PDF/X *in a Nutshell*

PDF for printing – The ISO standard

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PDF association

PDF/X *in a Nutshell*

PDF for printing – The ISO standard

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Introduction: The history of PDF/X

by Dietrich von Seggern

PDF/X was the first ISO standard based on PDF technology. A subset of the PDF specification, PDF/X was designed to constrain PDF files in order to cater to specific use-cases. The first part, PDF/X-1a, based on PDF 1.3, came out in 2001. Why did that happen?

Adobe introduces PDF

In the 1980s, Adobe invented PostScript, a standard page description language that allowed for connecting any (PostScript) printer to any (PostScript) layout application / computer. PostScript serialized page description commands so that a printing device could convert them into a printed page without big processors or lots of memory; at that time, a very important requirement. However, PostScript was not designed to be saved to a disk, it usually resulted in very large files and on screen rendering was – if at all possible – time consuming.

As the developer of Photoshop, FrameMaker and Illustrator, Adobe had a strong graphic arts background. However, when they designed PDF to overcome the shortcomings of PostScript they initially thought of it more as an exchange format for documents. What Adobe did not see – at least not in the beginning – was the desperate need for a data exchange format in the print industry as well.

Prepress became digital and open

In the 1990s, the print production marketplace was disrupted by desktop publishing technologies bringing what used to be very expensive tools to the average user's desktop. This change affected the cost and equipment used by print production companies, and generated a need for exchanging print layouts between companies.

At that time, I was working for the German newspaper marketing organization responsible for a network connecting advertising agencies with newspaper production facilities. EPS (Encapsulated PostScript) was used as the exchange format. It was – compared to PDF – huge, no viewers were available, it was not easy to parse and preflight, fonts were usually not embedded and had to be sent separately, and so on.

Due to the limitations of EPS, we were constantly searching for a replacement. Unfortunately, all candidates (there was PDF 1.0 but also a few others) were too focused on document processes and did not support the print color space with CMYK and many other core requirements of prepress. When Adobe announced PDF 1.2 – which would not only support CMYK, but in addition create very small files even for high resolution images – it sounded too good to be true.

PDF changed the prepress world

PDF 1.2 was a great step forward, but there were still a few weaknesses and particularly one important shortcoming: the lack of spot color support. PDF's ability to change the whole prepress production chain was nonetheless becoming clear. In 1998, a group of European prepress experts wrote a white-paper on "PDF for prepress" and sent it to Adobe; almost all of this group's recommendations were addressed in PDF 1.3. From that point forwards PDF was a cornerstone of graphic arts workflows.

PDF's inherent flexibility made it clear that not every PDF file could be used for printing, a fact that triggered developers to create preflight tools to establish whether a given PDF file met the requirements of the printing industry.

Standardizing PDF for print

To streamline their own workflows, printers started to develop their own requirements for PDF files, and they shared these requirements with the creators of the PDF files that they had to process and print.

Technically this made a lot of sense, but this approach had some major limitations: First, it required that a print file creator had to align their PDF files with the print house of choice, which meant that a PDF file acceptable to one print house might be refused by another. Discussing the print house's specific requirements, which might be necessary to alignment, represented overhead, and didn't scale well.

Even more important was the fact that print file creators were usually also the printer's customers or at least closely affiliated with them. They discovered that it is difficult to apply strict rules that potentially require additional work to an input when the supplier is at the same time the customer. What's more likely that the customer just goes elsewhere to find a printer that conforms to the customer's preferences rather than being forced to match preferences with the print vendor.

It was clear that what was needed was a clear 3rd party specification – a standard – for both creator and receiver. This urgent need for independent rules for print-ready PDF culminated in the development of PDF/X.

PDF/X: The key facts

by Dietrich von Seggern

PDF/X has to be complete and everything on a PDF page has to be printable.

