snap

Specifications for Newsprint Advertising Production

October 2011 Edition

Foreword

The SNAP Guidebook was originally published in October 1984 and subsequently updated in 1987, 1989, 1994, and 2005. Since its inception, more than 30,000 copies have been distributed worldwide. Beginning with the 2005 edition, the SNAP Guidebook was made available in an electronic edition. Information about SNAP, the most current version of the SNAP Guidebook, and instructions for the SNAP Press Test and Certificate can be found at www.snapquality.com.

What is SNAP?

The Specifications for Newsprint Advertising Production (SNAP) is designed to improve color reproduction quality on newsprint, communicate standards and best practices for print reproduction and proofing, and provides guidelines for the exchange of information between advertisers, advertising agencies, publishers, pre-press managers, material suppliers, and commercial and newspaper printers. The specifications pertain to proofing and printing for all newsprint production on offset lithography web presses for a wide variety of products (e.g., newspapers, pre-printed advertising inserts, and other printed material). SNAP is *not* intended for magazine, catalog, packaging, or direct mail printing, nor is it intended for sheet-fed, gravure, or heat-set web offset printing processes. Other specifications have been developed to provide guidance for these processes. *

Why Use SNAP?

Originally created to develop effective communication among those involved in the reproduction process to ensure that the ideas of the designer and advertiser were printed in an accurate, efficient, and timely manner, SNAP has evolved to include newspaper workflow guidelines, PDFx and ANSI color gamut standards used by graphics software and digital workflow developers, and specific workflow and best practices for color printing and proofing for newsprint reproduction.

SNAP provides guidance for the following professionals:

- Designers
- Art Directors
- Ad Agencies
- Editors
- Marketers
- Merchandisers
- Print buyers
- Print Production Experts
- Pre-press professionals (analog and electronic processes)
- Service Bureau Representatives
- Color Separators,
- Electronic pre-press studios, and trade shop personnel
- Printers and Newspaper Publishers
- Material suppliers to cold-set printers

*The following are documents and standards for other markets:

- Specifications for Web Offset Publications (SWOP™), ANSI/CGATS.6-1995, Graphic technology — Specifications for graphic arts printing — Type 1, and ANSI CGATS TR 001-1995, Graphic technology — Color Characterization Data for Type 1 Printing, which addresses the needs of the magazine marketplace;
- General Requirements for Applications in Commercial Offset Lithography (GRACoL), which was developed for commercial printing markets not already addressed by SWOP or SNAP material;
- FlexoPrint Specifications from the Newspaper Flexo Users Group and Flexographic Image Reproduction Specifications & Tolerances (FIRST), which was developed for the flexographic industry.

To achieve consistent color advertising reproduction in newspapers delivered across town or across the country, SNAP has developed standards and guidelines for coldset reproduction on newsprint (uncoated groundwood papers) and workflow best practices to maximize print quality. The SNAP Guidelines are intended for newsprint substrates; thought similar, does not include uncoated freesheets, corrugated, or other materials.

SNAP contains the most complete set of specifications available today. For many characteristics, SNAP provides a range of aim values and tolerance limits to allow for variation in manufacturing and measurement. Using these aim values will result in predictable, high-quality reproduction. Any modification of these guidelines should be discussed with the printer.

SNAP uses the term “dot gain/tone value increase (TVI)” to describe what was formerly known as “dot gain.” All density values reported in SNAP are absolute (i.e., values include paper density) unless otherwise noted (see section on Viewing and Measurement Methods for more details).

The SNAP Committee supports and endorses industry standards. References to the standards of the American National Standards Institute (ANSI) and the International Organization for Standardization (ISO) are used where appropriate. A complete list of documents relevant to SNAP is Appendix 3, ANSI and ISO Standards Relevant to SNAP.

Comments and suggestions concerning SNAP are welcome. Submit them in writing to a SNAP Committee member listed at the end of this document. To obtain copies of the SNAP Guidelines PDF file and SNAP ICC color gamut file, contact the SNAP website, www.snapquality.com.

CHAPTER 1:

Coldset Reproduction Process Responsibilities

In today's world of electronic pre-press technology, the roles and responsibilities of advertisers, agencies, pre-press service suppliers, newspapers, and printers have changed. Tasks have shifted from one portion of the process to another. Today an agency may prepare material for digital submission directly to a newspaper or printer, bypassing the pre-press service supplier. With shifting tasks come shifting responsibilities. A clear understanding of the respective roles of each party and the information required to submit a digital ad file is critical to ensure a timely, high-quality result on time.

The Creator

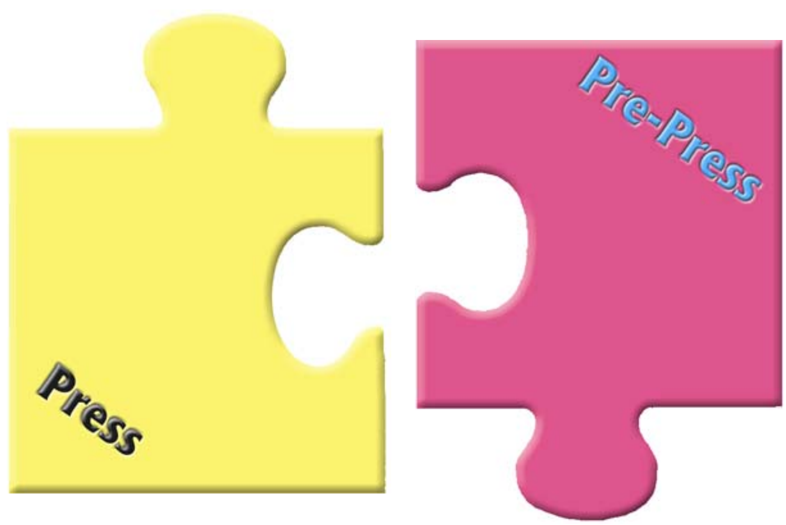
The printing process begins with those who design and create the original materials--an advertiser, an advertising agency, a design studio, or a pre-press service supplier. The responsibilities of those who create the materials include the following:

- Training employees to use the SNAP specifications
- Preparing digital materials that conform to SNAP
- Providing an accurate and complete description of analog and digital materials submitted to the newspaper or printer
- Alerting the printer if materials do not meet SNAP specifications; agreeing on alternative approaches
- Providing knowledgeable representatives to answer the printer's questions about the materials
- Cooperating and communicating with the others involved in coldset reproduction process
- Explaining the creation process and maintaining expectations because of the limitations of the coldset printing process.

The Printer/Newspaper

Responsibilities of the printer or newspaper include the following:

- Training employees to use the SNAP specifications.
- Matching the appearance of the supplied proof if the proof conforms to SNAP specification.
- Managing the imaging process to meet SNAP aim values.
- Notifying the supplier when material or electronic files do not meet SNAP specifications and the possibility of substandard reproduction.



Responsibilities of the printer or newspaper include the following (Continued):

- Providing knowledgeable representatives to answer any questions from the advertiser, agency, pre-press service supplier, or customer.
- Preparing digital and physical materials that conform to SNAP
- Cooperating and communicating with others involved in the coldset reproduction process
- Explaining to customers if some expectations cannot be achieved because of limitations in the coldset printing process.

The Materials Supplier

Responsibilities of the suppliers of materials (e.g., digital or physical materials, hardware, software) include:

- Training employees to use the SNAP specifications
- Providing products that help achieve coldset reproduction that reflects SNAP aim values
- Preparing digital and physical materials that conform to the SNAP specifications
- Consulting with others involved in the printing process if materials that meet SNAP specifications are not available; explaining why conformance is not possible and discussing alternative approaches
- Providing knowledgeable representatives to answer questions about the application of the supplier's materials and the effect these materials might have on coldset reproduction quality or consistency
- Cooperating and communicating with others involved in the coldset reproduction process and providing technical support and analysis

Consistent quality reproduction begins with accurate and timely job information. The job information for the pre-press and printing supplier must be comprehensive and accurate, and it must be received by the appropriate person in a timely manner.

Required Information for Supplying Digital Media

Unless the parties agree otherwise, all digital files must be accompanied by proofs that represent how these files will reproduce on the final printed piece. Proofs should be color calibrated using the SNAP ICC profile and the appropriate dot-gain applied. With each set of files and accompanying proofs, the following information must be provided. (A sample Pre-press Preflight Worksheet is supplied at the back of this book.)

- Advertiser name
- Name of advertiser's representative (e.g., the design or production studio, or the pre-press service supplier)
- Name of contact person(s), telephone numbers, and hours of operation of the organization creating the films and proofs
- Information about the job, including:
- Job due-date/on-press date
- Job purchase order number
- Advertiser or advertiser representative job number, if any
- Name of the job, including pertinent edition and version information
- Description of supplied media type
- Description of hard-copy materials accompanying digital media
- Proof system manufacturer, brand, colorants, substrate, and finishing processes.
- A notation as to whether GCR was used in creating the files and, if so, what software was used and at what percent
- A statement confirming that the creator has negotiated or retains copyright permissions for all images contained in the supplied digital files
- Descriptions of the supplied digital files, including:
- Disk labeling information
- Number of files on each supplied disk
- Name of each file on each supplied disk
- Name of page composition software and version used for each file
- Name of graphics creation/illustration software and version used for each file
- Name of image manipulation software and version used for each file
- Manufacturer, name, style, and any version of each type font used in each supplied file
- Note as to whether the file has been image trapped, what kind of software was used, and the amount of trap applied
- Number of linked graphic files per disk file
- Name of each linked graphic file
- Input scan resolution of each image to be printed
- Percent re-sizing required of each image to be printed
- A description of required physical output for each file

Disposition of Input Materials

The organization receiving transmissions, disks or other electronic media, and physical films and proofs for printed reproduction should return the material to advertisers or their representatives pursuant to arrangements discussed and confirmed when the specific job is initiated. In the absence of such arrangements, the printer or newspaper will store these digital and physical materials for a specified time period. Although there is no standard industry practice as to that time period, it is usually not longer than 30 days after the sale or publication date of the printed piece. Supplied digital and physical materials cannot be retained indefinitely at the newspaper or printing facility, and charges might be incurred if retention is required.

CHAPTER 2:

Type Design and Lines

Quality print reproduction begins with careful planning of design, type, and graphic elements that helps you control the effectiveness and quality to insure your vision is captured in the final printed ad.

Like any printing process, coldest printing on newsprint has specific reproduction characteristics and capabilities that must be considered. This section defines the design guidelines and rules to achieve the most legible type reproduction and explains options and approaches for creative type design.

Typography and Rules

Selection and placement of rules and type can have a critical impact on any print job. When working with rules and type, consider the following criteria:

- *Readability*, which encompasses such factors as writing style, the typeface (serif or sans serif), and legibility of the printed message.
- *Legibility*, which affects how quickly and accurately readers recognize type. Legibility is determined by typographic features such as the typeface, type size, letter spacing, line length, leading/interlinear white space, paper color, and ink density.
- *Printability*, which describes how efficiently a piece can be produced. Poor printability caused by any process component, including the piece's design and typography, typically leads to longer production time, higher waste, and additional cost.
- *Profitability*, which is often the measure of success of a printed piece. Each link in the production chain--from advertiser to supplier--either makes or loses money on every job. Type and rule selection, as well as placement, can affect this key measurement.

Effective typography requires decisions about design and production. Design involves characteristics like font size and style, line spacing, and alignment to make type readable. Production involves ink on paper; ink color, how type overprints photos, background colors and paper. Production makes the type legible. Below are some design guidelines and rules to improve type legibility in the printed ad.

Fine Rules and Small Type

Rule lines that are 4 points or thinner, as well as small type, should be reproduced as one color only. Small type is defined as:

- Sans-serif type that is 7 points or smaller
- Serif type that is 12 points or smaller
- Fine-serif type, such as Bodoni, that is 14 points or smaller

Sans-serif type is the best choice for newsprint reproduction.

Reversed Rules and Type

Type smaller than 12 points should not be reversed on a four-color background and type smaller than 10 points should not even be reversed on a single-color background. Serif type and fine-serif type should not be reversed at sizes smaller than 12 points, and even in cases of larger type, testing should be done to verify whether the process can reproduce the serifs. For contrast and readability, reverse type should not be positioned within screened areas containing less than a 70% screen of any one, two, three, or four colors. Type should not be reversed on a yellow or other light-colored background.

Reversed Hairline and Stroked Fonts Specifications

Reverse fonts and hairlines are dependant on perfect registration to maintain legibility. Though newspaper presses are highly technical; the physical limitations of high speed printing on newsprint results in registration variability. SNAP specifications allow for variation of 15 thousands (.015”) of an inch; for example, a point is 1/72nd of an inch or .013889 inches. Therefore when using reversed hairline and stroked fonts, the following is recommended:

Reversed Hairline Specs

- On a single color background, use no less than a 1pt. reversed hairline
- On a 2 color background, use no less than 1.5pt. reversed hairline
- On a background comprised of 3 or more colors, use no less than a 2pt. reversed hairline

Stroked Font Specs

- Use no less than a 1pt. stroke consisting of 1 color on 16pt text or larger Sans Serif and Serif fonts
- Use no less than a 1pt. stroke consisting of 2 colors on 18pt text or larger Sans Serif and Serif fonts
- Use no less than a 1.5pt. stroke consisting of 3 colors on 24pt text or larger Sans Serif and Serif fonts
- Fine Serif fonts should be confined to only using a stroke of .75 to 1pt. comprised of only 1 or 2 colors on fonts no smaller than 24pt. in size.

Additional Suggestions

On background comprised of only yellow do not use a reversed hairline, use black hairline or hairline consisting of multiple colors following SNAP guidelines for Hairline usage. As a general rule, do not reverse a hairline on any less than a 30% tint of a single color.

Screened Text

When reproducing text as a screen percentage of a solid color, avoid type styles with serifs or with a fine to medium weight. Generally, text screened at 80% or more will reproduce as a solid. Consider the effect on legibility before attempting to screen type as a light screen tint.

Surprinted Type and Tints

To assure readability of rules and type that are overprinted on a tint background, the tint background should be no more than 25%. Pre-press service suppliers should create these tints keeping dot gain/TVI in mind. These flat tints will reproduce darker on press than on a display monitor or on most proofing systems. It may be possible to specify higher tint values when using mainly magenta or yellow tints. The originator of the films and/or files should consult with the newspaper or printer about tints before creating the file or film. The background should not be knocked out in areas of 12 points or less. For larger bold text or headings, background screens should be trapped behind black text to hide misregister and show-through of background colors.

Tints or color builds should be adjusted to take dot gain/TVI into account.

Image Trapping

In most imposition and graphics software, trapping between elements can be set to standard or default settings. Trapping between image and text, or image and image should be 0.005 inches or higher to minimize the visual affect of register variation. One inch is approximately 72 points; one point is approximately 0.013888". To achieve image trap of 0.005", file originators should use a minimum of 0.36 points for trapping settings.

When type is reversed out of more than one color, the darker color used in the tint build should be kept constant and the lighter colors used in the tint build should be spread to prevent any visible misregister.

In general terms, file originators should allow the darker color to define the image or shape and either spread or choke the lighter colors to accommodate the darker color.

Margins

SNAP recommends that a margin width of not less than 9/16th of an inch be placed on both sides of a page printed in the direction of the web. For a broad sheet / standard product this guideline applies to the vertical (sometimes called the gutter and face) margins on either side of the page. For a tabloid product this guideline applies to the top and bottom (sometimes called the head and foot) margins on the page. These unprinted margins are needed because coldset presslines use nip rollers that pull the printing web through the press with very high pressure. These nip rollers are placed on these margins. If printing occurs in these margins then the roller pressure causes a substantial increase in set off and marking. The overall quality of the advertisement will look cleaner if this margin width guideline is followed.

CHAPTER 3:
Photography

Controlling and preparing photographs for print reproduction requires an understanding of the relationship between design, prepress, and printing. This will help the designer and advertiser predict how images will appear when reproduced. Unlike photography for exhibition, photography and image capture for reproduction requires an understanding of the needs of subsequent processes. The photography guidelines explain various camera settings and image quality characteristics, like focus, tonal range, and color, to assure the best results.

Image Capture and Selection

A high-quality image cannot be reproduced on a press unless a high-quality image has been selected from the start. The human eye, camera film, and digital cameras are able to capture a wider range of tones than can be reproduced using the printing process. Here are some guidelines for taking and selecting images for newsprint reproduction:

Photographers should strive for middle tones in the critical elements of a photo because newsprint printing is able to image only a density range of about 1.10. Darker areas tend to fill in or "go solid;" lighter areas tend to disappear or get "blown out."

Shadow detail areas should be light enough to reproduce with 70% to 80% halftones.

Highlight detail areas should be dark enough to reproduce with 5% to 10% halftones.

Highlights and shadow details captured on film or digitally will be compressed at a later stage. If possible, determine the important details beforehand and what can be sacrificed for accurate reproduction. Correct lighting is very important to ensure highlight and shadow detail during the prepress phase of image reproduction.

If a photo transparency is used it may lack contrast. A digital photograph may also appear to lack contrast on a monitor. In both cases these images will need to be optimized for the press during the prepress/imaging process.

Tonal Range

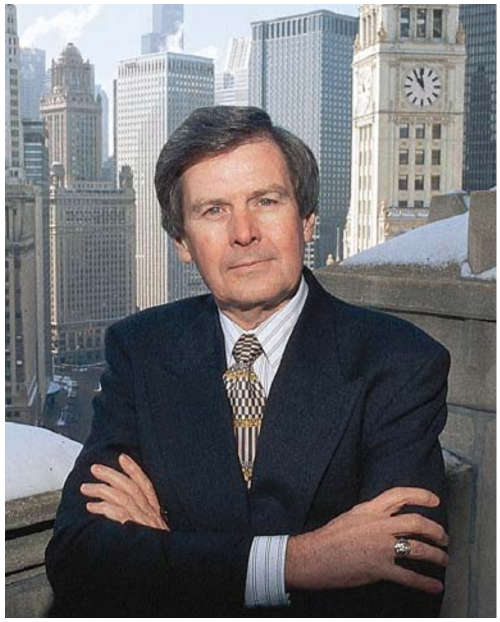
Photographers should aim for a "full tonal range." Full Tonal Range means all tonal values from light to dark, including specular highlights (shiny surface reflection, also called non-detail whites). With a full-range original, print contrast is significantly increased since halftones are not required in the non-detail whites during the separation process (SNAP defines separation process to encompass transparency scanning and image manipulation in programs such as Photoshop). Separating images in this manner optimizes the full effect of the entire print range from the paper whiteness to the maximum ink total area coverage (TAC) density. Originals with excessive contrast may be visually appealing, but extreme contrast is usually detrimental to printed reproduction and can lead to loss of detail during the separation process due to tone compression. Over-duped originals generally have excessive contrast.

Using conventional photography, the best color separations are achieved from transparencies, because they have a greater tonal range than conventional print photos. Regardless of digital or analog camera, original photos have about the same tonal range. When choosing color photos, either digital or conventional, it's important to view proofs under standard viewing conditions, which is a key to quality control.

Lighting

Proper front lighting of the subject will increase printed detail and help maintain color fidelity. Such lighting helps position the subject toward the lighter, more distinguishable detailed region of the print range by providing detail in the shadow regions of the image. Uniform lighting throughout the photograph results in the best reproduction and allows detail to be maximized throughout the full tonal range of the image. Backlighting, in contrast, leads to a darker reproduction. Non-uniform or uneven lighting of subjects in the same photograph can pose separation problems because the process cannot maximize the reproduction of detail both in illuminated subject areas and in shadowed areas. Lighting that falls behind the subject is not a problem. The goal is a contrasting background that accentuates the subject matter. A background that is not lit will reproduce as dark gray or black, adding a sense of depth to the image.

Back Lighting



Front Lighting

Clarity and Sharpness

When selecting a photograph, art directors, artists, and other stakeholders should scrutinize the original picture or image to determine the level of image sharpness and resolution. For digital images, view at 100% in Photoshop and use the Info Palette to check shadow and highlight detail. For negative films, use a glass loupe and for transparencies use a loupe or projection.

Use of non-original copies of an analog photograph (also called duplicates); faster speed films, and enlarged grainy photographs all contribute to a reduction in the sharpness achievable in the printed reproduction. These photographs also have a detrimental impact on scanning because sensitive scanner optics cannot reliably sense the "pixelized" grain effect. Use larger format (2-1/4" or 4"x5") originals when making extreme enlargements or undertaking selective cropping of an image. With digital images, image sharpness can be affected by insufficient lighting or resolution, which can introduce grain into the image. Generally, the larger the original physical image or digital file, the sharper the final reproduction.

