes, SheetSpotLoRes, SpotVeryHiRes, ScreenPrintSpot

A PDF file should not use spot colors that are ambiguous. Ambiguity is defined as:

1. Having the same name, but different CMYK equivalents.
2. Having a different name, but equal CMYK equivalents.

Equality of CMYK equivalents is determined as followed:

- If the alternate color spaces are not equal, the CMYK equivalents are different.
- If any of the colorant names of the color space is None, the equality cannot be determined.
- In all other cases, the tint transform functions are computed with an input value of 1.0 for the colorant being evaluated and 0.0 for all others. The resulting alternate color values are then compared.

If the equality cannot be determined, no preflight hit shall be reported.

2.4.8. PDF/X Output intent

A PDF file should not contain a PDF/X output intent without an embedded ICC profile.

A PDF file should not contain a PDF/X output intent with an embedded ICC profile which is not in the list of ICC profiles corresponding to the specification specified in the *Addendum: Recommended ICC profiles*.

Note: It is advised that the preflight report contains a message pointing to the list of recommended ICC profiles [as](#) defined in the Addendum "Recommended ICC profiles".

Note: These requirements are in addition to those imposed by PDF/X.

2.4.9. Small Text

For: MagazineAds, WebCmykHiRes, WebSpotHiRes

A PDF file should not contain text that is smaller than or equal to 5 points or text that is smaller than 9 points and colored with 2 or more colorants.

For: NewspaperAds, WebCmykNews, WebSpotNews

A PDF file should not contain text that is smaller than or equal to 8 points or text that is smaller than 10 points and colored with 2 or more colorants.

For: SheetCmyk, SheetSpotHiRes, SheetSpotLoRes, CmykVeryHiRes, SpotVeryHiRes, ScreenPrintCmyk, ScreenPrintSpot

A PDF file should not contain text that is smaller than or equal to 5 points or text that is smaller than 8 points and colored with 2 or more colorants.

For: All specifications

These requirements do not apply to objects which lie completely outside the Trim Box.

2.4.10. Line Weight

For: WebCmykHiRes, WebSpotHiRes, WebCmykNews, WebSpotNews, SheetCmyk, SheetSpotHiRes, SheetSpotLoRes, CmykVeryHiRes, SpotVeryHiRes
Line weight of elements in a PDF file should not be less than or equal to 0.124 points.

For: ScreenPrintCmyk, ScreenPrintSpot

Line weight of elements in a PDF file should not be less than or equal to 0.14 points.

For: All specifications

These requirements do not apply to objects which lie completely outside the Trim Box.

2.4.11. Image Resolution

For: NewspaperAds, WebCmykNews, WebSpotNews

Resolution of color and grayscale images shall not be less than or equal to 99 ppi and should not be less than or equal to 149 ppi and should not be more than or equal to 301 ppi. Resolution of 1-bit images shall not be less than or equal to 549 ppi and should not be less than or equal to 799 ppi and should not be more than or equal to 1906 ppi.

For: MagazineAds, WebCmykHiRes, WebSpotHiRes, SheetCmyk, SheetSpotHiRes, CmykVeryHiRes, SpotVeryHiRes, ScreenPrintCmyk, ScreenPrintSpot

Resolution of color and grayscale images shall not be less than or equal to 149 ppi and should not be less than or equal to 224 ppi and should not be more than or equal to 451 ppi. Resolution of 1-bit images shall not be less than or equal to 549 ppi and should not be less than or equal to 799 ppi and should not be more than or equal to 3601 ppi.

For: SheetSpotLoRes

Resolution of color and grayscale images should not be less than or equal to 149 ppi and should not be more than or equal to 451 ppi. Resolution of 1-bit images should not be less than or equal to 549 ppi and should not be more than or equal to 3601 ppi.

For: All specifications

Note: Image resolution is counted for all types of images (regular, image mask and stencil mask).

Note: It is expected that users are given instructions using the rounded values (e.g. "The minimum resolution is 225 ppi"). The specification tolerates a small difference, allowing e.g. small errors in downsampling during PDF creation (224 ppi instead of 225).

3. Addendum: Recommended ICC profiles

Based on the document "GWG recommended ICC profiles v13"

For: MagazineAds

ISOcoated_v2_eci.icc
ISOcoated_v2_eci_300.icc
ISOuncoated.icc
ISOuncoatedyellowish.icc
ISOwebcoated.icc
GRACoL2006_Coated1v2.icc
SWOP2006_Coated3v2.icc
SWOP2006_Coated5v2.icc
JapanColor2001Coated.icc
JapanWebCoated.icc
SC_paper_eci.icc
PSRgravureLWC.icc
PSRgravureMF.icc
PSRgravureSC.icc
PSRgravureHWC.icc
CoatedFOGRA39.icc
UncoatedFOGRA29.icc
WebCoatedFOGRA28.icc

For: NewspaperAds, WebSpotNews, WebCmykNews

ISOnewspaper26v4.icc
JapanColor2002Newspaper.icc

For: WebCmykHiRes, WebSpotHiRes

ISOcoated_v2_eci_300.icc
ISOwebcoated.icc
SC_paper_eci.icc
WebCoatedFOGRA28.icc
SWOP2006_Coated3v2.icc
SWOP2006_Coated5v2.icc
JapanWebCoated.icc
PSRgravureLWC.icc
PSRgravureMF.icc
PSRgravureSC.icc
PSRgravureHWC.icc

For: SheetCmyk, SheetSpotHiRes, SheetSpotLoRes, ScreenPrintCmyk, ScreenPrintSpot, SpotVeryHiRes, CmykVeryHiRes

ISOcoated_v2_eci.icc
ISOcoated_v2_eci_300.icc
ISOuncoated.icc
ISOuncoatedyellowish.icc
GRACoL2006_Coated1v2.icc
JapanColor2001Coated.icc
CoatedFOGRA39.icc
UncoatedFOGRA29.icc

Note: We recommend that PDF producers creating PDF's for print contact their printer or regional association in order to communicate about the best suitable profile to be used for color conversions and proofing for a specific print job on a specific paper type. The GWG recommendation concerning standard profiles for printing can be used as a general guideline in case there is no contact between the PDF creator and the printer. We have listed a number of well accepted ICC profiles for different printing conditions / market segments in different regions of the world. Be aware that individual countries may have agreed on different standards. In case of doubt contact your regional association.

Note: Not all recommended ICC profiles for News printing are listed since they are not valid ICC profiles to be used in a PDF/X Output Intent for PDF/X-1a.