PDF/X is a subset of PDF – see "Technical side and requirements of PDF/X", page 7, for an overview. As such, conforming with PDF/X means accepting specific requirements and restrictions to the use of the PDF format.

One principle of PDF/X is that conforming files must be complete, i.e. fully self-contained. In addition, nothing may appear on a PDF/X page that is either not printable at all (such as video or 3D) or where print output is not fully defined (for example, if a font is not embedded). While the first rule is rather easy to implement, the latter is more difficult. PDF allows for many complex situations, for example, colors in semi-transparent overlapping objects. In other cases, it may not be clear whether objects on a layer are to be printed. There are many other cases of interdependencies in which it is difficult to determine whether the print result is unambiguously defined, or not.

Certain features needed only for some print applications (e.g., a bleed zone) are not required in PDF/X as they are not required in all print products. Wherever it makes sense in such cases, however, PDF/X requires that if such information is present, it must be accurate. PDF/X requires, for example, that if a bleed zone is defined then that zone must not be enclosed by the trimmed print product.

Core principles of PDF/X

These requirements apply in all parts and conformance levels of PDF/X.

- An Output Intent must be present that uses an ICC profile to specify the intended printing conditions (print device type, paper type) when colors (or shades of gray) are defined.
- Spot colors may only be used if they have an alternate color, and this alternate color must be the same for all occurrences of the respective spot color.
- Fonts must be embedded (either fully embedded, or as an embedded subset in which all characters used in the text are present).
- Images must be present in the PDF (no external graphical content is allowed).
- No password protection of any type.
- No transfer curves (since they modify appearance of colors).
- No alternate images (e.g. no low-resolution alternates).
- If the bleed zone is defined, the BleedBox must be outside the printable area (the TrimBox).
- No use of LZW compression.
- No annotations in the print area.
- No audio, video or 3D annotations.
- No form fields or JavaScript.
- No embedded files.
- PDF metadata must indicate whether the PDF has been trapped, or not.
- PDF metadata must claim conformance to PDF/X and to which part and conformance level of the PDF/X standard.

What's not in PDF/X

PDF/X does not include provisions that although important, may vary depending on the printing conditions, e.g. the minimum image resolution or the bleed zone.

Other non-ISO standards have been developed based on PDF/X that cover such production specific requirements (see "Further quality requirements: PDF/X-Plus", page 14, for further information).

Technical side and requirements of PDF/X

by Peter De Bruyne

Even as the first part of PDF/X was published as ISO 15930-1 in 2001, others were already in development. PDF/X rapidly expanded into a family of standards supporting a wide variety of print production workflows. Each part of PDF/X builds on a previous part, providing flexibility while ensuring reliable exchange, the core rationale for PDF/X.

PDF/X-1a: Complete exchange

PDF/X-1a was the first and most restrictive member of the PDF/X family. PDF/X-1a aims for "complete exchange"; a single file must contain all information needed for printing the document as intended by the sender.

The core principles are the same as in all PDF/X standard parts: all fonts must be embedded and external data, password protection, visible annotations and JavaScript are not allowed (see "PDF/X: The key facts", page 6. Other requirements are specific to PDF/X-1a, e.g. those pertaining to transparency and layers which later (in PDF/X-4, see below) are permitted.

Additionally, printing a PDF/X-1a file must be possible without requiring prior color correction. Therefore, print elements can only use CMYK, greyscale or spot colors; no RGB or device-independent color spaces are permitted.

This implies that CMYK or greyscale elements must have been prepared for the intended output process as specified in an Output Intent, which consists largely of an ICC profile characterizing the intended print process. The use of standard Output Intents facilitates the standardized data exchange that is the objective of PDF/X.

PDF/X-3: Color management

PDF/X-3, originally published in 2002, shares most of its requirements with PDF/X-1a, but it lifts the restriction to CMYK and spot colors. In PDF/X-3, graphics can use CMYK, greyscale, RGB, Lab and ICC based color spaces. It requires, however, that device color spaces may be used only if the same color space is used for the ICC profile in the Output Intent, so DeviceRGB requires the Output Intent to use an RGB ICC profile. Since this is usually not the case, as a practical matter, only ICC based RGB or CalRGB are permitted. Accordingly, the faithful reproduction of PDF/X-3 documents requires a color managed workflow.