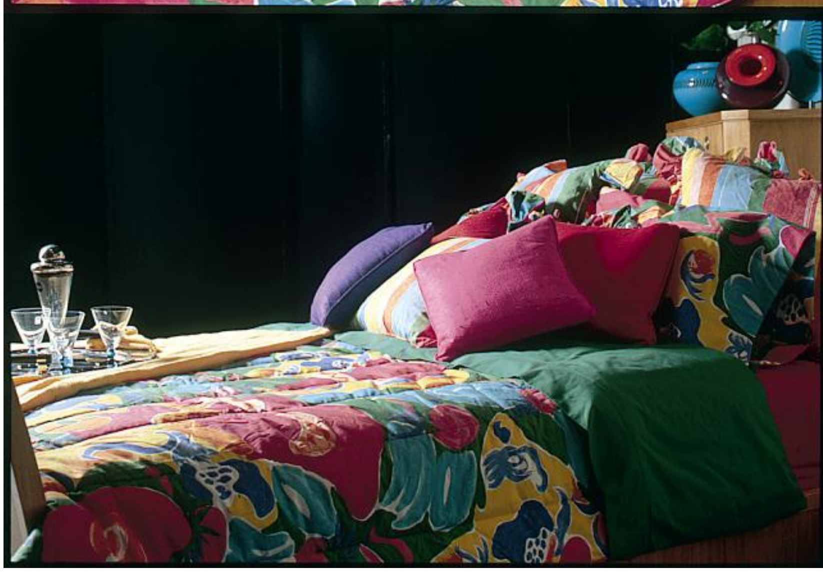
Lower resolution digital photos often do not have the necessary resolution for acceptable quality print reproduction; resulting in grainy print reproduction that lacks detail and sharpness. Digital images from different sources and camera types, including social media sources, should be tested to identify acceptable digital sources and specifications for acceptable print reproduction. See information on RAW photography and Digital Camera Images and Settings.

Flare and *haze* are also causes of color saturation loss in original images. Flare is non-image light that strikes the camera lens during the exposure process; this desaturates and washes out image colors. Backgrounds, strobe lighting, and camera angles can all contribute to an increase in flare. To prevent non-image light from striking a camera lens, the photographer should use filters, lens hoods and different lens angles. Haze is a normal atmospheric condition associated with hazy or overcast weather and, like flare, often reduces color brilliance. The extent of this reduction is a function of the camera angle and the amount of haze. A haze filter on each lens can help reduce the effect of haze.

Background Contrast/Color

Background contrast in photography plays an important role in successful newspaper reproduction. White or highly reflective backgrounds can affect the critical exposure time that cameras need to record the light-absorbing details of the main subject. If not carefully managed, this light reflectance can introduce unwanted flare that causes loss of detail and de-saturation of colors. As an example, a bright white background can create loss of detail when photographing dark brown and black subjects. Backgrounds that provide contrast--but are not highly reflective--will enhance printed reproduction.

Original with proper contrast



Original with excessive contrast

Self-Developing Photographs

Photographic media that are self-developing are not recommended for newspaper reproduction due to the limitations of the process and the lack of sharpness and inability to hold detail.

Digital Camera Images & Settings

Since most images now originate from digital photographs, an established workflow, with Standard Operating Procedures (SOP's), should be in place in the photo and pre-press departments to ensure consistency. Basic guidelines for capturing and color managing the image at the camera will help the overall reproduction quality of the images.

Digital camera images require proper exposure. A correctly exposed image will have good contrast and will reproduce well on newsprint. If the image is over-exposed, important highlight detail is lost. Underexposed images can increase noise. Fill flash is recommended because it dramatically improves the quality of the printed image by shortening the dynamic range.

When flesh tones are involved in the subject matter, make sure that they fall at the optimum point on the tone curve. On digital cameras, the LCD display, coupled with the histogram, make it easier for the photographer to determine where tones are falling on the curve. Pre-press departments can also use the histogram function in PhotoShop to evaluate this.

The color of light is critical to the color of the image. That's why it's important to plan on having a portable lighting kit. When it isn't possible to control the light source, make sure that the resulting colorcast is corrected during the acquire step (SNAP defines the acquire step as the process where the image is imported from the camera to the image adjustment software) or in the first few steps of the photography toning SOP. If no consideration is given to the color of the light at the time the picture is shot then unsatisfactory color will result even with the latest digital camera technology. Set the neutral point by using the camera's Pre-Set White Balance function, before the assignment is shot. Use a neutral gray card shot under the same lighting conditions and with the same exposure that will be used for the subject. If the neutral point is set correctly, then neutral areas of the subject will remain cast-free.

Since digital cameras produce small files that will be enlarged, be sure to keep the ISO as low as possible. Take pictures at ISO 200 whenever possible. When the ISO increases, so does the digital noise. ISO on digital cameras is not standardized the same when compared to film, think of it as a guideline, but each sensor (even from 2 of the same camera) will record light at different exposures.

Frame and tightly crop the image with the camera. Shooting the subject tight ensures that photographer captures every important detail needed for enlargement of the image. Make sure that the picture is sharp and in focus for the key subject matter.

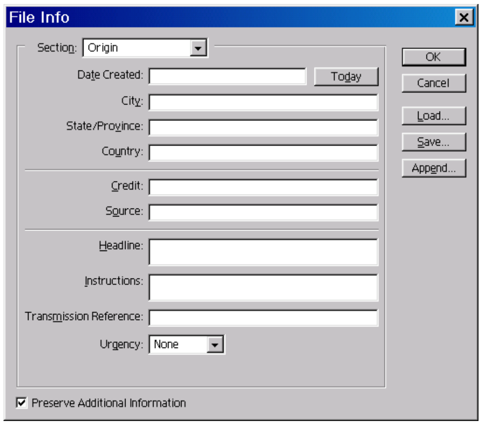
When shooting RAW, acquire the pictures correctly. The key points previously mentioned, contrast, tones, and color, are obtained during the acquire function. During acquire, the proprietary format used in the camera is being converted to an editable document. Using the Click Balance function, in the acquire software when shooting in the RAW format, is another way of eliminating severe casts. But be aware that an incorrect color balance setting when shooting JPEGs will create partial colorcasts that will create major problems in Photoshop. Focus on getting the color balance right when photographing the subject.

Although the following guidelines might change on your specific workflow, some of the basic recommendations for image manipulation workflow include:

- Always check the Photoshop settings before starting; all departments should be using the same settings, including color space.
- Crop the image. Do not enter a height, width or resolution when cropping. This is the same as turning off the "fixed target size" in older versions of Photoshop. There is no need to resample image data at this step. This can be done later in the work flow.

- Analyze the image with the Info Palette. SNAP recommends using CMYK data. Check the shadow and highlight areas for detail. Check a neutral in the image for a colorcast.
- Use only Levels and Curves when making image adjustments. When adjusting contrast in Curves do not adjust the end points. Remember you are toning for newsprint, not the computer screen.
- To Dodge/Burn the image, use the History Brush or the selection tools. Use the Feather feature set to a minimum of three pixels. Do not use the Dodge and Burn tool.
- Images should be sharpened only once in the workflow, once final image size is known.
- Save the image with the least amount of compression, based on SNAP requirements, in JPEG format.

Communicate image capture, procedures, acquire, setting, pre-adjustment settings between the photo and prepress to preserve the integrity of the tone curve on newsprint. There should also be open dialog between the two departments to ensure accurate reproduction of the digital camera images. SNAP recommends using the file info dialogue box as seen below



Digital Camera Settings

Each digital camera system has a wide range of custom functions to improve the camera's behavior. Below are settings that must be changed.

- Color Space – Change to Adobe RGB from sRGB
- In Camera Sharpening – Turn Off, the default is On.
- JPEG Quality – If not shooting the camera's RAW, always use the highest quality JPEG
- Adjust ISO to the lowest setting for light issues.
- Adjust the white balance manually off a reference card.

Though not recommended, some organizations are using a consumer camera over 3 megapixels. SNAP recommends:

- Use optical zoom only.
- Use highest resolution available.
- Use backlight mode.

Characteristics of Digital Images

Attempting to define the characteristics of a "good" photograph is an exercise in futility when one considers all the subjective aspects that are contained in a photograph from a creative point of view (e.g. composition, lighting, subject matter, etc.). However from a purely technical point of view there are some common characteristics that form the basis of images that will reproduce well in a newspaper. The following describes these basic characteristics along with examples of images that show the concepts being described.

EXPOSURE

An image that will reproduce well should have data throughout the tone scale without blown out highlights or plugged up shadow detail. A very easy way to determine this is to investigate the histogram and make sure that there is not data "piled up" at either end of the scale (All digital SLR cameras and most advanced point and shoot cameras have the ability to show you the histogram of the image captured in playback mode).

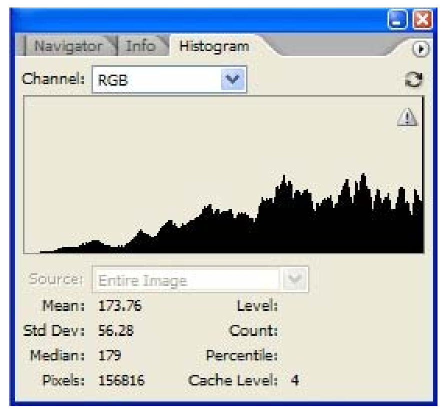


Image 1 – 1 stop over exposed, Illustration 1 – histogram with blown out highlight

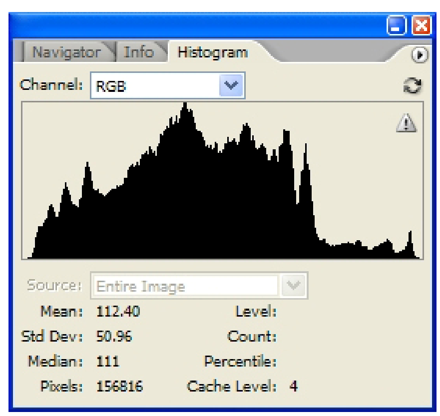


Image 2 – correct exposure; Illustration 2 – histogram of correct exposure;

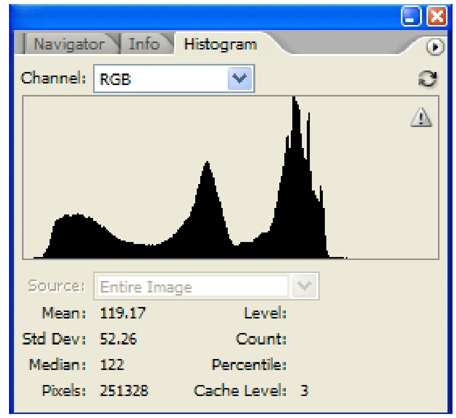


Image 3 – 1 stop under exposed, Illustration 3 – under exposed histogram

Overall note for captions: see how the underexposed image does not push data off the end of the histogram while the overexposed image does clip data – this is very common for the sensors in most digital cameras

If data is clipped at either end it cannot be recovered later using image editing software - it is the responsibility of the photographer to adjust the exposure on the camera to correct for this situation at the time of image capture. The data should also cover the majority of the range available in the histogram, if not the image will appear flat and without contrast when reproduced in the paper.

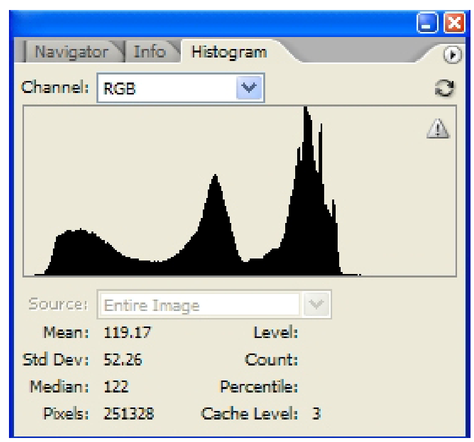


Image 4 – limited data range, Illustration 4 – histogram of limited data range

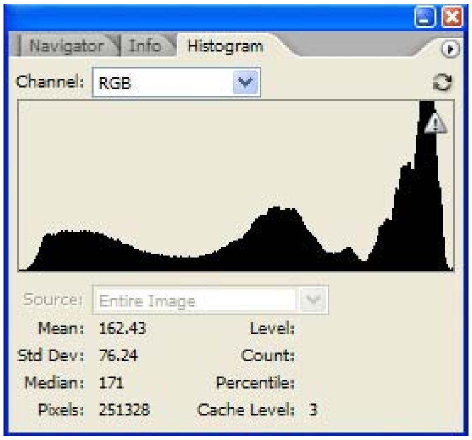


Image 5 – correct data range, Illustration 5 – histogram of correct data range

Ideally the photographer adjusts the camera settings or lighting to achieve this, but in situations where that is not practical the adjustment needs to be made using image editing software during post processing.

IMAGE CONTRAST

The second characteristic of a good image is pleasing contrast. Because an image only has a fixed amount of density range (defined by the output device – in this case a newspaper), it is necessary to exaggerate the separation of the tones in areas that are important in a particular image. It is a common misconception that it is possible to have good contrast everywhere in a picture, which is not the case in reality. Whenever contrast is increased in one part of an image it must be sacrificed somewhere else. A decision must be made as to which area of the photo is the most important and then contrast curves must be applied to emphasize those areas while other areas are de-emphasized or flattened.

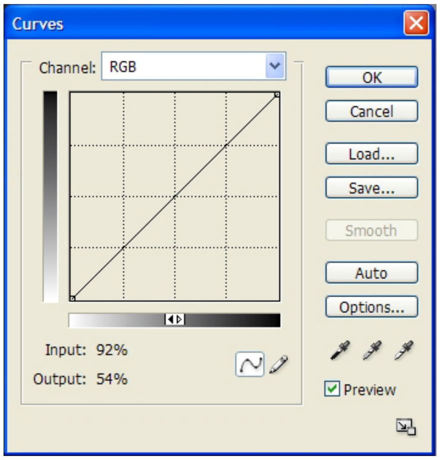


Image 6 – Starting photo, Illustration 6 – 45 degree line in curves

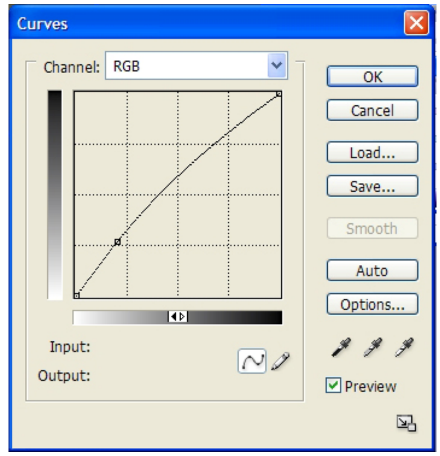


Image 7 – Highlight Contrast, Illustration 7 – Highlight contrast curve

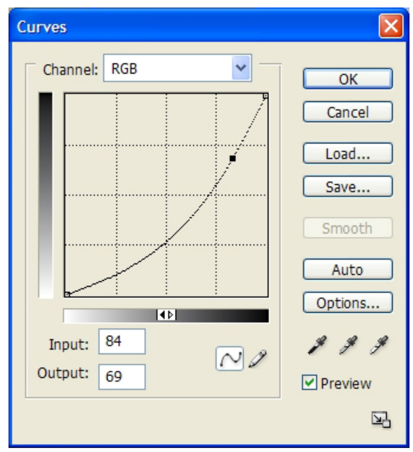


Image 8 – ¾ Tone Contrast, Illustration 8 – ¾ Tone Contrast Curve

It should also be noted that in newspaper reproduction, special attention should be taken to ensure contrast in the ¾ tone area in darker images as the dot gain normally present in cold set printing on news stock tends to flatten the contrast out in this area.

The third characteristic of an image that will reproduce well is good gray balance. When speaking of images that are still in an RGB color space this means that areas that are neutral should have equal amounts of red, green and blue when sampled with a digital densitometer. If the image is CMYK it is much more difficult to specify exact relationships as they are dependant on the press or proofing device, but generally the magenta and yellow should be equal with the cyan at a slightly higher percentage. When an image has good gray balance the rest of the colors should also be very close to their correct percentages – this is why many seasoned color correction experts will immediately make global adjustments to achieve good gray balance as their first color correction adjustment. From the photographer's point of view, the best thing that can be done to achieve good grey balance is the selection of the correct white balance when photographing the scene (more detailed information on this subject is contained below).

RESOLUTION AND SHARPNESS

The final characteristic to look for in an image that will reproduce well is proper resolution and sharpness. For newspaper reproduction the image will generally need to be at 200 pixels per inch at the size it is going to run in print. Proper sharpening needs to be applied to the image to account for the inevitable loss of sharpness that will occur when the image is screened and printed on a press – it is not intended to cover up issues such as out of focus photography. Determination of the optimal sharpening settings is best performed by running a controlled test on the equipment used in daily production and having a jury of decision makers evaluate the results visually. Although different types of images require different settings, this will give a good baseline set-up from which all images can be adjusted. It is also important to note that sharpening should only be applied once the final size of the image is known and the image has been sized accordingly as multiple rounds of sharpening will lead to exaggerated noise and undesirable edge artifact. It is advised that the photographers turn off the sharpening in their cameras, or at the very least set it to “low”, to avoid these undesirable artifacts from occurring.

Image 9

Image 10

Image 11

Image 12

Image 9 – Correct Sharpening,
Image 10 Double Sharpening
Image 11 Sharpened then sized Down
Image 12 Sharpened then sized Up

SLR Photography - Equipment Selection

Single lens reflex cameras (SLR’s) form the backbone of most editorial photo staffs. Some of the advantages of SLR cameras are interchangeable lens to match a variety of shooting conditions, bright viewfinders that show exactly the image that will be captured, fast autofocus systems, rapid frame rates and excellent image quality. When selecting and setting up digital SLR cameras for a newspaper operation there are some basic issues one should consider.

Resolution

Professional SLR’s range from 4 megapixels to 16 megapixels (megapixels are millions of pixels – for example a camera with an image sensor that is 2000 pixels across by 2000 pixels high will capture 4,000,000 total pixels and is called a 4 megapixel camera). Cameras at the lower end of the spectrum are suitable for many newspaper applications as long as the image is not cropped excessively and then enlarged. Cameras with higher resolutions allow significantly more latitude in cropping and enlargement as well as the ability to use the images in applications where higher resolution is required (e.g. glossy publication work, advertisements in other media, etc.). One should be aware that unless the highest quality lenses are used, many of the new high resolution cameras (10+ megapixels) will not achieve their full potential as the lens cannot deliver detail as fine as the sensor can resolve.

Dynamic Range

The dynamic range of a camera describes its ability to resolve detail in light and dark areas of a scene without "plugging up" detail at either end of the spectrum. Although this specification does not gain nearly as much attention in popular press as resolution, it is a very important issue for editorial photographers as they are often faced with harsh lighting conditions which they have no ability to manipulate. Because digital sensors have a very limited dynamic range compared to the negative film most photojournalists used in the past, they must be much more aware of lighting ratios when shooting with digital cameras

Image 13 – Blown out Highlight detail.

As digital technology advances it is inevitable that camera manufacturers will begin to pay more and more attention to expanding the dynamic range of their sensors as the race to constantly increase sensor resolution has effectively run its course due to optical limitations and the practical needs of most print applications.

Noise

As the sensitivity of an image sensor is increased to allow faster shutter speeds in lower light, the amount of "noise" present in the image will increase. As technology evolves, the ability to push the cameras to higher and higher ISO levels while still retaining acceptable noise characteristics continues to get better. This is especially important for events such as stage productions, indoor sporting events, etc. where the lighting is dim and the subjects are moving rapidly. The ability of cameras from different manufacturers, as well as different models inside of one manufacturer's line, vary quite considerably so it is recommended to investigate these characteristics before purchasing cameras that will be used in these environments

Images 14 and 15 – Same Shot with D2H and D200 at high ISO.

In addition to the native characteristics of a particular camera in regards to noise, there is also specialized software available from many companies that will dramatically reduce the noise in images without losing critical detail


Images 16 and 17 – Before and After Noise Reduction.

Careful use of this software can greatly increase the usability of images captured in very low lighting or with older camera technology that displayed troublesome noise characteristics.

Autofocus System

The variety and capability of various autofocus systems available on different camera models is overwhelming to digest and in many cases is overkill for everyday work. However, for photographers who capture sporting events or other situations where the subjects are moving very rapidly, having one of the newest autofocus systems and understanding how to use its capabilities can make a very noticeable difference in the number of sharp images. Consider the number, spread and sensitivity of AF sensors as well as the ability to set camera to use the sensors in different combinations and program modes when selecting cameras that will be used in these demanding situations. Also make sure to allow for some training, either conducted internally or with an external resource, so that staff photographers understand how to use the capabilities that these high performance systems have to offer.

Flash System

Flash systems on the newest digital cameras have become much more powerful than the standard TTL systems of just a few years ago. Balanced fill flash, remote triggering, automatically balanced multiple strobes and more are all part of the capabilities built into the newest camera systems. When building a budget for new camera bodies, also consider adding some money for new flash units that take advantage of all the capabilities of the new bodies

Images 18 and 19 – Single Flash vs Multiple Flash.

Although these systems can seem complex at first, once they are understood they do an amazing job of correctly lighting a scene very quickly and easily, both of which are important for photojournalists that rarely have a lot of time to spend on each assignment. As with the autofocus systems, it is advised that a training session be set up for the staff photographers to help them understand how to use these systems most effectively.

Consistent Settings and Equipment

The variety of settings on most SLR's is fairly complex and it is very worthwhile to go through all the settings in your pool of cameras and make sure each of the bodies is configured the same. Things such as sharpening, color space, tone compensation, firmware revision, etc. should be determined and then set consistently on all cameras. Spending the time to go through this process will result in much more consistent input to your imaging department, which will in turn result in a more consistent end product. Having cameras that are the same vintage and model will also greatly increase the consistency of the images as well as having other side benefits such as back-up, user familiarity and ability to use universal accessories such as flashes.

Image Capture

Capturing a technically correct image should be the goal of all good photographers. It is common misconception that the introduction of digital imaging and the post processing techniques available in applications such as Adobe Photoshop allow the photographer to be less careful with the settings on the camera because, "it can be fixed in Photoshop". While it is certainly true that Photoshop is capable of many amazing corrections that weren't possible in a conventional darkroom, it is still in the best interest of everyone for the photographer to capture the image as accurately as possible. Below are some of the main issues that photographers should pay attention to for delivering high quality images (these tools and techniques work on all digital SLR's and may work on some higher end point and shoot digital cameras).

Understanding and Using the Histogram

The histogram is one of the most useful tools the digital photographer has at their disposal for ensuring consistent exposures, and thus good print reproduction. The histogram, as described above, shows the distribution of data throughout the image with shadow information on the left, highlight information on the right and the rest of the data distributed between the two (see previous photos and illustrations in *Characteristics of Digital Images* for examples). By understanding how to interpret the histogram when reviewing photos, the photographer can very easily tell if the image is correctly exposed while on location and make necessary adjustments to exposure if required.

A "normal" image that is exposed correctly under lighting conditions that fall inside the dynamic range of the camera's sensor will have a distribution of data that falls entirely between the ends of the histogram and does not show "spikes" on either end. If the image is underexposed or overexposed there will be a visible "spike" in the histogram at the corresponding end (see previous photos and illustrations in *Characteristics of Digital Images* for examples).

While the ideal condition is that all of the data falls in between the ends of the histogram with no spikes, it is often the case that the sensor in the camera is not capable of holding detail all the way through the exposure. Much like transparency film, most current digital image sensors have a fairly narrow dynamic range, and thus the photographer will need to make a decision about where they are willing to give up detail. The most likely scenario in these situations is a specular highlight that "blows out" and shows a spike on the right end of the histogram. Conversely, an underexposed image will show a spike on the left side which indicates lost shadow detail. As long as the photographer is comfortable that there is no detail required in the area contained in the spike, it is perfectly acceptable to let this happen. If, however, there is an area that requires detail for proper reproduction that falls in the spike, that data is gone and cannot be recovered in Photoshop further down the process. The photographer must correct for this situation in the field by adjusting the exposure as no amount of digital post processing can recover the data represented in the spikes.

Because the histogram cannot show the photographer where the overexposed data represented by the spike falls in the image, it is very useful to switch back and forth to the review mode which displays the blown out highlights via blinking pixels on the screen

(Image 20 and 21 – Same image with highlights displayed in black)

Using these two reviews modes in tandem will allow the photographer to optimize the image by adjusting the exposure until only the areas which contain no important highlight detail (e.g. a reflection on a chrome bumper, bright area of sky through trees, etc.) are flashing. By using this procedure an optimized exposure can be determined upon arriving at a location and used for the entire shooting session assuming the lighting does not change. Unfortunately none of the cameras currently on the market have a review mode that shows where lost shadow details fall. This, however, is not as big of a concern in practical use as most digital sensors are far more apt to have issues with lost highlight detail as opposed to lost shadow detail.

When judging the exposure by looking at data between the extreme highlight and shadow areas it should be noted that not all photographs will have a histogram that is evenly distributed through the entire range. If the photograph contains predominantly high key or low key data the histogram will be shifted to the appropriate end of the range

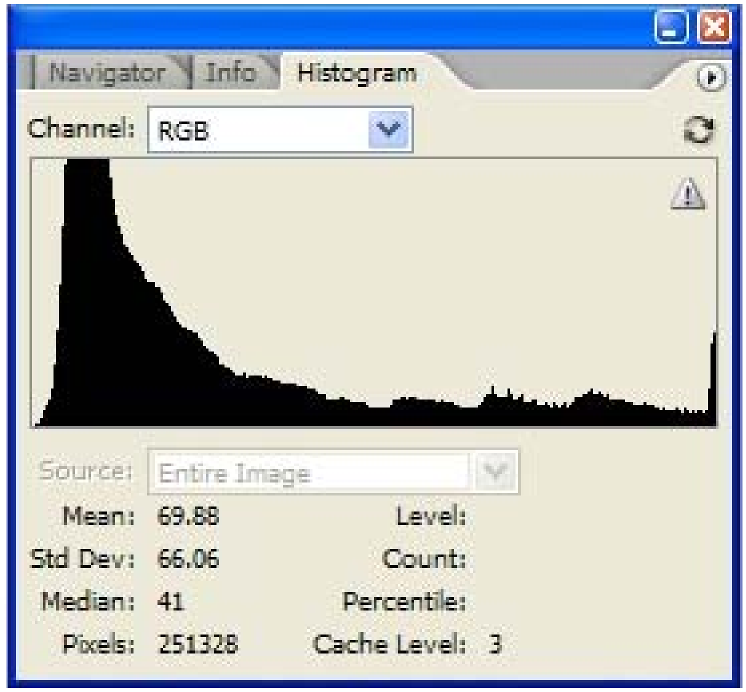


Image 22 – High Key Photo, Illustration 10 – Histogram for High Key Photo

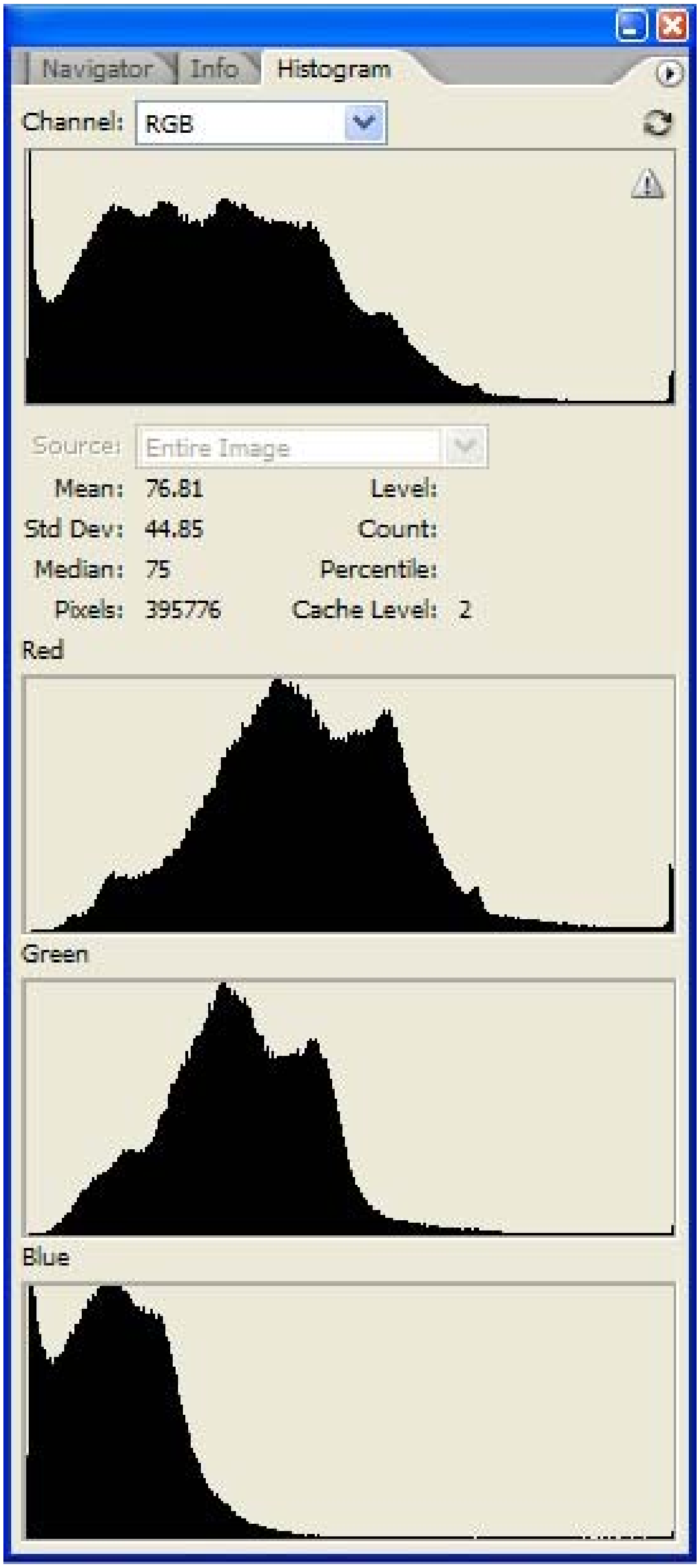


Image 23 – Low Key Photo; Illustration 11 – Histogram for Low Key Photo

Setting Correct White Balance

One of the most misunderstood concepts in digital photography is setting white balance correctly. Understanding this concept and appropriately setting the camera's white balance controls are paramount to getting good neutral balance in a photograph, which results in a high quality image with accurate color rendition throughout all the hues. It is not acceptable to just leave this setting on "auto", hope for the best, and use Photoshop as a crutch later on in the workflow if the camera doesn't guess correctly. Not only does this lead to excessive time required further down stream in production, it can also result in images that have clipped color channels that are not recoverable

(Image 24 – Heavy Yellow Cast)

The reason that white balance is so important is that it is what tells the camera the color temperature of the light illuminating a scene. Without this information the camera is not sure how to correctly render the color of a scene because what humans perceive as color (which is what the camera is trying to mimic) is a combination of the reflectance properties of the object and the color of the light illuminating the object. For example, if you were to take a neutral gray card into a dark room and light it with only a flashlight with a dark red filter, the "gray" card would appear red. In a more normal circumstance, such as a subject being illuminated by artificial fluorescent lights, the camera is likely to render subjects with a color cast that makes everything look un-natural (depending on how the camera is set up this could be anything from a very heavy yellow cast to magenta cast). The reason this happens is that the human eye is remarkably adaptable at understanding that the light is green and compensating for the color cast to make things appear "normal". Effectively your eye/brain combination does a great job of auto white balancing a scene and backing out the influence of the green color of the fluorescent lights. Although newer versions of professional SLR digital cameras are getting better and better at correctly setting the white balance automatically, there are still a number of occasions where the camera will get fooled and the results will not be acceptable. Therefore, it is important to understand how to set white balance manually so that you are assured of accurate color rendition in any situation. This is akin to understanding how to use the light meter in your camera to shoot in manual exposure mode. Although in a great majority of situations the advanced matrix metering in newer cameras will do an amazing job of correctly exposing complex scenes, there are still situations where it gets fooled and you need to be able to manually meter the scene to get a good exposure. White balance is exactly the same situation, you need to realize what circumstances your camera does a good job on auto (oftentimes outdoors in natural light) and when it needs to be set manually to get good color rendition (oftentimes indoors under artificial light).

There are basically four ways to set the white balance in most professional SLR's – auto, manual preset, degrees Kelvin or full manual. In automatic mode the camera tries to determine the white balance using an external sensor or by analyzing the scene after it is captured. Generally this setting works pretty well on most cameras when outdoors under natural light or when using the flash as the dominant light source indoors, however the results are very inconsistent under indoor ambient light. Using the manual presets the idea is to manually set the camera to a known lighting condition, for instance you can pick the icon of the fluorescent tube when shooting under fluorescent lights. This idea is good in theory, however the reality is that there is so much variety in color temperature even among lights of the same family (start looking critically at the color variation of a number of different fluorescent tubes and you will quickly confirm this) that it is a very hit or miss proposition. Although this method is generally not recommended, if you shoot in a similar location many times (for instance a local high school gym) you may be able to find one of the settings that works well and use it whenever you are at that location. Setting the white balance in degrees Kelvin is very difficult, unless you have a color meter that will give you this information, so it's primarily relegated to studio conditions where the light temperature is known and consistent. Setting the white balance fully manual is by far the most accurate method to obtain consistent results. The specifics vary by manufacturer and model, but the idea is to always fill the frame of the camera with something that is known to be neutral (often times a Kodak neutral grey card or something similar) and tell the camera to adjust itself to make that object neutral. It is very important that the object is under the same type of lighting as the intended subject for this process to work correctly. Another popular method of setting the white balance manually is to use a translucent, neutral object right over the face of the lens as opposed to an object such as a grey card out in front of the lens. This diminishes the chances for incorrect readings due to glare or not filling the frame with the neutral object. There are a number of commercial products available for this purpose as well as a number of ideas on various photography forums online for making your own device.

Using Electronic Flash

In the course of shooting various assignments, most photographers eventually will use a flash because it is simply too dark to get the picture otherwise or possibly as a creative tool. Either way, strobes create a whole new set of technical issues for the photographer and the reproduction of those images.

The most common problems include:

- Overexposed foregrounds and dark backgrounds: Direct on-camera flash hits objects that are close to the camera harder than objects that are far away. If you have objects in the front, middle and back, a correct exposure on the middle will result in washed-out foreground elements and dark backgrounds. The mixture of under-exposure and over-exposure in the same frame is very difficult to fix.
- Mixed Color Balances; Electronic flash by nature is bluer than sunlight or most types of room lighting. Introducing this blue light into a scene with a different color balance creates a mixed lighting situation. These images are difficult to tone because the different color shifts mix together throughout the image.

- Un-natural Shadows: Direct on-camera flash creates a “deer caught in the headlights” appearance with its blast of light coming straight from the camera. The direct light creates hard shadows directly behind the subject cast straight back onto nearby objects.
- Red eye: Direct on-camera flash in a dark room often reflects off the red blood cells in the back of the subject’s eyes. If the subject is an animal, you often get green eye - neeither is natural or flattering.

To address the problems listed above the photographer needs to understand the various tools available and how to integrate them into their shooting to create more pleasing results. One of the key elements to doing great strobe work is to study and understand natural light. Study the basic qualities of light: color, direction, and the softness or hardness of the light so that you have a feel for how light works. Then, apply these qualities to your strobe situations to create great light. Each shooting situation will demand different solutions.

Technique 1 – Avoid Using Direct Flash

On-camera direct flash is not flattering and does not look natural. Changing the direction of the strobe light is one of the key elements of great lighting.

- Bounce the strobe off the ceiling to change the direction of light. This allows the photographer to keep the flash on camera and still dramatically change the direction of the light. Use an off-camera flash cord to allow the photographer to hold and aim the flash off of the camera, creating a more directional light effect.
- Put the flash on a stand and trigger it with the camera. Aim the strobe to either mimic natural light or to create a stylized effect. Putting strobes on stands is a great location lighting technique when the situation allows.

Technique 2 – Color Balance your Strobes to the Ambient Light

You can greatly minimize mixed color light sources by placing a gel on the flash to match the dominant light source of the scene. The concept is to make the flash the same color of light as the main light source in the scene. This process makes it much easier to correct the color of the image by adjusting your white balance for the entire image.

- If the room is lit by florescent lights, put a florescent color gel over the flash to make your flash the same color of green as the florescent lights.
- If shooting under tungsten light, add a tungsten gel to the flash head to make it the same color of orange as the tungsten light source.
- If the flash is slightly blue (most are), put a slight warming gel over the flash to make it the same color as average sunlight.

Technique 3 – Soften the Light

The easiest way to judge whether a light source is hard or soft is to judge the size of the light source versus the size of the subject being lit. A small light source compared to the subject will ALWAYS create hard light. A small flash unit creates hard light for all subjects, unless they happen to be smaller than the front of the flash head. Hard light creates high contrast images that expose all of the flaws in the subject’s face. Soft light minimizes surface texture and can be more flattering for portraits with its soft-edged shadows. It is very easy to judge whether light is hard or soft by whether the shadows it casts are hard-edged or soft. In order to make soft light from a small, shoe-mount flash, photographers use two techniques. Because of the limitations in flash power, it is necessary to open up the exposure because of the loss of flash intensity from these techniques.

- Bounce the flash off of the ceiling. As the light travels up, it spreads out and reflects off the ceiling. The reflected light off the ceiling effectively creates a small umbrella, softening the light.
- Shine the flash through a diffuser like a small soft box, umbrella or other similar-type light modifier to make the light source somewhat bigger than what it was before.

Technique 4 – Override Automatic Flash Settings

Professional flash exposure systems can be fooled the same way that camera meters can be fooled (a white egg on a blacktop driveway would be an extreme example). The key is to understand the way the camera's metering system works with the flash and then make manual adjustments to over-ride the settings the system thinks are correct. Some things to look for include:

- If there is a light source in your picture – the sun, table lamps, exposed light bulbs, and even the sky on an overcast day – it will throw off your flash exposure. Typically the camera will underexpose the rest of the image as a result of the excessive amount of light being generated by the light source. Setting the camera or flash unit to over-expose the scene will generally fix this problem.
- Many modern flashes can be used in standard flash mode (flash is assumed to be dominant light source for the image and will fire with enough power to completely light the subject) or fill-flash mode (flash is assumed to be used only for filling in dark shadow areas and will fire with only enough light to fill in shadows). Make sure to understand the difference between these two settings and how to set the camera up so it gives you the results you are seeking (be careful with cameras that automatically switch between these two settings as they will give you greatly different results). Fill-flash mode can be wonderful for filling in shadows on harsh sunny days and is also very nice when you only need a little extra subject light in a fairly bright room. Standard flash mode is necessary anytime your subject is much darker than the light on the background or when your subject is against a large, dark background (for example a person standing on a dark street at night).

Technique 5 – Take Control of the Background

The best way to spot a high-quality flash image from a professional is when there is a good balance between the lighting on the subject and the lighting on the background. There are two main ways to balance the ratio between the flash and ambient lighting.

- Blend the flash exposure with an ambient-light exposure. When you take a flash picture, there are two exposures; one for the flash and one for the ambient light. Wonderful images result from adjusting your shutter speed or aperture up or down to allow the ambient room light to combine with the light from the flash. By changing the lighting ratio between the flash exposure and the ambient exposure, you can greatly change the look or mood of an image.
- Use additional flash units to light the background so that you can control the exposure on individual elements separately. This technique is very useful on static situations when you have time to set up multiple lights and meter the output of them individually to create the lighting ratios you are looking for. Many of the newer flash systems from the major manufactures do a surprisingly good job of balancing multiple lights automatically – take time to learn how these systems work in advance so that you can use them in the required situation in the field when time is critical. Another excellent use for multiple flashes is to control the light temperature of environments where the ambient light has a different color cast than the flash. Although this problem can be reduced by using a gel over the flash that matches the light temperature of the ambient light, oftentimes it is just as easy to use an additional flash on the background that overpowers the ambient light and matches the color balance of the flash on the foreground subject.

Chapter 4:

Pre-press Production Guidelines

Gray Balance in Pre-press Processes

Gray balance is just as important in pre-press processes as it is in pressroom production processes. Available printing inks are not as pure as the phosphors used in monitors and the colorants used in many digital proofing systems in pre-press.

When cyan, magenta and yellow inks are printed at SNAP target densities and dot sizes, the result is brown and not a neutral gray. This is due to the hue errors inherent in available pigments used in cyan, magenta, and yellow printing inks. To accomplish gray balance and reproduction of a neutral gray using these pigments, SNAP recommends using a tone scale calling for a larger dot size for cyan and smaller dot sizes for magenta and yellow since this relationship of dot sizes among the three colors yields a neutral gray to the human eye.

When converting from the RGB (Red, Green, Blue) to the CMYK (Cyan, Magenta, Yellow, and Black) gamut, software conversion preferences must be considered carefully and tested.

Every proof, whether digital or analog, should contain gray balance targets. See the sub-section on Gray Balance .