PDF/X-2: Partial exchange

The strict requirement of including all resources inside a single file is not appropriate for every workflow. PDF/X-2 addresses this need; it allows the use of proxy elements referencing external graphics. Otherwise, PDF/X-2 is the same as PDF/X-3, so it allows color managed elements next to spot colors and device colors prepared for the specified output intent.

PDF/X-4: Transparency

The previous PDF/X variants do not support the features of more modern (beyond PDF 1.4) versions of PDF. By 2008, it was time to bring PDF/X up to date with current PDF specifications.

PDF/X-4 is based on PDF 1.6, published in 2004. This specification added support for new features, including layers, JPEG2000, OpenType fonts, and 16-bit images. In addition, PDF/X-4 allows the use of transparency, a PDF 1.4 feature forbidden in PDF/X until PDF/X-4. →

PDF/X soon expanded into a family of standards, supporting a wide variety of workflows.

PDF/X-4 includes two variations known as "conformance levels": PDF/X-4 and PDF/X-4p.

- **PDF/X-4** inherits the rules of PDF/X-3 for complete exchange in color managed workflows, with the requirement of always embedding the output intent ICC profile.

- **PDF/X-4p** provides a form of partial exchange; it allows the ICC profile to be maintained externally. This ensures better efficiency in workflows where many files share the same output intent, or where embedding the ICC profile would substantially increase the file size.

PDF/X-5: More flexibility

PDF/X-5 is a set of three conformance levels, all geared towards different workflows. Each conformance level expands on PDF/X-4 or PDF/X-4p.

- **PDF/X-5n** allows for n-colorant color spaces that are used where the traditional four print process colors (CMYK) are not enough. n-colorant color spaces may be required to enable a larger color gamut (e.g. CMYK plus Green, Violet, Orange) to allow for more accurate skin tones, pastel colors or the like. Another use of PDF/X-5n is in packaging, in which certain product-specific spot colors are also used for imagery as process colors. In any such case an n-colorant ICC profile must be specified in the Output Intent; it can either be referenced as in PDF/X-4p, or as an embedded file.

- **PDF/X-5g** extends the PDF/X-4 standard with the ability to use external raster and vector graphics. Like the older PDF/X-2, a PDF/X-5g file can contain temporary placeholders that reference an external resource.

- **PDF/X-5pg** takes PDF/X-5g one step further. It offers the same method for external graphics as PDF/X-5g, and combines it with the PDF/X-4p's option of the output intent referenced as an external ICC profile.

PDF/X-6: Building on PDF 2.0

PDF/X-6 is currently under development within the ISO committee that manages the PDF/X specification. PDF/X-6 will relax some requirements, but the main difference as compared to previous PDF/X standards is that it will be based on ISO 32000-2, better known as PDF 2.0.

New to PDF 2.0 are page level Output Intents and better support for multi channel print color spaces (more channels than just CMYK) as is increasingly used in packaging or on digital printing devices. Annotations may be used within the print area if they have a printable appearance that complies with the same requirements as any other page content.

PDF/X: Users/industry segments

by Andrew Bailes-Collins

Where do all these different flavors of PDF/X fit, and for anybody wanting to use PDF/X, which versions should they investigate?

For those considering moving to a PDF/X-based workflow it's critical that the chosen PDF/X version fits the capabilities and objectives of that workflow. If the workflow and output RIP are relatively modern (purchased within the last 3-4 years), it will almost certainly be able to work with the latest PDF functionality such as live transparency and layers. In this situation, PDF/X-4 is highly recommended.