Scanning - Gray Steps

SNAP recommends that output devices--including proofers, imagesetters and platesetters--be capable of producing a minimum of 142 gray steps. The number of gray steps determines the number of tonal transitions achievable. The effect of insufficient gray steps is very noticeable when working with vignettes (sometimes called blends), which can result in banding. As a rule of thumb, a minimum of 100 gray steps or levels is required. The calculation for gray steps is:

# of Gray Steps = $(\text{dpi} / \text{lpi})^2$

Example:
An output device of 1016 dpi, outputting images with a line screen of 85 lpi, yields $(1016/85)^2$ or 142 gray steps.
Table 1. SNAP-Recommended Output Device Resolutions

Input and Output Resolution

Resolution--both for input devices and for output devices--is an important consideration in the printing process. Several measurements are used to describe image characteristics in the process:

- *ppi*, or pixels per inch, is a measure of the amount of information scanned in from an image or captured using a digital camera. The higher the resolution capability of the input device, the higher the possible scan resolution, which is critical to image quality.
- *dpi*, or dots per inch, sometimes referred to as spi (spots per inch), is a measure of the resolution of the printer, imagesetter, platesetter, or other output device. SNAP recommends use of dpi to refer to output resolution.
- *lpi*, or lines per inch, is a measure of the frequency of the halftone screen used to print an image. The specific lpi chosen is a function both of the printing process and of the substrate on which the job is being printed.

Lpi	***dpi***
72	900
85	1016
100	1200
133	1600
200	2400

For example, continuous tone images should have a minimum input resolution of 200 ppi at the final image size when a 100 lpi screen ruling is used for output.

Scanning resolution is also affected by the input/output size ratio and the screen ruling required of the output image. A scan-to-screen ruling ratio of 2:1 is recommended, although industry experts suggest that a ratio as low as 1.5:1 can be acceptable. A ratio of less than 1.5:1 could create coarse, uneven halftones and a fuzzy printed appearance. The scanner used and subject matter being scanned have an impact on this ratio as well. File originators are encouraged to test any scan-to-output ratio that is less than 2:1.

A guideline to use in determining the input scan resolution is as follows:

(Intended Output Size Ratio) x (Screen Ruling) x 2 = (Minimum Scanning Resolution)

Example 1:
Intended output size ratio = 1.00 (100% size of original)
Intended screen ruling = 100 lpi
Scanner input resolution = 1.00 x 100 lpi x 2 = 200 ppi

Example 2:
Intended output size ratio = 4.00 (400% size of original)
Intended screen ruling = 100 lpi
Scanner input resolution = 4.00 x 100 lpi x 2 = 800 ppi

Example 3:
Intended output size ratio = 4.00 (400% size of original)
Intended screen ruling = 133 lpi
Scanner input resolution = 4.00 x 133 lpi x 2 = 1064 ppi

The table below suggests scanning resolutions for different lines-per-inch levels, assuming that the image output size is the same--100%--as the image scan size.

Table 2. Scanning Resolutions for Different lpi Levels

Minimum Input Scan--ppi	144 ppi	170 ppi	200 ppi	266 ppi	300 ppi	400 ppi
Output Image--lpi	72 lpi	85 lpi	100 lpi	133 lpi	150 lpi	200 lpi

For many newspapers, the person capturing the image, may want to use a 50% higher resolution for editorial photos, to allow for any last minute size changes.

Scaling

Scaling scanned images changes the effective resolution and can adversely affect quality and file sizes. Enlarging a halftone image after it has been scanned may result in loss of sharpness and clarity. Enlarging images more than 110% may result in pixelization, or a breaking apart, of the image. SNAP suggests rescanning the original at a higher resolution if the scan is to be output at a size larger than 110%. Users may wish to test the 110% threshold to confirm whether the quality is acceptable.

Table 3. SNAP-Recommended Scanning Resolutions

An output line screen ruling of 100 lines per inch is assumed	
Percent Output Size	Input Scanning Resolution
100%	200 ppi
125%	250 ppi
150%	300 ppi
175%	350 ppi
200%	400 ppi
300%	600 ppi
400%	800 ppi

Line Art and Pre-Screened Copy

For line art, SNAP recommends using the same input resolution as the plotting resolution of the output device. Line art images should have a minimum input resolution of 800 ppi at the final image size. Line art should be scanned at close to the final reproduction size to avoid scaling problems. If resizing, use the input-output scanning ratios outlined above.

Table 4. Input Resolution for Scanned Art

Scanned Art	Recommended Input Resolution	Minimum Input Resolution	Considerations
Type	Same as output resolution	1200 ppi if the output resolution is not known at time of input	Higher resolution leads to larger file sizes
Line art	Same as output resolution	800 ppi if the output resolution is not known at time of input	Thinner/finer lines may demand higher input resolution
Line drawing/ cartoons	Same as output resolution	800 ppi if the output resolution is not known at time of input	Thinner/finer lines may demand higher input resolution
Pre-screened halftones (Example: Copy Dot)	Same as output resolution	1200 ppi if the output resolution is not known at time of input	A lower input resolution can create moiré in the output image.

Detail Enhancement

Scanned images may reproduce with a "soft" appearance. If this effect is not desired, use image sharpening. Image sharpening is recommended for both black and white and color images to improve the perception of detail and clarity. The amount of sharpness to apply depends on the original image, the enlargement size, and personal preference. Noticeable white or black image outlines, posterization, and artifacts (e.g., jaggies) can result if excessive sharpness is applied. Computer monitors present a low-resolution display of the final reproduction. The effects of unsharp masking may look very different on a monitor than on a pre-press proof or printed product. Testing can reveal this visual difference.

Rescanning

Rescanning an image that has already been converted to a halftone will often lead to a moiré pattern in the printed reproduction. High-resolution "copydotting" of the original screened image at the imagesetter output resolution may minimize the moiré.

Copy Dot Scanning

Digital workflows continue to roll out in the printing industry for reasons of speed, accuracy and efficiency. While the day of a 100% digital workflow to press is getting closer, one legacy is materials still received or archived in analog format. There are two types of analog format material, prescreened prints (or Veloxes) and film. Additionally, there will be a need to convert existing film or prints that are archived for reuse or pickup.

To accommodate a 100% digital workflow, these two types of analog material must be converted to digital content. One of a number of types of copy dot scanners is used for this purpose.

Criteria for copy dot scanners:
Format – transmission and/or reflective copy.
Flexibility.
Physical resolution, scanning and output.
Retouching, descreening and other bitmap processing techniques.
Dot-for-dot reproducibility.
Productivity.
Integration into digital workflows.
Output data format.

Issues for use:
Quality of scan, including thresholds for poor quality halftone dots.
Angling of copy
Checking for moiré and other image defects such as artifacts
For color files, registration of separations.

Digital File Preparation and Management

As personal computers and desktop publishing software make it easier to design ads on computers, digital files are quickly becoming the most common way to prepare and deliver materials. To ensure that these materials can be properly received and processed by the printer, standard procedures must be agreed upon and followed. Guidelines for the preparation and delivery of digital materials are spelled out below.

Advertisers dealing with printers for the first time should submit material to the printer in advance for testing to ensure that the raster image processor (RIP) can process files properly. A proof of the file should then be generated. Testing should be repeated whenever upgrades or software changes are made.

Digital images and pages should conform to the image capture, image area, tone reproduction, and other guidelines outlined by SNAP. In addition, the customer should make sure that the printer has the equipment to read the media on which the file is supplied (e.g., floppy disk, CD-ROM, digital tape).

A hard-copy proof is the only way to ensure that the file output by the printer contains all the elements that were sent by the customer. To verify image accuracy and placement, a hardcopy proof must accompany the digital file. For digital transmissions, a proof can be faxed or supplied by mail, courier, or overnight delivery. A new proof should be submitted whenever changes to the digital file are required. (See sub-section on Proofing Processes for more information.)

File Exchange Formats

In an effort to eliminate incompatibilities among various file formats, SNAP recommends the use of standard PDF (portable document format) for the exchange of digital materials between advertisers and printers.

Recognizing the inherent problems in reading and processing files arriving in many different program formats, the Committee for Graphic Arts Technologies Standards (CGATS) set out to identify a software-independent format that could be accepted by all those involved in the printing process. Such a format--a kind of universal language--would allow all parties to read and process files regardless of the programs used to create them.

As a result, a subcommittee developed "ANSI/CGATS.12/1 *Graphic technology — Prepress digital data exchange — Use of PDF for composite data — Part 1: Complete exchange (PDF/X-1)*." This standard is based on a portable document format developed by Adobe Systems Incorporated. It allows finished files to be converted to PDF/X format, and then read and processed by "readers" designed to interpret the format. Commercial software is readily available to "encode" and "decode" PDF files.

The PDF format offers a number of advantages:

- It is highly compact and can contain embedded fonts, pictures, and compressed vector objects.
- It is device- and media-independent, with CMYK and named (spot) color support and color space definitions incorporated.
- Files are able to be trapped and imposed.
- The format is viewable in a number of operating systems using readily available readers.
- It can be more easily "preflighted" to identify errors before it is sent to the printer.
- Last-minute changes can be made without the use of the original software used to create the file.

SNAP recommends:

Use Acrobat 6 Professional
Use PDF/X-1 settings including:
SNAP recommendations for minimum resolution
SNAP recommendations for compression

Communicate which version was used to create the file and settings used.

TIFF/IT-P1 is a specific type of graphic arts format used in some segments of the publishing industry. TIFF/IT-P1, as defined in *ISO 12639, Graphic technology — Pre-press digital data exchange — Tag image file format for image technology (TIFF/IT)* provides a simpler conformance level called profile 1 (P1) which limits the options for most tag values. P1 maximizes the compatibility between pre-press systems.

Chapter 5:
PDF/X Guidelines

What is PDF/X?

PDF/X is not a substitute for PDF; instead it is a standard that defines how *applications* that create and read PDF files behave. PDF is a very powerful tool but there are many functions that it can perform which are not appropriate for use in the printing industry. PDF/X limits the scope of what can be created in PDF, thus allowing someone to create a file that will print correctly on press even if they do not fully understand the entire process.

Why use PDF/X?

Many printers have a set of job options set up in Acrobat Distiller that will limit the PDF in the same manner as PDF/X however, this requires that the file be created using Acrobat Distiller but not any of the other applications that can export to PDF. Using this approach also requires more sophistication on the part of the individual creating the file since the details of what needs to be looked at during the pre-flighting stage can be very complex and confusing.

Where can I find more information about PDF/X?

There are actually several different PDF-X standards in existence: PDF/X-1a and PDF/X-3; being the most popular versions. The difference between the two is PDF/X-3 allows for the color-managed color space to be defined and PDF/X-1a does not. Therefore for newspaper production needs, version PDF/X-3 typically is used.

If you would like to learn more about PDF/X you can find more information by visiting the following web sites:

www.pdf-x.com and www.pdfx3.org

For more detailed setting options please review Appendix 7

Contact your printer/newspaper to discuss which format to use.

Layout Guidelines

- Design digital pages to conform to the image area, margin, and bleed guidelines specified in the sub-section on Film Preparation. Note that newspapers are not able to reproduce bleed images.
- Make the dimensions of the file the actual size that it will be printed, with no margins. Be sure to set the X-Y coordinates at (0,0) for the advertisement or page size. Use this guideline for advertisements or pages that will float, so that the page size is equal to the final insertion or press-delivered product size.
- Use the portrait printing orientation to prevent pages saved accidentally as landscape documents from being cut off or compressed by newspaper or printer imaging systems.
- Assume that files will be output at 100%. Printing options for page set-ups should be set for 100% output.
- Do not overlay filled graphic elements to hide non-printing items; delete unused elements and other extraneous items from the pasteboard area outside of the advertisement or page perimeter.
- Place all the elements for each ad--logos, photographs, graphics, and page layout--in a single ad folder to facilitate the use of Automatic Picture Replacement (APR) and Open Pre-press Interface (OPI) technologies used by some printers.

Text and Font Guidelines

Files stored in PDF should embed all fonts within the file (see above). That is one reason why PDF is the preferred format for exchanging ad materials.

Follow these guidelines for all files:

Keep text and graphics boxes completely within the advertisement or page dimension boundaries to prevent possible errors during file processing.
Convert text included in a logo to outline graphics.
Avoid combining colors of similar contrast when color text in an advertisement or page will be converted to black and white (grayscale). For example, red text on a black background will become illegible.
Remember that type scanned as a graphic element is like a photo; it cannot be edited like text that is entered on the keyboard.

If PDF is not used, it requires that the file provider save all screen and printer fonts in a folder and place the folder inside the primary ad folder, along with the ad and accompanying images. Make sure all parties have information about the screen and printer fonts you are using, including specific font name, manufacturer, version, kerning pair information, and font preferences.

Color Management Systems (CMS)

Computer-based color management, using standard color printing characterization data, is an emerging technology that promises to bring more consistency to color reproduction in printed materials. Computer hardware and software are being developed to compensate for differences among components in the reproduction process by mapping color outputs to a reference gamut. So-called CMS technology is finding increasing application in the printing and publishing industry. While work in this area is underway, no applicable specifications are currently available for the implementation of such systems. The technology is discussed in further detail in Appendix 2.

SNAP recommends:

With use of PDFX/1 selection of a reference profile is not needed. Select a SNAP profile or printer profile for the output profile.

Color Graphics and Image Files

- Place graphics on the page using the tools of the layout program. Avoid shared document features. Do not use the “publish and subscribe” features for graphics on Macintosh computers, and do not use the “cut/copy and paste” features on any platform.
- Copy and include as a linked element in each of the different ad folders any logo or graphic that is used in more than one ad.
- Avoid intricate layered blends; they may make the page files too complex for a RIP and the file may not print as expected. To minimize output problems, flatten or composite all layers before saving the final file.
- Remember that an EPS (Encapsulated PostScript) file nested within another EPS file causes layering complexity. These nested files may cause the RIP to improperly output the file or fail altogether.
- Avoid fade-to-zero blends; they are difficult to reproduce in the printing process.
- Minimize the number of points used when creating clipping paths. Large numbers of points can make page files too complex for the RIP and the file may not print as expected.
- Use the CMYK format for color graphics and images.
- Utilize the appropriate file extension to indicate the format (e.g., filename.tif, filename.jpg, filename.eps).
- Do not change the names of photo or graphic files after they have been imported into the ad layout; vital file path links will be broken.

File Naming Conventions

The suggested format for naming files is as follows:
(Publication/Event Date) (Advertiser Name) (Sequence Letter) (Version Number)

- The *publication date* is the date on which the advertisement will run in the newspaper or the insert will appear in the newspaper. It should be four numerals with the month first, followed by the day. For example, “0904” means September 4. For multiple run or insertion dates, use only the first date.
- The *advertiser’s name* should be abbreviated with no punctuation. For example, “Joe’s Tires” could be abbreviated as “Jtires.”
- The *sequence letter* is used to distinguish different advertisements or insertions from the same advertiser. Use letters “A” through Z.” If the advertiser is running a second ad or insertion on the same publication date, a different sequence number would be used for each. For example, “0904JTiresA1” would be one advertisement; “0904JTiresB1” would identify the second.
- The *version number* is used to distinguish changes in the original advertisement or insert. It should be a numeral. For example, “0904JTiresB1” would be one version of an advertisement; “0904JTiresB2” would identify a second version.
- Punctuation should not be used in the file name.
- For applications limited to eight-character filenames, use the first four characters for the publication date and the remaining four characters for the advertiser name, sequence letter, and version number.
- The file extension should indicate the file format. Example: “0904JTiresB2.EPS” would indicate an EPS.

Final Checks

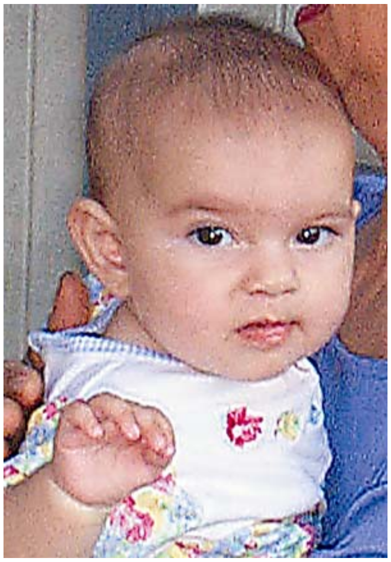
- Make sure that all colors are prepared for CMYK separations and that unused colors are removed from the color palette.
- Clear all extraneous information from the pasteboard and remove any unprintable items from the digital document.
- Remove all “job jacket” and other extraneous information from the digital file.
- Make sure that all pages have the correct dimensions and zero margins.
- Use the “SAVE AS” rather than the “SAVE” command to save the final version of the page or advertisement. In some software packages, this creates a cleaner, more compact file.
- Put the page layout, photographs, and graphics into one main folder and put a separate font folder inside it. Package the entire main folder using archival software for transmission via removable media or electronically.
- Verify that the correct version of all files required for the job has been included on the supplied media, including linked graphics files and less obvious page elements, such as borders and rules.
- Clearly communicate to the printer any versioning information associated with the file. (Use the File Naming Conventions noted on page 21.) All versioning information should be marked on the content proofs as well.
- Make sure that pages or ads supplied on removable media fit on a single disk or cartridge. They should not be sent on multiple disks.
- Attach written pre-press and preflight information for files submitted on disks to ensure a successful result. Similar information can be sent along with digital files as a simple text file. Sample forms providing such information are provided at the back of this publication and can also be found on various industry web sites.
- Back up all files before sending them.
- Label disks (or other media) with a contact name and phone number, along with the names of the files on the media.
- Notify the printer of any potential compatibility issues due to program enhancements such as extensions, plug-ins, or add-ons.

Compression of Image Files

Many image or advertising files are compressed to increase file transfer speed and minimize storage requirements. File compression techniques are either “loss-less” or “lossy”.

“Lossy” compression merges similar and equal value data, resulting in a loss of original data in the final, uncompressed file. The most popular type of compression for images in the printing industry is JPEG (Joint Photographers Expert Group). The higher the “lossy” compression setting, the more dissimilar information is merged into the same value. High compression of the “lossy” type results in quality degradation of image files, typically affecting image detail, and often produces “artifacts” in the file when it is transformed.

JPEG 2000 is not currently supported by PDF 1.3 or 1.4, it has not been certified part of the PDF/X standard which is based on those two formats, and should therefore not be used for prepress work at present.


Example of JPEG Artifacting

Repeated compressing and decompressing, will also result in quality degradation. For example, an image might be compressed in JPEG format, then decompressed, edited, and compressed once more in JPEG format. The same image might later be decompressed, placed in a design application, and saved in portable document format, causing compression yet again. These repeated cycles of compression/decompression may result in additional loss of quality.

Loss-less compression merges equal data values only, resulting in no quality loss when the image is later decompressed. Examples of loss-less compression include Zip™ and LZW™ formats. They typically compress data at a 3:1 ratio.

Data compression is not required for transmission of digital files, but it can expedite the transmission of large files. It should be used only if the sender and receiver agree on the compression method.

Here are some specific guidelines for using compression software:

- Check with your printer for their specific compression guidelines.
- The extent of file compression affects image quality. Pre-testing to determine the effects of any compression scheme is recommended.
- Generally, compression programs require the receiver to have the same software tools as the sender to decompress the file properly.
- Segmenting files during compression is not recommended.
- There are several commonly used applications for compression. Check with the printer or newspaper to determine which applications are supported.
- Compression and decompression can require a fair amount of computing power and time. It may be worthwhile, however, to produce a smaller ad file that a network can handle and that costs less to transmit.
- If your application allows control of the extent of JPEG compression, specify the "maximum quality" setting for black and white photographs and the "high-quality" setting for process color. These settings will preserve high-quality reproduction while providing the benefits of compression.

PDF software typically has its own compression features. It is not advisable to further compress PDF files.

PDF defines compression using quality image options. The scale goes from 0 to 12, 10 to 12 is the maximum quality lowest compression, high quality is 8 to 9, medium compression is 5 to 7, low quality or maximum compression is 0 to 4. Color should be no lower then 8 and black no lower then 10 for the compression settings.

File Transmission

There are many ways to get digital files to a printer or newspaper, some of which can be as simple as handing over a diskette. But long distances and short deadlines make this method impractical. Modems, phone lines, bulletin board systems, and the Internet have made it easy to send digital ads electronically. And services specializing in exchanging materials among advertisers and newspapers have emerged to make the transmission of digital files even easier. SNAP recommends using an FTP site to exchange files.

Specific methods and software tools for transmitting digital files are beyond the scope of these specifications. By following the above guidelines, a finished file should be ready for delivery to the printer. For guidance on sending and receiving the files, refer to the instructions specific to the communications hardware and software being used.