In an older workflow system that has difficulty digesting some of the newer PDF functionality such as transparency, it's probably not a good idea to attempt adopting PDF/X-4; an older PDF/X version is probably more suitable.

It's important to leverage the free dedicated test suites that allow users to evaluate their workflow for PDF/X-4 readiness; the Ghent PDF Workgroup (GWG) Output Suite is one such.

When testing, all applications within a workflow must be considered, including (but not limited to): imposition software, color servers, ink saving software, trapping software, and output RIPs.

Designers, creators and advertising agencies

The benefit for a design company in working with PDF/X is that it's easier than coping with a myriad of PDF creation settings from different printing companies and suppliers.

The output settings needed to create valid PDF/X files are pre-configured into most professional page layout and design applications, so generating a PDF/X file is just a matter of selecting the required PDF/X version, and ensuring the file is compliant after creation.

If an artwork creator supplies a conforming PDF/X file, then any print service provider should have the tools and knowledge to be able to process and print that file without problems, the key rationale and value proposition that underpins the PDF/X standards.

Magazines and newspapers

Magazines and newspapers often integrate content produced elsewhere (e.g., advertising) into their products. Typically, these publishers produce very detailed specifications on how a PDF file should be created and checked before they receive it. Due to the sheer volume of content they receive and deliver, and the deadlines they work to, they normally expect any incoming advertising files to be correct when delivered.

The production for these types of publications is split into two distinct areas, receiving files for advertising, and delivering final pages for print.

- **Receiving:** PDF files of advertising content are received from external suppliers; these files are checked and then incorporated with editorial content in a layout application to create the final pages of the publication.

- **Delivering:** The completed publication is exported as a PDF file and sent to a print site.

Since smooth workflows is of critical interest to these businesses, magazines and newspapers were among the very early adopters of PDF/X. New York's Time Inc. is credited with the first

What is most important for anybody who wants to move to a PDF/X based workflow, is that the PDF/X version they use fits their workflow and the capabilities of that workflow.

known use of a PDF/X-1 file in live production, when they ran an advertisement for Bayer in the March 13, 2000 issue of TIME magazine.

Today, most newspapers and magazine publishers have joined Time, Inc. in adopting PDF/X. Most of these businesses require all advertising to be delivered as a PDF/X-1a file, and in turn deliver their final pages to the printer as PDF/X-1a files.

If you have a modern workflow and output rip, then you are more than capable of handling a PDF/X-4 file.

It's fair to ask: why haven't periodical publishers embraced the newer versions of PDF/X, such as PDF/X-4? The answer is straightforward; their current workflows are working predictably and correctly. Another limitation is the fact that as yet, many suppliers and stakeholders in the production chain are currently unwilling to accept responsibility for flattening transparencies, and handling other PDF/X-4 functionality. Until recently, to these publishers, the risks in handling the latest versions of PDF/X has not been worth the benefits of making the transition, but this is now changing.

A key driver for this change is that PDF/X-1a files are not very useful when it comes to re-purposing content. However, newspaper and magazine publishers increasingly need to develop cross-media content that's optimized for tablet or online publication. This requirement, along with the gradual acceptance of modern production techniques, is driving the newspaper and magazine publishing industry towards PDF/X-4.

Commercial print and digital printing

Commercial and digital printers jumped on PDF/X-1a when it was released. For many of these companies, it is still the standard they use for the same reasons as the periodical publishers discussed earlier: predictability and responsibility.

When it was first released, live transparency caused a major problem for printing companies, as their output RIPs and workflows were not capable of handling it correctly. In many cases, their output devices were based on PostScript, so files with transparency needed to be flattened prior to output to ensure correct results and avoid waste and spoilage.

In today's commercial and digital printing marketplace, however, PDF/X-4 is very much in use. If you have a modern workflow and output RIP, then you are more than capable of handling a PDF/X-4 file.