Meanwhile, a few general procedures will make transmissions easier and less costly:

- Be prepared. Before transmitting the files, be sure all material is ready. This will prevent a telephone line from being tied up needlessly and will help reduce communications costs.
- Use file compression as described above.
- Employ a fast modem. The faster the modem, the shorter the transmission time. Check with the printer or newspaper to determine its preferred operating speed.
- Have the phone company check the condition of the lines if many data packets need to be re-sent. Poor telephone line quality can lower the effective speed of the modem.
- Do not hang up. Never terminate a modem connection by turning off the originating modem or computer. This may cause operational difficulties for the receiver.
- Call the printer or newspaper before sending large files (more than 3MB) to verify that enough storage is available at the receiver site. This also alerts the receiver to a pending extended communications session.
- Check all files for viruses prior to transmission. Even though the receiver may also perform verification, it is poor etiquette to send files that have not been checked.
- Allow time for retransmission. There are numerous reasons that a file needs to be retransmitted, including telephone line noise and dropped connections.
- Use the proper protocol. Verify with the printer or newspaper any technical protocols that should be used for modem operations.

Chapter 6:

Conventional Materials Preparation

While the use of digital material in the coldset printing process is growing rapidly, many materials are still prepared for delivery as paper or film. Here are some guidelines for preparing these materials.

Camera-Ready Pre-screened Reflective Materials

When preparing final materials for the printer that will be delivered as pre-screened reflective materials such as Veloxes, Paper Positives, or other reflective media, follow these guidelines:

- Black original artwork is recommended for best results. Red type on a black background yields inferior results.
- Light original materials, such as pencil and charcoal artwork, will not reproduce well and are not recommended.
- Material submitted in its final size dimensions will reproduce best. Enlarging or reducing artwork too much causes loss of detail.
- Pre-screened materials should be supplied in final size dimensions because enlarging or reducing will alter tone reproduction.
- Type, line work, Veloxes, and other hard-copy materials should be output at a resolution of 1200 dpi.
- Type, line work, Veloxes, and other hard-copy materials should have a uniform and minimum Dmax of 1.7. Consistent Dmax that falls between 1.7 and 1.9 should reproduce well.
- Photocopied or faxed materials should not be submitted as originals for reproduction. Each successive generation after the original diminishes print quality and causes lines and type to break up.

Tone Reproduction Aim Points

To allow for dot gain/TVI, use the following tone reproduction aim points for Veloxes or originals to be reproduced as black-and-white or single-color halftone images.

Table 5. Tone Reproduction Aim Points Using a Line Camera

Tonal Area--Line Camera	Offset (85-100 lpi)
Specular/non-detail	0%
Highlight	10%
Quartertone	20%
Midtone	38%
Shadow	80%

(NOTE: Line cameras add contrast to the original copy. A loss of 10% in highlight tones and a gain of 10% in shadow areas is common when making line shots of Veloxes. These values are derived using the Yule-Nielsen equation with an N Value of 1.7.)

Table 6. Tone Reproduction Aim Points Using a Copy Dot Scanner

TONAL AREA – SCANNER	Offset (85-100 lpi)
Specular/Non-detail	0%
Highlight	5%
Quartertone	22%
Midtone	35%
Shadow	85%

(NOTE: Copy dot scanners tend to lose 2 to 3% in the highlight to quartertone areas of the tone curve. These values are derived using the Yule-Nielsen equation with an N Value of 1.7.)

Film Preparation

To ensure optimum reproduction of supplied films, make sure the proper specifications for the printing process are met. A failure to conform to these specifications requires discussion among those involved in the process and could result in delays or added costs.

General Guidelines

- Supplied film must be clean, free of pinholes and scratches, have good fit (internal register), and be in register (external register).
- Before films are created, suppliers should verify format requirements with printers, such as whether films should be provided as single pages or as printer spreads.
- Suppliers should discuss with printers whether films should be punched and, if so, the punching configuration recommended by the printer.
- Suppliers should confirm with printers the correct film image areas, including required margin or bleed dimensions.
- Suppliers should establish the required film emulsion orientation with the printer.
- Any loose elements should be incorporated into films before they are provided to the printer. Films requiring this type of work should be discussed in advance with the printer.
- To optimize flexibility and minimize the cost of last-minute changes, some advertisers may wish to place black text on a separate piece of film. In most cases, the printer will print this black type using the same plate used to print the black portion of a four-color separation. All parties should discuss whether to place black type on a fifth piece of film prior to taking this step.
- With regard to Dmin film guidelines:
- Dmin values in the chart below refer to film alone. The Dmin of the film stripped to acetate or other clear base will be higher.
- For optimal plate exposure consistency and quality, users should not mix films with substantially different Dmin values.
- The Dmin values shown refer to film having a thickness of 0.004”. Films having a greater thickness will typically have higher Dmin values.

Common Film Requirements

The following tables provide the physical requirements for films supplied for coldset printing processes.

Table 7 - Common Film Requirements: A

Film Characteristic	Offset
Minimum base thickness/ type	0.004” polyester
Polarity	Negative
Dmax	Typically 3.8 or higher unless otherwise agreed (UV or ortho)
Dmin	0.10 or less (UV); 0.05 or less (ortho) unless otherwise agreed
Halftone hardness	Hard dots with a minimum of fringe
Opaquing	Should be minimal and only on the base side of the film
Screen angles	Cyan, magenta, and black screens must be separated by 30 degrees, with yellow at an angle 15 degrees from the other three colors. In all cases, black must not be placed at the 90-degree angle.
Register marks	Each piece of film should include center register marks that are 1/4” (0.250”) in length and located at least 1/4” (0.250”) away from the live area.
Crop marks	Each piece of film should include corner crop marks indicating final trim and fold dimensions that are located at least 1/4” (0.250”) away from the live area.
Identification	Each piece of film should include, color, and version identification of that film (e.g., page number).
Bleed extension beyond the live area (Note: bleeds are not possible for products that are not trimmed, such as daily newspapers.)	Bleeds of at least 1/4” (0.250”) should exist on all sides of the page that are to bleed. Smaller bleeds should be used only after consultation with the printer. Bleed image should consist only of non-essential image area.
Bleed image area (Note:, bleeds are not possible for products that are not trimmed, such as daily newspapers.)	Live matter on bleed pages, including text, folios, important images, and other copy, should not be placed closer than 3/8” (0.375”) to the printed product’s finished size in any direction.
Margins/Borders	Margins of 1/2” (0.5”) should exist on all four sides of the page. Smaller margins may be used only after consultation with the printer/ newspaper.
Film output resolution for process color and halftones (See discussion of output resolution,.)	Film imaging process color and single-color or two-color halftones should have a minimum output resolution .
Film output resolution for mechanical and single-color line work	Film imaging mechanical and single color line work should have a minimum output resolution .

Table 8. Common Film Requirements: B

Film Characteristic	Offset
Orientation (emulsion down)	Right-reading emulsion down (RRED)
Halftone shape	Round preferred
Screen ruling	85 lpi to 100 lpi. Higher screen rulings are acceptable upon consultation with the printer.
Image trapping (aim point)	Total image overlap should be 0.010”
Cross-overs	Images that require critical alignment and that cross over a gutter should be avoided. “Critical alignment” is defined as 1/8” (0.125”) or less.

Contacting/Duplicating Control

When duplicating films, halftone dot size must vary no more than plus or minus 2% from the original. A process test should be completed at the beginning of each shift or on a regular basis

A suggested method is as follows:
An original exposure control guide (such as a UGRA scale) should be contacted or duplicated in the same manner as the production materials to be processed.
Using a properly calibrated transmission densitometer, record the actual values of the original exposure guide tints along with the actual values of the contacted/duplicated exposure guide. Both sets of values should be communicated to the recipient of the contact/dupe along with information about the transmission densitometer and the spectral response (ortho, UV, Type 1, etc.) used to measure the films.

Creating Halftones from Continuous-Tone Reflection Images With a Graphic Arts Camera

To reproduce reflective copy, proper halftone dot values should be assigned to the input density values of the continuous tone original. This allows the greatest possible tone range and gradation of the original image to be captured. The following table is for Normal Key copy.

Continuous-Tone Reflection Image Input Density Values

Table 9 – Continuous-tone Reflection Image Output

Tone Curve Portion	Continuous-Tone Reflection Image Input Density Values
Highlight	0.05 to 0.10
Midtone	0.90 above highlight
Shadow	1.60 above highlight
Total Range (substrate white to solid)	1.65 to 1.70

Tonal ranges greater than 1.70 may lead to loss of detail in the final printed product.

Tips for Vacuum Frame Exposures

- Clean the glass often with residue-free cleaner and lint-less cloth. Clean glass reduces light absorption, refraction and image defects.
- Ensure that the vacuum pump is clean and that the vacuum subsystem is free of leaks.
- Use stiff gray or black backing mats to prevent deformity. The surface should be uniform and free of hills and valleys.
- Verify integrity of the seal/bead around the mat.
- Make sure that lamp distance is great enough to cover the printing frame with even illumination, but short enough for practical exposure. A 21-step scale (Stouffer, RIT, GATF, or UGRA) should not be more than one step different from the center of the image to the edge of the largest possible image used in the frame. Be aware of light falloff (lower exposure) toward the edges. Determine the evenness of exposure.
- Replace lamp bulbs occasionally because their spectral output changes as they age. The efficiency of a bulb decreases by about 20% over its life span. Follow the manufacturer's replacement schedule.
- Contact or duplicate an original exposure control guide (such as a Stouffer, RIT, GATF, or UGRA scale) in the same manner as the production materials to be processed. A test target should be used daily. New lamps can vary by as much as 40% from one manufacturer to another and from bulb to bulb from the same manufacturer.
- Ensure consistent light intensity. Lamp-to-substrate distance, age and condition of bulb, type and condition of reflector, and accuracy of resetting lamp brightness control all can influence light intensity. Changes in the voltage supplied to a contact exposure lamp can cause significant changes in the actual exposure obtained. Integrators should be set to "integrate" as opposed to "time".
- Test to verify draw-down time, which should be sufficient to insure intimate contact.

Final Output

If SNAP specifications have been followed, the screened tone values should have the following values.

Screened Tone Values for Black-and-White or Single-Color Images

Table 10a

Tonal Area	Offset (85 lpi)	Offset (100 lpi)
Specular/ non-detail	0%	0%
Highlight	3%	3%
Quartertone	18%	16%
Midtone	35%	32%
Shadow	85%	85%

Screened Tone value for Four-Color Images

Table 10b

Cyan	Magenta	Yellow	Black	Tonal area
Offset 85 lpi				
3	1	1	0	Highlight
20	14	14	0	Quartertone
38	30	30	10	Midtone
60	50	50	80	Shadow
Offset 100 lpi				
5	2	2	0	Highlight
20	14	14	0	Quartertone
36	28	28	10	Midtone
60	50	50	80	Shadow

The values shown in Table 10b should exist in the file and on the film or plate imaged by that file following the application of any GCR or Undercolor Removal (UCR) applications.

Table 11. Additional Requirements for Screened Tone Values

Film Characteristic	Offset
TAC Maximum Imaged to film or plate	220%
TAC Minimum Area Coverage for neutral shadow	200% Note: lower values may be possible with prior testing
Stochastic Screening	Not recommended without prior consultation
Exceeding the TAC	Acceptable provided the area is not larger than approximately 1” in diameter and all segments understand that this area will print as a solid. Do not exceed 260%.
Neutral Maximum Shadow Areas	For any separation, not more than one color should print as a solid (100%); the two secondary colors should each not exceed 75%.

(Note also that current US and International Standards refer to the term Tone Value Sum (TVS) to describe TAC.)

How to Linearize an Imagesetter

To ensure high-quality reproduction, it is important to set and maintain proper exposure and linearization conditions on output devices. Maintaining these conditions results in more accurate and predicable dot percentage values throughout the tone range of images and optimizes reproduction of fine type. Use the following procedure to achieve more consistent output results with film and photographic paper.

1. Verify that processor conditions meet the requirements of manufacturers and suppliers, including time, temperature, chemistry concentration, and replenishment rate.
2. Affirm that all transmission densitometers are properly calibrated and are capable of reading optimal Dmax as specified by the supplier of the film.
3. Perform an exposure sweep for each designated resolution, line screen, and dot shape to determine optimal setting for achieving both fine type and the manufacturer-recommended Dmax. Confirm that the imagesetter is operating within the manufacturer’s recommendations. Density variation should not exceed 0.40 across the page.
4. Output an unadjusted, screened step-scale or other test target through the RIP.
5. Measure all tint values from the unadjusted, final plate-ready film test target.
6. Input test values.
7. Verify linearization.
8. Activate linearization and apply to production files.

Chapter 7:
Proofing Processes

Proofing is a term that refers to the process of checking a job during its production. Proofs are used in pre-press and pressroom departments for functions such as content and color approval, process control, quality control, and confirmation of corrections. Proofing methods and requirements differ depending on both the production stage and the customer's expectations. A range of proofing solutions exist which vary in quality, complexity, and cost.

Proofs can be classified in three ways:

1. The image source for the proof
    - Analog proofs can be created from film using an ultraviolet (UV) light source.
    - Digital proofs can be imaged directly from a file using a laser, ink jet, or other technology.

2. The format in which the proof is supplied
    - Hardcopy proofs are output using physical materials and include the following:
    - Press proofs, which are printed from plates on a press using ink and paper.
    - Off-press proofs, sometimes called pre-press proofs, which use photosensitive materials that are exposed with the separation films.
    - Digital hardcopy proofs, which are created without the use of film directly from a file using any one of many direct imaging approaches.

- Softproofs appear as an image on a screen or terminal.

3. The proof's purpose

The term "proof" encompasses a range of functions. These include the following:

- A "content proof" or "position proof" is used for checking for image content, color breaks, and position (not for color matches).
- A "Contract or Final Proof" is used for final color guidance and position of all elements.

Typically created from either final film or the final digital file, the final proof is sometimes called the Color OK proof. This proof is intended to represent the final version of the job that is correct in terms of color, tone reproduction, substrate, layout and position of elements, and content of elements. The purpose of the final proof is to predict the printed reproduction of the supplied film or file.

Final Insights

- All proof types--analog and digital, hard and soft, content and final--are useful tools for assessing jobs and their images. Each type has its own features, benefits, and limitations.
- A proof that one customer or marketplace segment deems useful only as a content proof may be acceptable for other customers and marketplace segments as a final proof.
- The classification described in this section is intended to promote communication and understanding. Process demands and customer expectations should dictate the selection of the proofing approach.

Requirements for SNAP Proofs

Content Proofs

To provide complete instructions for the printer/newspaper, the content proof should:

- Be actual size and tiled if necessary. Tiled proofs should be taped together to represent the complete image. If this is not possible, the proof should indicate the percentage of reduction or enlargement.
- Include trim, fold, and register marks.
- Identify rules as For-Position-Only (FPO) or to image.
- Identify tinted page elements as either fifth color/match colors or as CMYK tint builds, including the percent of each process color required.
- Be a color proof if the image is to reproduce using color. A color proof provides helpful insight into color breaks as well as potential trapping issues and indicates whether images are black-and-white or in color.
- Identify all silhouettes as “silo” since these effects typically will need to be recreated. If these graphic elements are ready to be output, identify them as “Live.”
- Be labeled with the customer name, event name or date, proof provider’s name and telephone number, and any versioning information.
- Mark all FPO graphic files clearly, including photographs and special effects. The content proof, which accompanies the digital file, should also contain either high-resolution scan files of these photographs or the original photographs.

Final Proofs

Final proofs for coldset printing should **visually predict** the final job as closely as possible. The final proof should accurately simulate the final printing results, including:

- Final Layout
- Substrate characteristics (i.e., surface, color, brightness, whiteness)
- Ink color/gamut
- Tone reproduction
- Image area surface appearance
- Good register.
- Origin and date of creation
- Standardized color bars

Press Proofs

Press proofs should use inks printed to the density specifications listed in the section titled Press Production Guidelines. The proof’s dot gain/TVI should be controlled and monitored for optimum consistency. Because the coldset industry uses a wide variety of uncoated groundwood papers whose color, brightness, and opacity vary widely, it is not practical to designate a standard proofing stock. If press proofs are required, the proofer should determine the specifications of the production sheet and pull the proofs on either the same stock or one with similar characteristics. The recommended ink sequence for a press proof should follow the pressroom production guidelines. Color bars should include a solid, 25%, 50%, and 75% tint of each color, 2-color overprints, and a 3-color gray patch of 40%C/30%M/30%Y. Such color control targets are available from NAA, GATF, RIT, and other organizations.

Off-press Proofs

Many types of pre-press color proofing systems are available, including digital and analog (overlay and single sheet) methods. In order to simulate the final printed job and comply with the general guidelines above, these proofs should be made according to the manufacturer's recommendations. Analog proofing systems require exposure frames with appropriate light sources, so the proofing manufacturer's recommendations for bulbs and exposure times should be followed. Proper calibration and monitoring also are required. Despite similarities, all analog systems are unique and have their own characteristics and procedures. Any questions should be directed to the manufacturer.

Color management software is available on most digital proofers, so the user should be able to choose characteristics consistent with SNAP (see Appendix 2). Digital proofs should be imaged from the same RIP file used to image the final film and/or plate materials. Such proofs are often used to verify content and position. SNAP strongly recommends that digital proofs be tested both for accuracy and consistency

Proofing solutions in a digital workflow remain a challenge. At present, digital and analog workflows exist side by side and are used together in many instances. Changes in this area are occurring rapidly due to emerging technologies.

Platemaking Processes

Conventional Processes

Accurate image transfer from film to plate is essential for good print reproduction. Improper exposure can cause excessive dot growth on negative working plates. Here are some guidelines:

- Maintain plate exposure frames and processors according to manufacturers' specifications.
- Once a week use test images such as an UGRA scale, Rochester Institute of Technology (RIT) Microline target, or GATF plate control target to evaluate plate exposure at least once a week.
- Use Stouffer scales on a daily basis to maintain exposure.
- Replace plate control targets when they become physically damaged or faded. Scheduled target replacement depends on how each is used and stored. The manufacturer should provide guidelines on care and useful life.
- Expose all plates with only hard-dot negatives.
- Plate exposure vacuum control is important to provide accurate plating.

Computer-to-Plate Processes

Computer-to-Plate (CTP) workflow is the process of printing a digital file directly onto plate material instead of paper or film. Relatively new platesetter technology makes this possible. A platesetter outputs a file to plate material much like a traditional imagesetter outputs a file to paper or film. Guidelines for digital file preparation and management apply to computer-to-plate output just as they do to film output.
Two important differences exist between film output and plate output:

- Even with a perfectly calibrated digital pre-press system and a calibrated digital platesetter, the plates may not have the same dot gain/TVI as plates made from film.
- Proofing the final file calls for using a digital proof that is known to be able to predict consistently how the file will appear when printed on press.

Guidelines for implementing computer-to-plate processes include:

CTP technology requires a 100% digital workflow, beginning with file submission and encompassing digital proofing, preflighting, and platemaking. It is important that quality assurance standard operating procedures (SOPs) are in place to assure that the supplied files will image properly and that the resulting plate has been imaged and processed with the desired curve.
On a weekly basis check the exposure and processing conditions for the digital plate with a suitable target, such as the digital UGRA image or tint scales supplied by the RIP vendor. Follow the manufacturer's recommendations. Tint values on plates are measured using either a reflection densitometer or plate reading devices that have been developed with the intention of eliminating interference from plate grain effects.
Tone values on CTP plates typically show a decrease of 3% to 5% dot gain/TVI because of the elimination of contact exposure and the light undercutting that occurs when exposing plate to film.
As with film imagesetters, CTP processes allow control of dot gain/TVI using the RIP.

If using a CTP workflow, SNAP recommends:

- Running a press test and measuring printed results plates made using CTP processes versus film-based processes in order to understand how the dot gain /TVI changes with the change in platemaking processes.
- Exploring modification of the tonal curves in the platesetter RIP to reflect the changes determined from the press test.
- Measuring the plates on a regular and frequent basis using a device approved by the plate supplier.
- Documenting file processing, plate measurement, plate processors, equipment maintenance, and allied standard operating procedures to assure quality.
- Keeping a focus on plate process chemistry and maintenance since these processes remain important.

Chapter 8:

Press Production Guidelines

Advancements in equipment, processes, and controls have dramatically improved the quality of printing. Nevertheless, acceptable results depend on the right combination of many variables, including materials and press conditions. The SNAP guidelines are intended to standardize printing practices to yield the highest quality results. The guidelines are based on extensive testing and settings that have been proven to generate good results. When the proof has been prepared according to SNAP specifications, and the printing process is carried out according to the guidelines below, the result should be of high quality.

The tolerances shown in the tables make appropriate allowances for variation in measurement methods, materials and equipment.

See the section on Viewing and Measurement Methods for information on measurements of press sheets.

Solid Ink Density

Solid ink densities are determined by printing the solid color and measuring the result with a densitometer. The values measure the relative amount of ink applied to the substrate. For balanced color reproduction, recommended aims for solid ink densities are outlined in the following table.

Table 12. Recommended Aims for Solid Ink Density

Dry Solid Ink Density (SID)	Offset Newspapers	Offset Commercial
Cyan	.90	.95
Magenta	.90	.95
Yellow	.85	.90
Black	1.05	1.10
Tolerances	+/- 0.05	+/- 0.10

(Dry SID Status T densities measured as absolute; paper density included)

Notes:
1. *Dryback* is the difference in density between ink measured immediately after printing and ink measured after it has had time to set. If ink is measured immediately after printing, dryback values must be added to the numbers above. Typical industry experience has seen dryback values of 0.02 to 0.05.. Dryback values will vary from press to press and from color to color. See Viewing and Measurement Methods section for information about dryback testing.
2. Coldset density aim points for commercial printing are slightly higher and variation is slightly larger than for newspaper printing because the intent of commercial printing is to match the proof. Newspapers generally run to match density numbers.
3. The Status T measurements have been used on all instruments other then the X-rite 500 series instruments. SNAP recommends when using a 500 series Densitometer from X-Rite, to use the Status Tx' setting. This will more assimilate the values of the data collected by SNAP.
4. See sub-section on Gray Balance and Color Bars for Process Control for additional information on color balance.

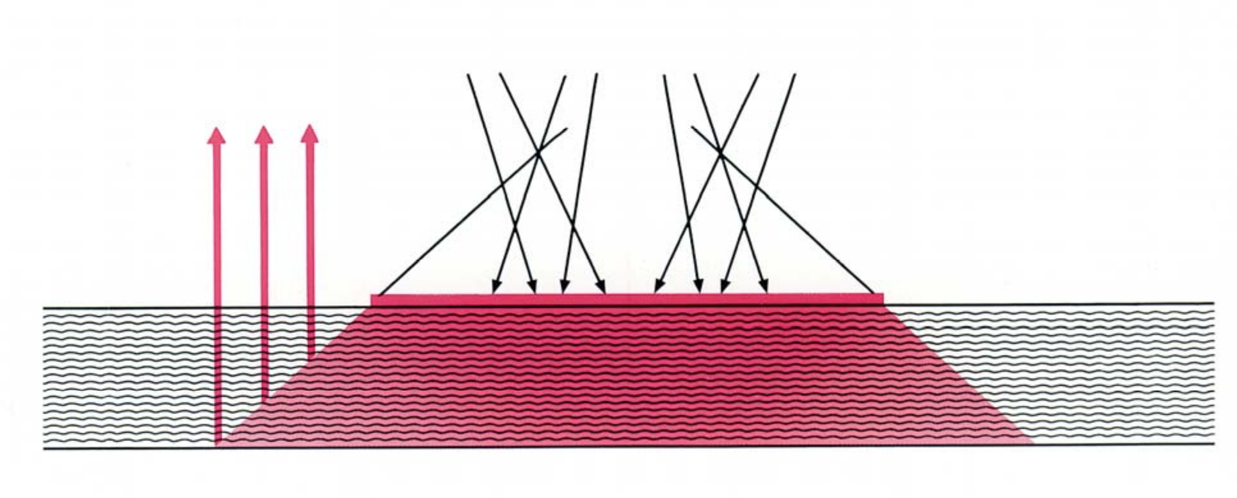
Dot Gain/TVI

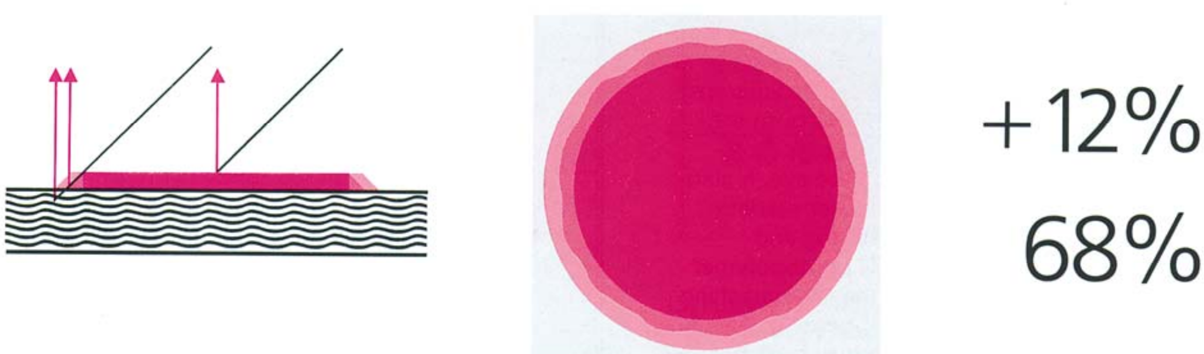
Dot gain/TVI is an increase in the halftone dot that results from different stages of the reproduction process. Every stage of the process--from film through platemaking to the stages of final printing--contributes to dot gain/TVI.

Total dot gain: Mechanical (physical) plus optical (visual) dot gain

Total Dot Gain/TVI is defined as the combination of mechanical (physical) and optical (visual) growth in the halftone dot. As the dot transfers from the plate to the paper, it physically increases in size. After the dot is printed on newsprint, the eye and densitometer perceive it as larger than the physical growth alone because light is scattered within the paper and some of the light is trapped below the halftone dots in addition to being absorbed by the ink. This effect is called optical dot gain/TVI. Optical dot gain/TVI can increase if light scattering and reflection is more pronounced due to surface characteristics of the stock.

Dot gain/TVI is measured with a reflection densitometer. It is important that the instrument use the Murray-Davies equation option for measurement, which measures the combined mechanical and optical gain. The values in the tables below assume use of the Murray-Davies equation. Although dot gain is stated as a percentage, it is not really a percentage value. For example, if a dot area or tone value of 50 percent in the image area measures 80 percent when printed, it is said to have a dot gain/TVI of 30 percent. That number is simply the difference between the two percentages, not a percentage value of the original number.





The tables below show the expected dot gain/TVI (as measured by a densitometer) at different tonal values. For instance, for offset printing an initial 25 percent cyan tone value in the film or file can be expected to reproduce on the printed sheet as a 53 percent cyan tone value (25% initial dot+28% gain = 53%). Knowing these values, the material can be adjusted in the prepress process so it reproduces properly when it is printed. An optimal tone reproduction curve can thus be developed for the film, file, or RIP, and appropriate preference tables can be created in electronic prepress software applications.

Press operators should use these numbers as aim points and tolerances. If on-press values consistently differ from these values, you should investigate why. You should also communicate your specific values to the providers of the film or file.

The following values are aim points for the coldset printing process, whether using AM or FM screening, conventional or CTP Plates. They are intended to give the advertisers to have a single set of aim points to target. If your process does not meet these ink-on-paper values, you will need to adjust the process accordingly.

Table 13. Dot Gain/TVI Measurements at Different Tonal Values

Dot Gain/TVI @ 25%	Offset (85 – 100 lpi)
Cyan	24%
Magenta	24%
Yellow	24%
Black	24%
Tolerances	+/- 3%

Dot Gain/TVI @ 50%	Offset (85 – 100 lpi)
Cyan	26%
Magenta	26%
Yellow	26%
Black	26%
Tolerances	+/- 4%

Dot Gain/TVI @ 75%	Offset (85 = 100 lpi)
Cyan	17%
Magenta	17%
Yellow	17%
Black	17%
Tolerances	+/- 3%

Note: The dot gain / TVI values are based on an average of over 200 SNAP certified Printers.

Color Balance Considerations

Changes in dot gain values among the various colors can lead to color balance problems. If dot gain values stray too far from the values noted above, the relationship among the colors can be seriously damaged. Color balance is typically evaluated at the 50% dot area. While the dot gain tolerance for any given color is +/- 4% in the 50% dot area table, the values for each color should not differ from each other by more than 4%. For example, if cyan is 2 percentage points above the recommended value, then yellow should not be more than 2 percent *below* its recommended value. Otherwise, the spread between the two colors would exceed 4 percentage points and color balance would be adversely affected.

Green cast in Neutrals Red Cast in Neutrals Blue Cast in Neutrals

Direct Lithography Considerations

When using direct lithography, plates commonly are exposed with the emulsion side of the negative up (not in contact with the plate surface). This results in dot gain/TVI of approximately 8 to 10 percent on the plate. The potential for variation of dot gain/TVI between direct lithography and offset lithography may be substantial. Measurement of the process is recommended to verify actual results.

Printing Ink Lay-down Sequence

SNAP recommends the following printing sequences:

Table 15. Recommended Printing Sequences

Offset
Cyan-Magenta-Yellow-Black or Black-Cyan-Magenta-Yellow

Note: Many tests conducted throughout the industry have shown that the widest possible gamut for offset colors is obtained through the CMYK laydown sequence. In newspaper flexographic printing, the opaque yellow is laid down first so that it does not hide the subsequent colors.

Image Registration on Press

The final step in the four-color printing process is the proper registration of the four colors. These colors must be aligned carefully so that they print exactly in the correct positions. A misaligned reproduction looks fuzzy and out of focus, while the properly registered reproduction looks clean and sharp.

Register of any color to black must not exceed “0.012” in any direction, including lateral, circumferential, or skewed. Further, register between any two colors must not exceed 0.015” in any direction, including lateral, circumferential, or skewed. The value of 0.015” is equivalent to 1.5 rows of dots @ 100 lpi, 90º angle.

Paper

The shade and brightness of newsprint and uncoated groundwood papers vary. These variations influence printed ink hues and overprints. The SNAP specifications are based on materials that were printed on newsprint with the characteristics below. If the substrate being used is substantially different from these reference values, adjustments to SNAP specifications may be necessary to achieve desired results.

Table 16. Reference Values for Substrate

	L*	a*	b*
SNAP Stock	82.0	0	3

Tolerances for the colour of the print substrate

	ΔL*	Δa*	Δb*
Proofing should be within	3	2	2
Production should be within	3	1	1
Production shall be within	4	2	2

L*, a*, b* and brightness measured according to 4.3.1.1 of ISO 12647-3 (2^0 observer, illuminant D_{50}, $45^0/0^0$ or $0^0/45^0$, black backing).

Ink

The aim values for inks and overprints to be used in press processes are shown below. Although the process colors may yield the aim values below, this does not necessarily mean that the secondary colors will yield the aim values. The values for red, green, and blue can vary depending on press, paper, and ink. (CIE, referred to in the table below, stands for a French standards organization.)

Table 17. CIE Lab L*, a*, b* Aim Values

	L*	a*	b*
Cyan	57	-23	-27
Magenta	54	44	-2
Yellow	78	-3	58
Black	36	1	4
Cyan + Yellow	53	-34	17
Cyan + Magenta	41	7	-22
Magenta + Yellow	52	41	25
Values come from ISO 12647-3. They represent offset inks and paper only. Data for flexographic inks were not available at the time of publishing. Measurements are according to ISO 13655 (2^0 observer, illuminant D_{50}, $45^0/0^0$ or $0^0/45^0$, black backing).			

CIELAB tolerances for the primary process colour solids

	K	C	M	Y
Deviation tolerance [a]	5	5	5	5
Variation tolerance [a]	4	4	4	5
Not more than 60 % of the total deviation or variation shall be attributable to either Δ*L** or Δ*H**				
a Deviation and variation tolerances are defined in ISO 12647-1				

Many coldset printers are embracing the use of CIE Lab as an objective means to specify and communicate information about ink and colorant hues and the results anticipated using these inks or colorants. For others, hue error, grayness, and trap--measured using reflection densitometry--remain helpful tools to measure, describe, and communicate these process components objectively.

When printed on the same substrate at similar densities, inks made to conform to specifications set by the NAA appear very similar to inks made to conform to SWOP. Subtle differences do exist, however. Here are recommended ink sets for newspaper and commercial printing:

Table 20. Recommended Ink Sets

Market	Offset
Newspaper	NAA AD-LITHO®
Commercial	AD-LITHO® Hues

Offset inks conforming to NAA and SNAP specifications are made using the following pigments:

Cyan	Phthalocyanine blue (green shade)
Magenta	Rubine red
Yellow	Diarylide yellow
Black	Furnace black (blue shade)

The difference between commercial and NAA AD-LITHO inks is strength only; the hue characteristics are identical. NAA has ink verification programs for coldset inks. For a fee, NAA will evaluate ink samples submitted voluntarily by printers or ink manufacturers and verify conformance to NAA AD-LITHO, AD/FLEX, and AdPro specifications. GATF also will evaluate SNAP inks for a fee.

How to Run a Print Quality Press Test

The best way to analyze print quality is to print a specialized test form. Industry organizations such as NAA, GATF, and SNAP offer test forms designed to obtain important information. Printers can also create their own test forms. At a minimum, the form should contain the following items:

- Patches for evaluating single solid ink density
- Patches for 3-color gray balance referenced to 25%, 50% & 75% black tint
- Two-color solid overprints for evaluating color
- A step gradation for dot gain measurement (25%, 50% and 75% minimum) of each process ink

Be sure to communicate the test goals and objectives to all involved before the run. Remember that quantitative measurements of print quality depend on solid ink density. It is imperative that the tools for controlling density be made available to the pressmen running the test. Some additional guidelines are listed below:

- Determine whether the test will evaluate the printing process as it typically occurs in a production mode or what the process is capable of achieving when the press is set up to manufacturer's specifications.
- Use calibrated reflection densitometers with status T response for density control. Care should be taken to ensure that print densities are within the industry-recommended target range and are uniform across the printed page.
- Produce four-color separation films on a properly linearized imagesetter if using digital media. Check the output films to ensure proper reproduction.
- Ensure that plate-processing equipment is operating within specification (exposure, draw down and light source).
- Produce plates from films and check plates to ensure proper exposure and processing.
- Attain the proper ink/water balance after bringing the press to normal operating speed.
- Adjust solid ink density to SNAP specifications one color at a time using a calibrated reflection densitometer. Allow a minimum of one to two minutes for adjustment to take effect. Ensure that density is uniform across the printed sheet before making adjustments to the next color. Check at least three random sheets and average the density readings before making any adjustments.

Pull a number of sheets for evaluation after all final adjustments for density are made. To get reliable process control data and statistics, at least 25 sheets should be evaluated. Pull sheets randomly during the press run to determine variation.

Gray Balance and Color Bars for Process Control

This section of the document addresses selected tools, procedures, and methods that printers and newspapers can use to achieve consistent and repeatable results.

Process Control and Testing

Testing is Important
Several locations in the SNAP document cite the need for testing prior to establishing a production procedure. Testing is especially important prior to agreeing with a client to:

- Use new or modified production technologies
- Use new or modified production methods or workflows
- Change specifications

Verify That the Process is Statistically Stable Prior to Undertaking Definitive Testing
Testing requires measuring and evaluating output from each step in the reproduction process, including devices such as scanners, imagesetters, and printing presses. Prior to measuring an output or evaluating data, it is important to verify that each aspect of the process under study is stable (also referred to as being in good statistical control) and exhibits only normal process variation. In contrast to normal process variation, abnormal process variation indicates that the process is subject to unpredictable variation, making improvement difficult and unreliable since the output changes in an unpredictable manner.

These concepts and the broader use of statistics to understand and managed variation is generally called Statistical Process Control (S.P.C.).

Gray Balance

Gray balance is a measure of how well the three process colors--cyan, magenta, and yellow --are properly adjusted for printing. It is determined by reproducing a gray color scale using cyan, magenta, and yellow tints. A neutral three-color gray is produced using unequal tints of these three colors, with the cyan tone value always being larger than the yellow or magenta tone values when printing to SNAP densities. Cyan, magenta, and yellow tints that produce proper gray balance in SNAP proofs and printing are shown in the table below. Dot gain/TVI values must be monitored, adjusted, and controlled throughout the scanning, proofing, film creation, and printing process in order to maintain the relative halftone dot values required for gray balance to be achieved.

Gray balance is an important indicator that dot gain/TVI values among the component colors are in balance. It is important to ensure that gray tones reproduce accurately.

How Is Gray Balance Measured?

Visual Gray balance is more important than measured gray balance. Gray balance is subjectively assessed by comparing an overprint of cyan, magenta, and yellow tints with a black tint having an equivalent tone value. Gray balance must be visually assessed under standard viewing conditions. Gray balance on the coldest process needs to be able to change the absolute values to compensate for the stock in order to be visually gray. Gray balance can also be measured objectively. With the following methods:

- Using a densitometer in the absolute mode, the filter measurement should be equal, the SNAP specification for newsprint has a yellow cast which will impact the final density values. For this reason SNAP recommends that the three colors be equal in density over the unprinted newsprint. Thus if your newsprint measures .23, .23, .26 (C,M,Y) your printed gray bar should be also higher in the yellow component, i.e. .60, .60, .63.
- Using a spectrometer, neutral gray is defined as have an a*, b* of 0,0 over the newsprint. Thus if your paper has an a*, b* of 0,3, the printed gray should be 0,3 also.

Gray Bar Targets

Every printed job should include either a gray bar or a series of objective solid and tint targets. These targets should be included on every page or on as many pages as possible. Recommended gray bar values to produce a 3-color neutral gray, and the black tint that it should approximate, are shown in Table 21a below. The aim density shown in Tables 21a, b, and c represents the density of the combined tint patch density as measured with each of the filters.

For the target to remain neutral gray, the total range among the three ink densities for these tables should not be greater than +/- 0.03

Table 21a. Offset 3-C Gray Balance

Offset 3-C Gray Balance				Black Tint Equivalent	Aim Density of Three-Color Patch
C	M	Y	K	K	
25%	18%	18%	0%	25% (Quartertone)	0.52 +/- 0.05
40%	30%	30%	0%	50% (Midtone)	0.65 +/- 0.05

Rules for Using Gray Bars

- Imagesetter and film processors must be checked regularly with a transmission densitometer to ensure that they are outputting the proper film dot area/tone values for the gray bar.
- The width of the gray bar should be as wide as the target window for both transmission and reflection densitometers to ensure proper readings.
- Densitometers should be checked daily for proper calibration.
- The inherent density variation of the press should be within the print density tolerances shown in Table 21.
- When necessary, adjust gray-bar densities on press from dark to light because the ink pigments are not pure. The cyan and magenta pigments contain components that affect the yellow reading of the gray bars. After adjusting one color, the other two must be rechecked as well.
- Always take readings at the same position of the gray bar and at the same plate position (high or low side) to minimize density variations due to ink zones or impression on the press.
- The three density values should be within +/- 0.03 of each other.
- When starting the press, follow these steps:
- Get the page in register.
- Get gray bar visually balanced across the page.
- Check the gray bar with a reflection densitometer.
- Adjust the density if necessary.
- Recheck density after a few minutes in the same position and adjust as necessary.

Color Bars

In addition to gray bars, color bars should be run on every job if possible. Color bar targets should include the following elements:

- Solids of all four colors
- Nominal 50% tints of all four colors
- Solid overprints of each two-color combination

If space permits, inclusion of nominal 75% tints and nominal 25% tints of all four colors also is recommended. Gray bars and color bar targets should be large enough to permit measurement. A target height/width or diameter of 3/8" is recommended. Smaller sizes are possible if the printer or newspaper agrees. Color bar targets do not need to be continuous and can be creatively designed across the width of the page. (See also Rules for Using Gray Bars above.)

Matching Printed Copy to Proofs

1. Prior to press start, the press crew should review, under standard viewing conditions, areas of the proof that the customer considers particularly important.
2. When the press achieves the proper running speed, registration should be set using a loupe with a minimum of 8x magnification.
3. If the offset process is being used, water should be set to minimal levels to prevent ink scumming.
4. The solid black inking level should be set to the appropriate SNAP density aim point using a calibrated reflection densitometer.
5. The solid color inking level should be set to the appropriate SNAP density aim point using a calibrated reflection densitometer. If no targets are available, adjust color ink levels visually to obtain even ink distribution across the page.
6. Customer-specific color matching requests should be satisfied. Ink levels should be adjusted to improve the visual appearance match to the supplied SNAP proof(s) when available.
7. If no customer-specific requests are provided, neutral tonal areas should be set to levels that match the proof. Color casts should be maintained if they are present in the proof under standard lighting conditions. Look for red, green, and blue areas in the proof and adjust inking levels to match.
8. Continue to monitor reproduction for the remainder of the run using a reflection densitometer and visual assessment under standard lighting conditions.

Chapter 9:

Viewing and Measurement Methods

Viewing Conditions

Transparent and hard-copy artwork, physical mechanicals, proofs, and printed material should be viewed using lighting, equipment, and a physical surround that conform to *ANSI/PH2.30--1989 Standards for Graphic Arts and Photography--Color Prints, Transparencies, and Photomechanical Reproductions--Viewing Conditions*. This standard requires that the surrounding area, including floors, walls, and ceiling, be painted using a Munsell N8/gray color. It also requires that lighting have a color temperature of 5000 degrees Kelvin and specifies the light source's minimum color rendering index, luminance, uniformity, and spectral power.