One aspect of PDF/X-4 that often causes concern, particularly in sheetfed and web offset, is the fact that color spaces such as RGB and Lab are allowed. Many printers are not confident in handling files that contain these color spaces, and prefer to handle only CMYK and spot color based files. It is, however, perfectly possible to use PDF/X-4 based preflight configurations that forbid these color spaces (i.e., permitting only a subset of PDF/X-4). The newer GWG preflight specifications (see "Further quality requirements: PDF/X-Plus", page 14, are all based on PDF/X-4.

In digital printing, particularly with output engines that have large color gamuts, RGB based files are beneficial, as they can use the full color gamut available in the press rather than constraining the color gamut to that of a conventional CMYK based process.

Large format printing

PDF/X-1a, PDF/X-3 and PDF/X-4 are all relevant to large format printing, but there are certain aspects of each that should be recognized. The choice of format will depend on the type of work, the workflow and knowledge of the printing company in question. These aspects are fundamentally the same as those discussed in the commercial print section above.

One attribute of a PDF file that can be a requirement for large format printing is the 'user unit'. A PDF file (prior to PDF 2.0, which allows pages measurable in kilometers) has a technical size limitation of 200 x 200 inch-

es, which is fine for most commercial printing, but when you want to print a poster that covers the side of a building, this limitation becomes an issue. To overcome this size limitation the PDF 1.6 specification included a function called 'UserUnit' which effectively enables the size of the PDF to be scaled by a multiplication factor, allowing the creation of larger page sizes.

The PDF/X-4 specification is based on PDF 1.6, so if it's a requirement that PDF files are supplied at their correct size, then PDF/X-4 would be needed.

However very often in this market, files are supplied at a smaller size than the final required size, and are enlarged on output. This is a more traditional method of working, and has been the case since the days when film supplied as a reduced size version would be projected on a large camera to the correct final size.

Digital large format devices very often have large multi-color ink sets to deliver a wide color gamut. Some devices have up to 12 inks to maximize the quality of printing, and can produce most available spot colors (excepting special inks such as metallic).

The output RIPs on these devices often have very sophisticated color management functionality in order to work with these ink sets, and it makes sense that PDF files being printed should maximize this capability. In this case PDF/X-3 or PDF/X-4 can be useful as they allow color-managed color spaces such as Lab, CalRGB or use of an embedded ICC profile.

When investigating PDF/X for large format, a key consideration is the output RIP driving the printer. There are a large variety of different large format RIPs available, with different quality and functionality. Thorough testing is advisable to ensure the output of the required PDF/X level is correct and predictable, before implementing a PDF/X based workflow. The GWG output suite mentioned above usually proves to be very useful in such testing.

Labels and packaging printing

Label and packaging differs from other methods of print production for several reasons. A key distinction is that the size of the final job is often not a square or a rectangle, so it cannot be defined by a PDF page box. Additionally, in packaging, the use of multiple spot color inks rather than just CMYK is very common, with spot colors frequently used in image separations as well as in text and vector graphics.

Additionally, within modern packaging production, extended gamut printing is becoming more prevalent, especially with digital devices. Extended gamut printing uses a fixed ink set of CMYK plus additional spot colors (orange, violet and green are typical) to produce a very large color gamut, allowing a large range of spot colors to be produced without the need to run individual spot color inks.

All PDF/X formats require that an output intent is defined (see "Technical side and requirements of PDF/X", page 7 that uses an ICC profile to characterize the intended output. Output intents use normally CMYK ICC profiles, but for PDF/X-4 or PDF/X-3 that can also be RGB or even Gray profiles.

To fully support multi-channel workflows with PDF/X, a multi-channel color profile is required. Multi-channel profiles are not supported by any of the previously mentioned PDF/X standards. The only PDF/X version which that allows for multi-channel profile support is PDF/X-5n

As of this writing, PDF/X usage in the label and packaging market is not widespread, but with PDF 2.0 and the upcoming PDF/X-6, functionality will be added to make adoption easier and more beneficial.