At the time of publication of SNAP, ANSI PH2.30 and its equivalent, ISO 3664, were being revised. The revision includes the concept of spectrally defining the illumination and specifies sample backing for reflective images. It also introduces two levels of illumination. One level is for critical comparison and the other is a lower level for aesthetic viewing. For communication with customers and suppliers, SNAP recommends using the illumination level intended for critical comparison because this level represents current practice.

Reflection Densitometer Measurements

Reflection density measurements should be made with a properly calibrated densitometer.
All reflection density and dot gain/TVI values in SNAP are based on ISO Status T equipment that conforms to ANSI/ISO 5/3 and 5/4 standards. Use of a 4mm aperture is recommended when measuring newsprint and other coarse papers. In all cases, the aperture size should be communicated with the measurements. All measurements are made with non-polarized instruments. Density measurements are absolute and include paper density.

Dot gain/TVI calculations should conform to ANSI/CGATS.4 (based on the Murray-Davies equation). Trap measurements should conform to ANSI/CGATS.4 (based on the apparent trap Preucil equation). All measurements are made using a flat, neutral, matte, and black backing conforming to ANSI/ISO standards ANSI/CGATS.4 and ANSI/ISO 5/4.

Transmission Densitometer Measurements

Transmission density measurements are based on use of orthochromatic light, although both UV and orthochromatic (ortho) values should be reported. Percent dot area calibration is verified using a device such as an UGRA scale, with the .5% tint area serving as the zero reference (base fog) patch. Use of a 3mm aperture is recommended. In all cases, the aperture size should be communicated along with the measurement. Measurements should be made in accordance with CGATS.9.

Coldset measurements mirror the measurement methods discussed in this section. (See Appendix 3 for information about where various standards can be found.)

Use of UV Light

Dmax and Dmin values are reported using both ortho and UV light values because historically the industry has referred to these values using ortho measurements. Most plates are exposed using high-intensity UV light, making the UV values more useful and predictive. The UV absorption of many films is quite different from the ortho absorption of these films, making the UV measurements an important and often overlooked contributor to variation in contacting, duping, proofing, and platemaking processes.

Spectrophotometric Measurements

SNAP recommends the use of the CIE Lab uniform color space for comparison and presentation of color data. ISO 13655:1996, *Graphic technology — Spectral measurement and colorimetric computation for graphic arts images* (ANSI/CGATS.5 – 1993 of the same title) specifies the use of weighting functions using the CIE 2° observer and illuminant D_{50}. The standard specifies 45°/0° or 0°/45° instrument geometry for reflectance measurement, and a black backing behind the sample to be measured. It is important to evaluate any measuring system (instrument, operator, and environment) using ANSI/CGATS.11 PIMA/IT2.11, *Graphic technology and photography — Reflection and transmission metrology — Documentation requirements for certified reference materials, procedures for use, and determination of combined standard uncertainty*.

Dryback Testing

To evaluate dryback, density measurements of printed solid ink targets should be made immediately after printing, three hours later, and again after 24 hours. These values should be recorded and graphed to indicate the slope with which the paper/ink process dries back. Those in industry typically have seen dryback values of 0.02 to 0.05 density units after 24 hours. These dryback values vary by press and color and are not specified or recommended values.

Hue Error/Grayness

For SNAP measurements, paper density is included in hue error and grayness calculations.

Print Contrast

Print contrast measurements are absolute and include paper density. Print contrast measurements call for measuring the density of the solid printed or imaged target, measuring the density of a 75% printed or imaged target of the same hue, dividing the difference of these two values by the density of the solid target, and then multiplying the result by 100 to determine the percent value.

SNAP/NAA Quality Toolbox

The SNAP committee and the NAA Color Quality Reproduction Task Force developed the following list of equipment and tools that prepress and pressroom departments should have to evaluate process performance. Some of these tools are for advanced analysis. Suppliers should be contacted for information about where these tools can be purchased.

Tools for Pre-press

- Reflection densitometer with current calibration plaque
- Spectrophotometer
- Transmission densitometer with step tablet for film
- 30x lighted magnifier with reticule and color filters suggested
- Linearization software for imaging
- Screen angle indicator
- Screen rule determiner
- SNAP digital color test form
- Plate exposure scale / contacting scale
- Color booth at 5000 degrees Kelvin
- Device to verify light accuracy
- Monitor calibration software and occluder

Tools for the Press

- Reflection densitometer with current calibration plaque
- Spectrophotometer
- Shore A hardness gauge / durometer.
- Blanket gauge to measure height over cylinder
- Conductivity / pH gauge
- Roller stripe measuring device / tester
- Device to measure roller pressure settings such as the SET-RITE Gauge
- Color reference guide such as NAA Color Ink Book, or Pantone
- Torque wrench
- Impression Gauge
- 8x to 10x loupe
- Micrometer
- Color booth at 5000 degrees Kelvin
- Device to verify light source accuracy.

Appendix 1:
Common Graphic Arts Conversions

	From	multiplication factor		To	
1	Inches	25.4		25.400	millimeters
1	millimeters	0.039		0.039	Inches
1	Inches	2.54		2.540	Centimeters
1	centimeters	0.3937		0.394	Inches
1	Feet	30.48		30.480	centimeters
1	Feet	0.3048		0.305	meters
1	Meters	3.2884		3.288	feet
1	Kilometers	0.621371		0.621	miles
1	Miles	1.6		1.600	kilometers
1	Square yards	0.836127		0.836	square meters
1	Ounces	28.3495		28.350	grams
1	Pounds	0.453592		0.454	kilograms
1	pints	0.47		0.470	liters
1	quarts	0.95		0.950	liters
1	gallons	3.78		3.780	liters
32	Fahrenheit	F-32 x 5/9		0.00	Celsius
100	Celsius	C x 9/5+32		212.00	Fahrenheit
1	pica	12		12.00	point
1	inch	72		72.00	point
1	inch	6.0225		6.02	picas
	Paper sizes				
		millimeters	inches		sq. meters
	AO	841 x 189	33 1/8 x 46 13/16		1
	A1	594 x 841	23 3/8 x 33 1/8		0.5
	A2	420 x 594	16 9/16 x 23 3/8		0.25
	A3	297 x 420	11 11/16 x 16 9/16		0.125
	A4	210 x 297	8 1/4 x 11 11/16		0.063
	A5	148 x 210	5 13/16 x 8 1/4		0.031
30	Basis weight	1.627		48.81	grammage
48.8	grammage	0.615		29.99	Basis weight

Appendix 2:
Color Management Systems

Color management systems are software programs usually run at the operating system level (no application level) that control color characteristics of input devices such as scanners and digital cameras as well as such output devices as imagesetters, digital proofers, and printing presses.

About Color Management

Every Electronic Pre-Press (EPP) device has unique color gamut and tone reproduction characteristics. As an image moves from scan to proof to final print, each device along the workflow introduces its own subtle changes in color. In the past, when organizations purchased all equipment from one manufacturer, that manufacturer took responsibility for ensuring color control from input scan to the print. Today, most companies use a "plug-and-play" approach to building systems that calls for mixing and matching devices and software supplied by a range of manufacturers. One consequence of this approach to the digital workflow has been loss of a guarantee of color consistency. Because each device used is likely to come from a different manufacturer, no single piece of equipment can know which device preceded it in the workflow. Nor can any one device correct all color discrepancies that are introduced into this workflow. One solution to this dilemma is the technology known as a Color Management System, or CMS.

Why Use CMS Technology?

Just as perception of color varies from one person to another, each device in the imaging workflow--input, display, output--relies on a different method to process colors. The technology employed by each machine limits the range of colors that any particular machine can scan, display, or output. This range of colors is called its color gamut. Regardless of the device, certain colors exist that are outside of its color gamut and thus cannot be easily processed with that device. For example, presses using standard cyan, magenta, yellow, and black inks cannot easily print deep blues and deep reds because these colors are outside of the color gamut achievable using the process of printing these inks on paper. In a similar manner, monitors are often poor at accurately displaying certain other colors, such as warm yellows. Differences in color space can play havoc with an image as it progresses through a workflow. For example, a specific blue might be inside the color space of a designer's monitor but outside the gamut that a printing press printing ink-on-paper could achieve. Consequently, the blue will appear quite saturated on the monitor. Once it is printed on press, however, the result might appear too desaturated because of the limitations in the reproduction process. This lack of a common color gamut extends to EPP printers. A specific color may reproduce well on one printer device but not on another.

The Value of CMS

- Good color predictability faces two hazards:
- Differences in color gamuts among the different devices in a workflow
- Deviations from the standard performance of any device in a workflow
- CMS technology manages the differences in color reproduction of the devices in a workflow. This technology translates the color space that each device is able to reproduce into a common color space and then transforms--or color matches--each of these colors into those code values necessary to obtain a close match to another device in the workflow.

Applying CMS Technology

Applying CMS requires three steps:
Calibrating each step of the color reproduction process
Characterizing each step of the color reproduction process
Controlling through measurement the variation associated with each step of the color reproduction process

The following paragraphs examine these steps more closely.

Calibration

The performance capabilities of monitors, proof devices, imagesetters, and other output devices change over time. In monitors, phosphors degrade and become unstable. In proofing devices, the dyes or colorants can change with age, heat, humidity, and other factors. Each device used in the color reproduction process should have a calibration routine to ensure that the equipment will image colors at correct levels.

Characterization

The process of identifying the color gamut that any specific input device, monitor, or output device can achieve is called "characterizing" that device. Following device calibration, characterizing a device--sometimes referred to as profiling a device--follows a process that scans, displays, or prints a standard target comprised of many different solids and tints. Normally an IT8 target or some variation of these standard targets is employed. Once scanned, displayed, or imaged, this target is measured. (For scanners, the colors associated with the scans of each solid and tint are evaluated; the target is displayed on monitors or output using EPP proofing devices or film and then printed and measured using spectrophotometers.) Measurements are converted using software into a designated standard color space--a color space is the name given to an agreed-upon way of describing colors objectively--called CIE Lab.

The resulting captured device-specific color space is referred to as a device profile. Characterizing a device results in a profile of the color gamut achievable using that device. This gamut is described using a CIE Lab Diagram. The Diagram provides a plot, or gamut, of all hues at a range of saturation and lightness values. CMS characterization software is able to understand the gamut that each device should be able to render and, through measurement of the targets, the gamut that the device is actually able to reproduce. The amount of difference at each point is determined, and the measured, actual hues are "mapped" in relation to anticipated, known points. The resulting "map" provides the CMS software with a description of the device's imaging capabilities.

Controlling

Control of each element of the color reproduction process, often referred to as process control, is the third key element to applying CMS. Each process component, including the scanner, the monitor, the proofer, the imagesetter, and the printing press, must be managed so that the variation associated with each of these components is predictable. A CMS profile requires this because the profile assumes that the process being profiled remains fairly constant in terms of the color gamut that it is capable of reproducing. An unpredictable process will render the CMS profile less effective--or ineffective--since the profile will not necessarily anticipate the specific, unpredictable color gamut that the process might be generating at that time.

CGATS Reference Printing Conditions

The CGATS and ISO TC130 Graphic Technology standards communities are developing one or more standard "reference printing conditions" for defining press output. In addition, each reference printing condition will be used to create characterization data from the IT8.7/3 (ISO 12642) target. The colorimetric data characterizing each condition will be made publicly available as standards. Those standards should then be used by color management systems in the creation of standard CMYK data for all digital data exchanges. Prepress service providers should use these standards when preparing CMYK data for SNAP.

ICC Profile Format

The International Color Consortium (ICC) was established in 1993 by eight industry vendors to create, promote, and encourage the standardization and evolution of an open, vendor-neutral, cross-platform color management system architecture and components. The current ICC Profile Format Specification is ICC.1:1998-09. One of the first decisions made by the ICC was that color space transformations were the responsibility of the operating system. Making the operating system responsible meant that such transformations did not have to be replicated in each application while still being available to the applications. Device profiles, which contain information on the color behavior of the various peripherals, provide the data necessary to perform these transforms. Various profile types that are specified in an ICC Profile include the following: Input Device, Display Device, Output Device, Color Space Conversion, Device Linking, and Abstract Profile. ICC profiles should be developed using color characterization data being developed by CGATS.

SNAP ICC profile

A custom profile created by SNAP to address the translation of RGB to CMYK in a leading software application. The SNAP profile can be downloaded from the SNAP Quality website: www.snapquality.com or by going to Color.org: http://www.color.org/registry/index.xalter .

Appendix 3

ANSI and ISO Standards Relevant to SNAP

Several organizations in the U. S. are providing guidance on electronic workflow issues and the required supporting standards. Two of the major organizations are the Digital Distribution for Advertising Publications (DDAP) Association and the Committee for Graphic Arts Technologies Standards (CGATS). Many of the CGATS activities are also mirrored within the International Standards Organization (ISO) Technical Committee 130 (TC 130).

CGATS is working with the SNAP committee to develop color characterization and proofing definition standards. These are critical to the future definition of SNAP in an electronic exchange world as well as to the emerging capability for DDAP.

The portfolio of graphic arts standards grows yearly. At the present time, the following standards, approved at both the U. S. and International level, are directly applicable to the exchange of graphic arts data for SNAP proofing and printing.

ISO Legend:
WD= Working Draft
CD= Committee Draft
DIS= Draft International Standard
FDIS= Final Draft International Standard

IT8.7/1-1993 "Graphic technology — Color transmission target for input scanner calibration"

IT8.7/2-1993 "Graphic technology — Color reflection target for input scanner calibration"

IT8.7/3-1993 "Graphic technology — Input data for characterization of 4-color process printing"

IT8.8-1993 "Graphic technology — Prepress digital data exchange — Tag image file format for image technology (TIFF/IT)"

CGATS.4-1993 "Graphic technology — Graphic arts reflection densitometry measurements — Terms, equations, image elements and procedures"

CGATS.5-1993 "Graphic technology — Spectral measurement and colorimetric computation for graphic arts images"

CGATS.9-1994 "Graphic technology — Graphic arts transmission densitometry measurements — Terms, equations, image elements and procedures"

CGATS.11-199x "Graphic technology and photography — Reflection and transmission metrology — Certified reference materials — Documentation and procedures for use, including determination of combined standard uncertainty"

CGATS.12/1-199x "Graphic technology — Prepress digital data exchange — Use of PDF for composite data — Part 1: Complete exchange (PDF/X-1)"

ISO 5-1:1984 “Photography — Density measurements — Part 1: Terms, symbols and notations”

ISO 5-2:1991 “Photography — Density measurements — Part 2: Geometric conditions for transmission density”

ISO 5-3:1995 “Photography — Density measurements — Part 3: Spectral conditions”

ISO 5-4:1991 “Photography — Density measurements — Part 4: Geometric conditions for reflection density”

ISO/DIS 2846-2 “Graphic technology — Color and transparency of printing ink sets for four-color printing — Part 2 Coldset web offset lithographic printing”

ISO 12639:1997 “Graphic technology — Prepress digital data exchange — Tag image file format for image technology (TIFF/IT)”

ISO 12640:1997 “Graphic technology — Prepress digital data exchange — Standard color image data (SCID)”

ISO 12641:1997 “Graphic technology — Prepress digital data exchange — Color targets for input scanner calibration”

ISO 12642:1996 “Graphic technology — Prepress digital data exchange — Input data for characterization of 4-colour process printing”

ISO 12645:1998 “Graphic technology — Process control — Certified reference material for opaque area calibration of transmission densitometers”

ISO 12647-1:1996 “Graphic technology — Process control for half-tone color separations, proofs and production prints, Part 1: Parameters and measurement methods”

ISO/FDIS 12647-3 “Graphic technology — Process control for half-tone color separations, proofs and production prints, Part 3: Coldset offset and letterpress on newsprint”

ISO 13655: 1996 “Graphic technology — Spectral measurement and colorimetric computation for graphic arts images”

ISO/DIS 13656 “Graphic technology — Application of densitometer and colorimeter measurements in the graphic arts”

ISO/CD 15790 “Graphic technology — Reflection and transmission metrology — Documentation requirements for certified reference materials, procedures for use, and determination of combined standard”

ISO/WD 15930 “Graphic technology — Prepress digital data exchange — Use of PDF for composite data”

For additional information on U.S. and International Standards, contact Mary Abbott, Director of Standards Programs, NPES, 1899 Preston White Drive, Reston, VA 20191-4367, (703) 264-7200, or visit the NPES web site at http://www.npes.org.

Appendix 4

Print Contrast

Print contrast is an objective way to describe how open the shadow portion of a printed image is. It is calculated using densities from a solid and a shadow dot area. If densities are within SNAP guidelines, higher print contrast values indicate an improved ability to maintain shadow detail on the printed sheet. The following formula is used for calculation:

(Density of Solid) – (Density @ 75% Tone Value) x 100/(Density of Solid)

If densities are within SNAP guidelines, the result of this equation should be as indicated in the following table. If not, adjustment will be required for proper reproduction of material prepared according to SNAP specifications.

Table 14. Print Contrast Values at a 75% Tint

Print Contrast @ 75%	Offset	Flexography
Cyan	13	20
Magenta	12	20
Yellow	15	20
Black	16	20
Tolerances	+/- 5	+/- 5

Hue error, grayness, and trap measurements can serve as a crosscheck for SNAP specifications. If the printed result looks good and the hue error, grayness, and trap measurements are close to those shown in SNAP, the process components are working properly. If the measurements are not close but the image looks good, then consult the ink, press, or paper suppliers to determine why. Suppliers should also be consulted if the measurements are close but the image looks bad.

The values in Table 18 and Table 19 are hue error, grayness, and trap values representative of those found in coldset printing. Because both methods can be found in different pressrooms, the tables include measurements for both absolute hue error and grayness, which include paper density, and relative hue error and grayness values, where paper density is subtracted. SNAP recommends that hue error and grayness values be measured in the absolute manner, so that paper values are included in the resulting measurements.

The values in these tables are included in SNAP to provide users with a reference and not to serve as specifications. Printers and newspapers should undertake a print quality press test using their combination of paper, ink, printing press, printing sequence, and other process components. The printed targets created from this test should then be measured to determine hue error, grayness, and trapping values when quality printing is achieved.

Table 18. Ink Trap Values

Ink Trap	Offset
Ink Sequence	CMY
Blue	69%
Green	80%
Red	50%

Table 19. Hue Error/Grayness Values

Hue Error/Grayness	OFFSET **"PAPER EXCLUDED"**	**OFFSET "PAPER INCLUDED"**		
Cyan	28 toward magenta 10	28 toward magenta 42		
Magenta	56 toward yellow 11	58 toward yellow 34		
Yellow	8 toward magenta 1.4	10 toward magenta 25		

Absolute hue error and grayness values (paper density included) and *relative* hue error and grayness values (paper density excluded) are shown because both methods are in general use. However, SNAP recommends printers use *absolute* values for process evaluation.

Appendix 5

UCR

Theoretically, when all the process colors cyan, magenta, and yellow are printed on the same piece of paper, they should absorb all the colors reflected from the surface of the paper and thus create black. However because of the nature of the pigments used, the combination of equal amounts of the three colors is brownish in nature. As a result, the black ink is added to the three colors to compensate for this deficiency. Undercolor removal is the process of reducing yellow, magenta, and cyan dot values wherever black is printed. In other words, areas that are 100% of the four solid colors are reduced to 60% yellow, 60% magenta, 70% cyan, and 70% black. This allows for a total coverage reduction from a 400% ink film to a 260% ink film. This would be described as having 260% UCR. This is an extreme example and is not necessarily real. Most halftone prints would not have this level of coverage. However, the theory would be the same for lower coverage areas with a similar reduction possible. Some advantages of UCR are as follows:

1. Black brings out better detail and contrast in the photograph than it is possible with the process colors. Black will make the white appear whiter and will add density, resulting in improved contrast in the shadow areas. Higher contrast usually also increases the image sharpness.

2. Substantial amounts of the process colors removed from the areas where black is to be printed allows better ink trapping during the run.

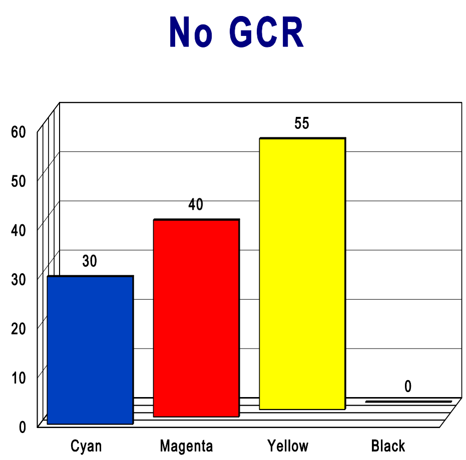
3. Process colors are more expensive than black. Substituting three process colors with black makes undercolor removal more economical.