PDF/X: Tools and usage

by Andrew Bailes-Collins

Quality control and PDF/X conformance are an absolutely key part of the production process.

PDF/X Tools

The good news for anybody wishing to start working with PDF/X standards, is that there are many tools available to support all aspects of PDF/X production. The current PDF/X specifications are well established and mature as far as software developers are concerned.

PDF/X Creation

PDF/X files can be created directly from professional page layout packages such as Adobe InDesign or Quark Xpress. When exporting to PDF, the user can simply select the required PDF/X version (1, 3, or 4) and the software will guide the user, allowing only configuration settings that will produce a valid PDF/X file.

It is not possible to directly export a valid PDF/X file using the output options within office applications such as Microsoft Word or OpenOffice. However, it is possible to export a PDF file that can then be converted to PDF/X using an additional application capable of correcting the file to meet one of the PDF/X standards. These solutions can be desktop or server-based, depending on the volume of files that need to be processed. These solutions generally begin by checking PDF/X conformance, and subsequent correction to PDF/X is part of this process.

PDF/X Conformance and Correction

Quality control and PDF/X conformance are a key part of the production process. It doesn't matter if you are supplying files to a print service provider, or processing PDF files within a print company; quality control is paramount. Failure to ensure that a PDF file meets the required standard can result in missed deadlines, wasted time, material and extra cost. The later a problem with a PDF file is detected, the more expensive that problem is to fix.

The graphic arts industry uses a specific term for this quality control process: preflight. The term was inherited from the preflight checks that a pilot carries out before taking off in an aircraft. In a similar process, a print service provider will thoroughly check a PDF file before it enters the production process to ensure it is of sufficient quality for the required printed product.

Most PDF preflight solutions offer the opportunity for a Print Service Provider (PSP) to correct a lot of the issues that can arise within PDF files. This can be done as part of the service the PSP provides to its customer, or can be chargeable. In newspaper or magazine production, it is not uncommon for publications to insist on a 'print ready' PDF/X file. These publications are not willing to take the responsibility for any potential issues that may arise if they correct the file themselves.

PDF/X preflight and correction solutions are available in several different types of application.

Desktop solutions

For users who have a relatively low number of files to process, a manual application will probably be the most appropriate.

Desktop applications such as Adobe Acrobat have built–in preflight capabilities that enable PDF/X conformance to be checked and corrected. There are also third-party plugin applications for Adobe Acrobat that extend those preflight and correction capabilities.

Server-based solutions

For users who must check and correct hundreds or thousands of PDF/X files a day, hot-folder driven and server-based preflight solutions are available. These

applications are often also available as Command Line Interface (CLI) software capable of driving the quality control process programmatically. These allow high volume automated production, and can be driven by external systems using database connections or XML job tickets to allow the preflight check to be specific to the customer's order or advertising booking.

PDF workflow and output

PDF/X conformance and preflight are just two of the prepress production processes that a PDF/X file must go through to be successfully printed, but they are only pieces in a much larger workflow puzzle. When working with PDF/X, it's important that all pieces and processes in a print production workflow system are configured appropriately to handle the PDF/X version in use; it is not sufficient to just use a PDF/X preflight check. Many workflow vendors provide data sheets explaining how workflows must be configured to handle PDF/X files correctly.

Programming libraries

Programming libraries allow developers to integrate PDF/X functionality into their own applications without having to develop the technology from scratch.

Some desktop or server-based products are also available as programming libraries. With these "Software Development Kits", companies can add PDF/X functionality with minimal effort, and bring solutions to market very quickly. These libraries offer PDF/X creation, preflight and/or correction.

Further quality requirements: PDF/X-Plus

by Stephan Jaeggi

PDF/X only defines the general requirements for a reliable exchange of prepress data; the ISO standard itself does not specify quality requirements. These requirements are different for each printing process (sheetfed offset, web offset, newspaper printing, flexo printing, screen printing, etc.) and market segments (magazines, newspaper, art books, etc.).

For example, PDF/X does not define a minimum resolution for images. It simply requires that images are embedded (since external references are not allowed). There's no reason why an image of 50 ppi can't comply with the PDF/X specification because the required minimum resolution depends on the screen ruling as well as the screening technology (AM or FM screening), and varies with the print technology (ranging from newspaper print to printing on coated stock with high quality FM screening).

In 2005, the PDFX-ready association (www.pdfx-ready.ch) was founded in Switzerland. The main goal is to promote the use of PDF/X standards by creators and receivers of prepress data.

The ISO committee responsible for PDF/X made an early decision not to attempt to include quality requirements for every PDF/X use case, but to leave this task to organizations outside the ISO. Among other benefits, this approach makes quality requirements easier to update than if they were part of the official ISO standard (which requires approximately three years for a change).

Ghent (PDF) Workgroup

The Ghent (PDF) Workgroup (www.gwg.org) took over the task of defining quality requirements. Known informally as the "GWG", the Ghent Workgroup, founded in 2002, is an international organization made up of graphic arts users, associations & developers building best practices for publishing and packaging workflows. Originally GWG developed so-called "PDF/X-Plus" specifications based on PDF/X-1a for more than a dozen market segments. These segments were reduced to seven in the latest GWG2015 specification for heatset and coldset printing:

- Magazine Ads
- Newspaper Ads
- Sheetfed CMYK
- Sheetfed Spot
- Web CMYK
- Web Spot
- Web CMYK News

The following quality requirements (among others) are defined by the Ghent Workgroup for each market segment:

- small text
- effective line width
- use of spot colors
- total ink coverage
- image resolution for grayscale and color images
- image resolution for 1-bit images
- overprinting
- PDF/X output intent

The GWG2015 specifications are based on PDF/X-4:2010, and for each market segment there are two variants:

- CMYK (and spot colors) only, and
- CMYK+RGB which also allows ICC-based RGB images.

ICC-based colors for vectors and text are not allowed in GWG2015 since they require the use of special color management technologies at the print shop (e.g., to get pure black text) which makes the files unpredictable. In addition, the use of ICC-based trans-

parency blend modes is problematic in PDF/X-4 since the Adobe PDF Specification 1.6 on which PDF/X-4 is based doesn't clearly specify how to process such objects.

The Ghent Workgroup has started working on an enhanced version allowing more color spaces and more color managed objects using PDF/X-6 (based on PDF 2.0) which will clearly define processing of transparency with color management.

In addition to the GWG2015 specification for commercial printing, the Ghent Workgroup has also released GWG2015 specifications for packaging. These are also based on PDF/X-4:2010 and cover the following variants:

- Packaging Offset
- Packaging Gravure
- Packaging Flexo

PDFX-ready in Switzerland

In 2005, the PDFX-ready association (www.pdfx-ready.ch) was founded in Switzerland. The main goal of this organization is to promote the use of PDF/X standards by creators and receivers of prepress data via easy instructions (called recipes), color and export settings for layout applications, and preflight profiles for reliable PDF/X workflows. The deliverables are freely available in German, French and (partially) in English at www.pdfx-ready.ch.

Since the goals of PDFX-ready are very similar to those of the Ghent Workgroup, PDF/X-ready joined the Ghent Workgroup and is a very active member. The preflight profiles of PDFX-ready are based on the GWG specifications but provide additional checks and information.

In addition, PDFX-ready offers a family of certifications for its members:

- Creator certification
- Output certification
- Expert certification

PDFX-ready also publishes the popular PDFX-ready Guideline (over 250,000 downloads), which is updated every year (available in German and English).

The latest developments are the PDFX-ready Online Tools which allow anyone to upload PDF files to a cloud server for PDF preflight using the PDFX-ready profiles, color preflight and a conversion from older color profiles to newer versions (ISO Coated V2 to PSO Coated V3 and vice-versa) using a free Connector for Mac and Windows.

PDF/X and the other PDF standards

by Dietrich von Seggern

PDF/X	since 2001
"Prepress digital data exchange using PDF"	
Printing industry	
PDF/A	since 2005
"PDF Archive"	
Long-term archiving	
PDF/E	since 2008
"PDF Engineering"	
Construction diagrams with accurate measurements and live 3D models	
PDF	since 2008
"Portable Document Format"	
Corresponds with Adobe's PDF version 1.7	
PDF/VT	since 2010
"PDF for Variable Data and Transactional Printing"	
Variable data printing	
PDF/UA	since 2012
"PDF for Universal Access"	
Universally accessible PDF documents	

Specialized ISO standards based on the Portable Document Format are available for a wide range of purposes.

PDF

Originally developed by Adobe Systems in 1993, PDF 1.7 became an open standard in 2008 as ISO 32000-1. PDF 2.0 will be published in 2017.

PDF/A (ISO 19005)

PDF/A is designed to provide a robust digital file format replacing traditional paper or digital TIFF archives. Design goals of PDF/A include consistency, completeness and an unambiguous internal structure. The archival specification for PDF is not only used in archives, but also in cases where the reliability of digital documents is crucial, e.g. in the exchange of construction data between companies.

The standard's first part, PDF/A-1, was published in 2005. The technical concepts at work in this specification are based on experience with PDF/X (fonts must be embedded, colors must be defined in a device independent way, etc.). In turn, some of the more detailed provisions of PDF/A (e.g., font encoding and metadata) were adopted by PDF/X-4 in 2010. PDF/A defines two conformance levels; PDF/A-1b is the "basic" version while additional requirements pertaining to searchability and accessibility, are covered in PDF/A-1a.

PDF/A-2, published in 2011, differs from PDF/A-1 in that it is based on ISO 32000-1 (see above). This change makes conversion to PDF 1.4 (as required by PDF/A-1) unnecessary, so users leveraging features of PDF 1.7 need not lose those features when making PDF/A files.

PDF/A-3 (published in 2012) is identical to PDF/A-2 but allows for embedding arbitrary file formats. It's intended for controlled processes, and to provide additional information to the PDF/A file such as formulas in a spreadsheet or machine readable data in a XML file.

PDF/E (ISO 24517)

Based on Adobe's PDF 1.6, this standard has been available since 2008. It is aimed at engineering documents such as construction drawings and is usually derived from CAD files. PDF/E can display rotating and folding 3D objects on-screen, using tools like Adobe Reader. An update to PDF/E based on PDF 2.0 is currently under development.

PDF/VT (ISO 16612-2)

PDF/VT, published in 2010, supports variable data printing as is often used for invoices or personalized advertisements. "VT" stands for "variable data and transactional printing". PDF/VT requires conformance with PDF/X-4.

PDF/UA (ISO 14289)

The "UA" in PDF/UA, originally published in 2012, stands for "Universal Access". This specification includes provisions for making PDF files accessible to users with disabilities who must use assistive technology (AT) to read. In this context, so-called "Tagged PDF" provides the necessary structural information to enable navigational aids, reading software or Braille displays to navigate and present page content (text, images, diagrams, etc.).

Correct structure information also enables reuse of PDF content, for example to reflow a document's text on a mobile device to improve the reading experience.

PDF/X *in a Nutshell*
PDF for printing – The ISO standard

PDF/X was the first ISO standard based on PDF technology. A subset of the PDF specification, PDF/X was designed to constrain PDF files in order to cater to specific use-cases in the print industry.

Contents:

About the PDF Association

The PDF Association promotes the adoption and implementation of international standards for PDF technology.

The activities of the PDF Association include education and promotion of ISO 32000 (the international standard for PDF), as well as PDF/A, PDF/E, PDF/UA, PDF/VT and PDF/X. We work closely with ISO on the development of future PDF standards.

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