4. With UCR, the total deposit of ink on paper is reduced, hence the set-off problems are minimized.

Showthrough or strikethrough and pipe roller buildup are reduced because lower-volumes of ink are used. This allows for the use of lighter weight papers.

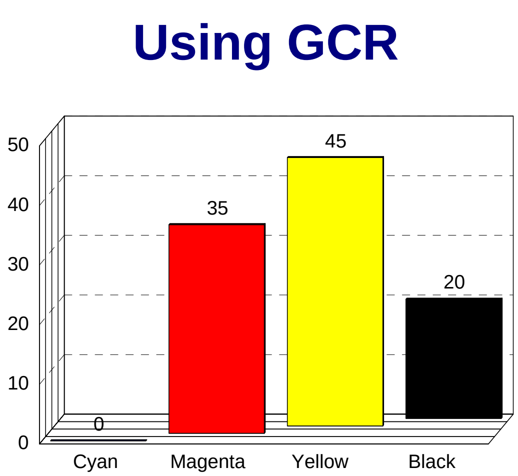
6. Because of the use of black, balancing the other three colors is less critical, especially in the shadow areas.

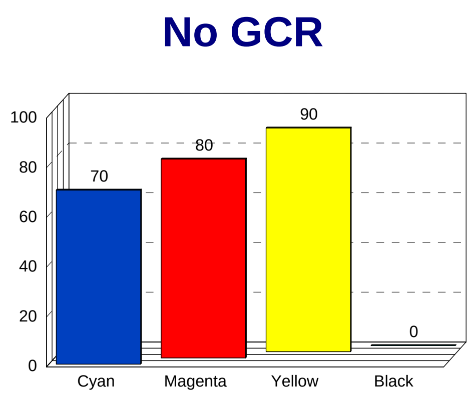
GCR

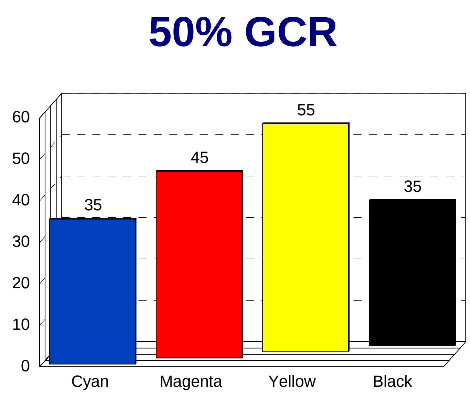


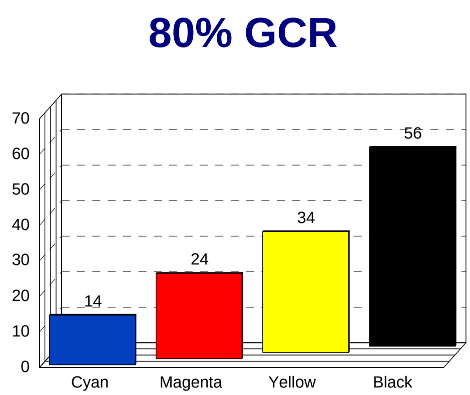
The theory behind GCR is that whenever dots of yellow, magenta, and cyan are present in the same color, there is a gray component to that color. That is, if the smallest of the three dot values were to be removed from the color, together with appropriate amounts of the other colors in order to produce a neutral gray tone, then that gray tone could be replaced with a dot of black.

For example, to produce a brown a balance of 30% cyan, 40% magenta, and 55% yellow could be used. By using GCR a similar color could be produced by removing the cyan and printing 35% magenta, 45% yellow, and 20% black (See Figure 1). The 3-color separation would require 125% of an ink film while the GCR separation would require only 100%.




No GCR
100
80
60
40
20
0
70
80
90
0
Cyan
Magenta
Yellow
Black


50% GCR
60
50
40
30
20
10
0
35
45
55
35
Cyan
Magenta
Yellow
Black


80% GCR
70
60
50
40
30
20
10
0
14
24
34
56
Cyan
Magenta
Yellow
Black

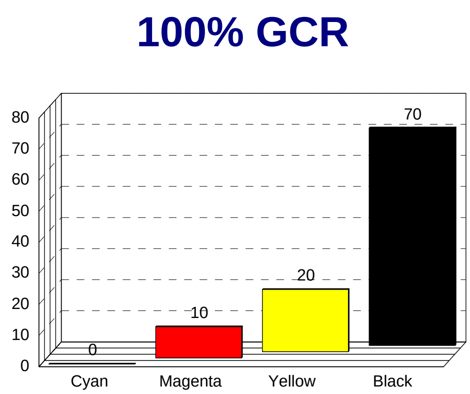


Figure 2

With the introduction of GCR, the function of UCR has become less prominent in the separation in a scanner. To better understand why this has taken place, let us discuss some of the differences between the two methods. UCR is mainly concerned with the removal of cyan, magenta, and yellow from the neutral areas of the original and replacing the three pigments with black. Originally UCR was referred to as the reduction of the process inks in the dark or near neutral areas of the print. Electronic UCR works satisfactorily with gray, but is deficient in colors close to the gray. With GCR, in addition to the function of removing cyan, magenta, and yellow from the neutral areas of the print, it is also possible to remove the gray component from all colors in the separation, from the highlight through the shadow areas and replace them with black. In other words, GCR consists of those components of the three colors in a reproduced color, which would have produced gray if it had been separated from the reproduction.

The percentage of GCR is related to how much of the tertiary color is removed. For example, if the tertiary color is fully removed, it is said that there is 100% GCR, if 80% of the tertiary color is removed, 80% GCR is said to be used. (See Figure 2).

GCR is given different names by various scanner manufacturers. Some of these are: PIR, Royal Zenith's Programmed Ink Reduction, CCR & PCR, Hell's complementary Color Reduction and Programmed Color Reduction, PCR, Crossfield's Polychromatic Color Removal, and ICR, Dainippon's Screen's Integrated Color Removal.

Advantages of GCR

1. Color ink consumption is reduced.

2. Dot gain fluctuation is generally less critical because most color shades are darkened with black, because only three colors are used to produce these shades as opposed to four.

3. The reproducible color space is better. Colors darkened with black show the changes in tonal range better compared to hue shifts caused when a third primary color is used.

4. Register problems are reduced because black is dominant and covers most outlines.

5. Trapping problems are minimized because the quantity of ink is reduced in all colors.

The percentage of GCR applied will depend on individual pressroom conditions, such as paper, ink, fountain solution, blankets, plates, etc. Separations with 40 to 60% GCR seem to be optimum at this point. It has been indicated that 100% GCR may create problems such as a white line around an object if the registration on the press is not perfect.

Appendix 7

PDF Settings for Newspaper Reproduction

What is PDF/X?

Adobe's Portable Document Format (PDF) has proven itself invaluable as a standard for distributing formatted documents that can be viewed and printed as designed on virtually any platform, but the optimal settings used to create, or "distill", a PDF document vary with the purpose for which it is created. For example, documents created for internet distribution and intended for viewing via a web browser are usually small, RGB, and low resolution to speed downloading and viewing, while still printing well on home printers.

On the other hand, PDF/X documents are created specifically for the purpose of high resolution print reproduction, and are considered "print ready." PDF/X-1a documents are completely self-contained. All fonts and images are embedded. All images are converted to CMYK, and are of the correct resolution for print. A PDF/X-1a document does not depend on any system resources or OPI to reproduce correctly. The appropriate viewing profile is embedded to enable soft-proofing. Everything it needs to print as it is viewed is built into the file, making it the electronic equivalent of a "slick" or separated film.

Built into current Adobe Distiller software as a drop-down menu item; use these default settings to create a document to SWOP Coated printing standards, PDF/X-1a:2001. Installing this PDF/X-1a:SNAP package will make creating an ad for insertion into a newspaper as easy as creating one for a slick magazine. This is a great timesaver to anyone who needs to create the same ad or page for several publications.

For example, the exact same file with placed RGB images may be Distilled once using the built-in PDF/X-1a:2001 default settings for a SWOP Coated publication, Distilled again with the PDF/X-1a:SNAP setting for newspaper, and even again using "Smallest File" for web distribution. For best results for all purposes, SNAP recommends an RGB workflow for images, with
advantages for all applications.

1. Smaller files. RGB image files in TIFF and EPS formats are 30% smaller than CMYK files. JPEG files, even when using minimum compression, save even more disk space and speed transfer times.
2. Fewer versions. Only one version of a page file with linked or embedded high resolution RGB images needs be created and archived, then Distilled to appropriate settings for each purpose as needed. There is no need to create multiple versions of converted images for different purposes.
3. Greater versatility. Toned, archived RGB images can be repurposed at a later date for any output, web or print, with no degrading conversions from one print profile to another.
4. Vector art built in CMYK, typically logos and colored type, maintains its assigned ink build and is not changed

Limitations

Acrobat Distiller does not convert the profile of CMYK images. There is no desktop PDF workflow that will convert placed CMYK raster art (photos) but not convert CMYK vector art. If configured to do so, exporting a PDF directly out of page software (skipping the postscript step) will convert all CMYK images and art, including the builds in logos and colored type. The versatility of this workflow is when RGB photos are placed, rather than CMYK. Distilling will also not up sample a low resolution image to high resolution. It will not take a low resolution image optimized for web distribution and magically turn it into high quality slick and glossy art. Distilling will down-sample images as specified, as in from coated specifications to newsprint or web.

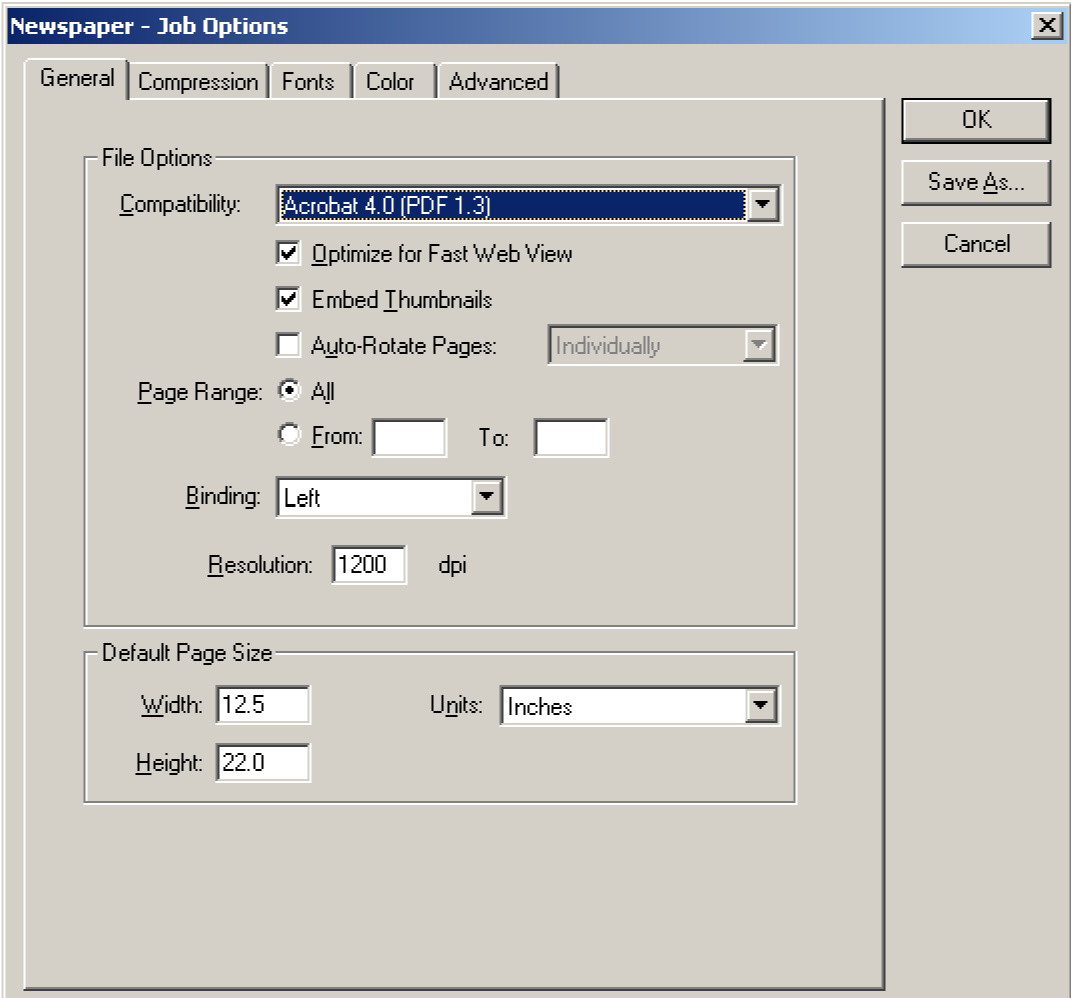
Installation

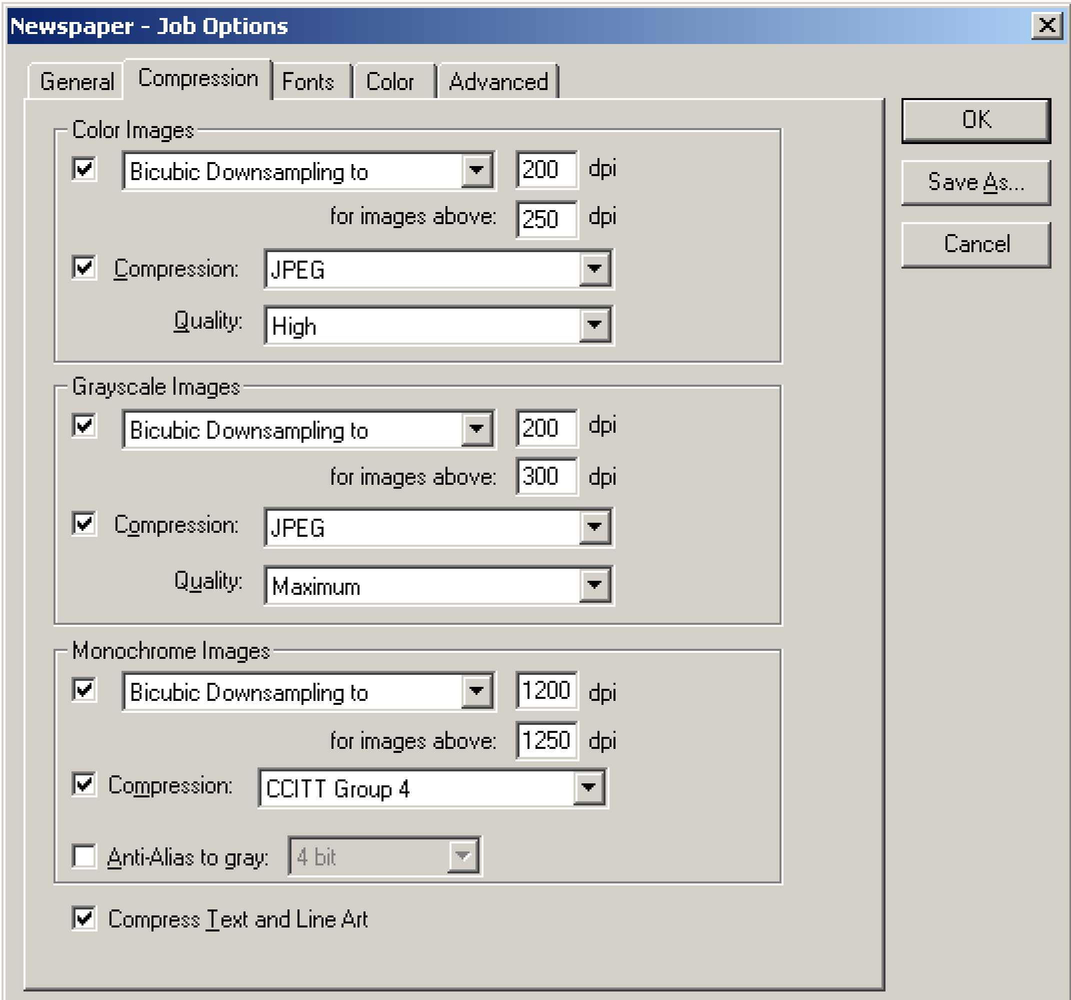
When either of the files pdfxsnap.zip (PC) and pdfxsnap.sit (Mac) are downloaded and double-clicked, they will open to create a folder (subdirectory) that includes an installation application and all the necessary parts to install the SNAP variation of the .joboptions settings for Adobe Acrobat Distiller for versions 6.0 and newer. There are three parts to the installation package: this README document, the SNAP press profile for converting RGB images to CMYK, and the job options file that defines the Distiller settings for creating PDF/X-1a documents to SNAP standards. If this does not work, then download the files “pdfx_snap.joboptions”, “SNAP 2007.icc”, “SNAP.csf”, and “Readme_install.doc” for instructions for manually loading the necessary parts to their appropriate directories. The file “SNAP.12.19.05.icc” is placed in Library: Application Support: Adobe: Color: Profiles. “PDFX1a 2001(SNAP).joboptions” is placed in Library: Application Support: Adobe PDF: Settings. Both will now appear in the appropriate drop-down menus.

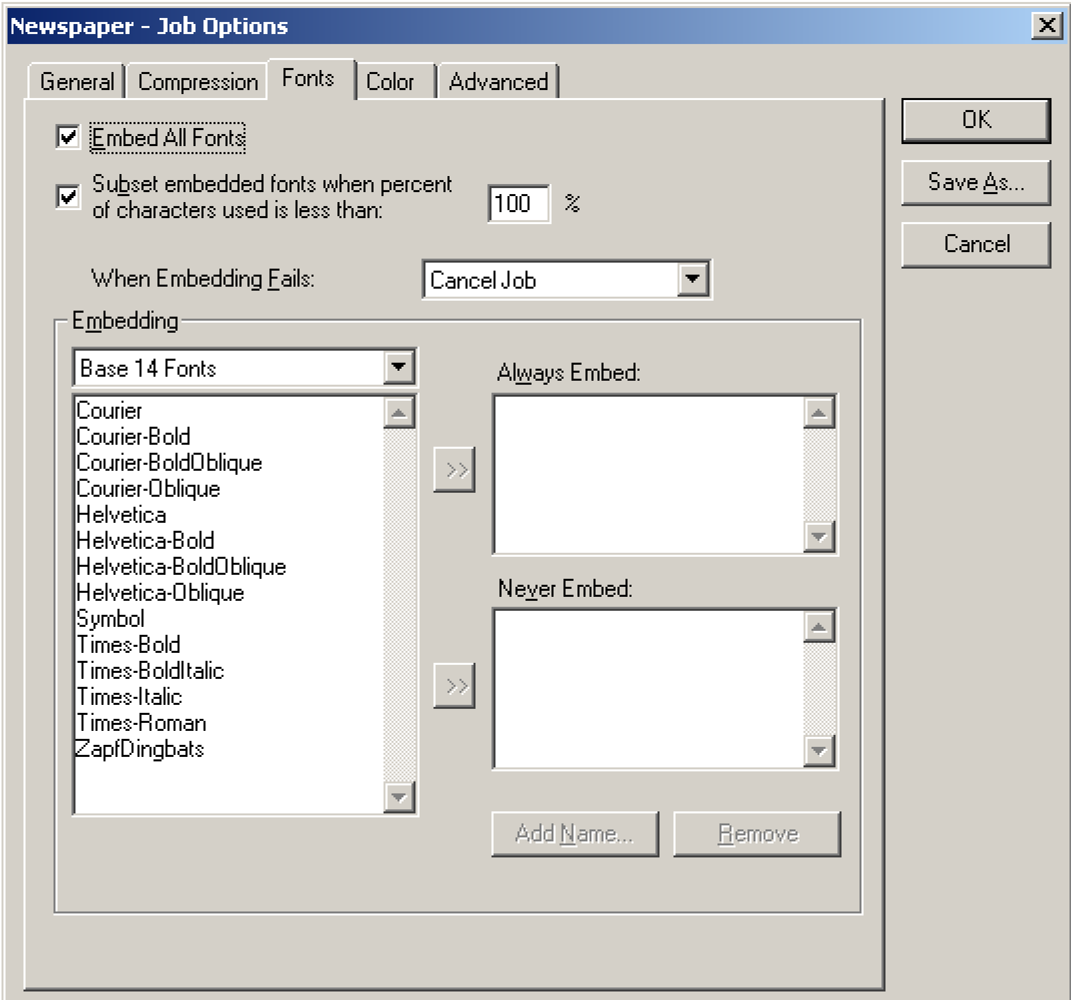
How to use

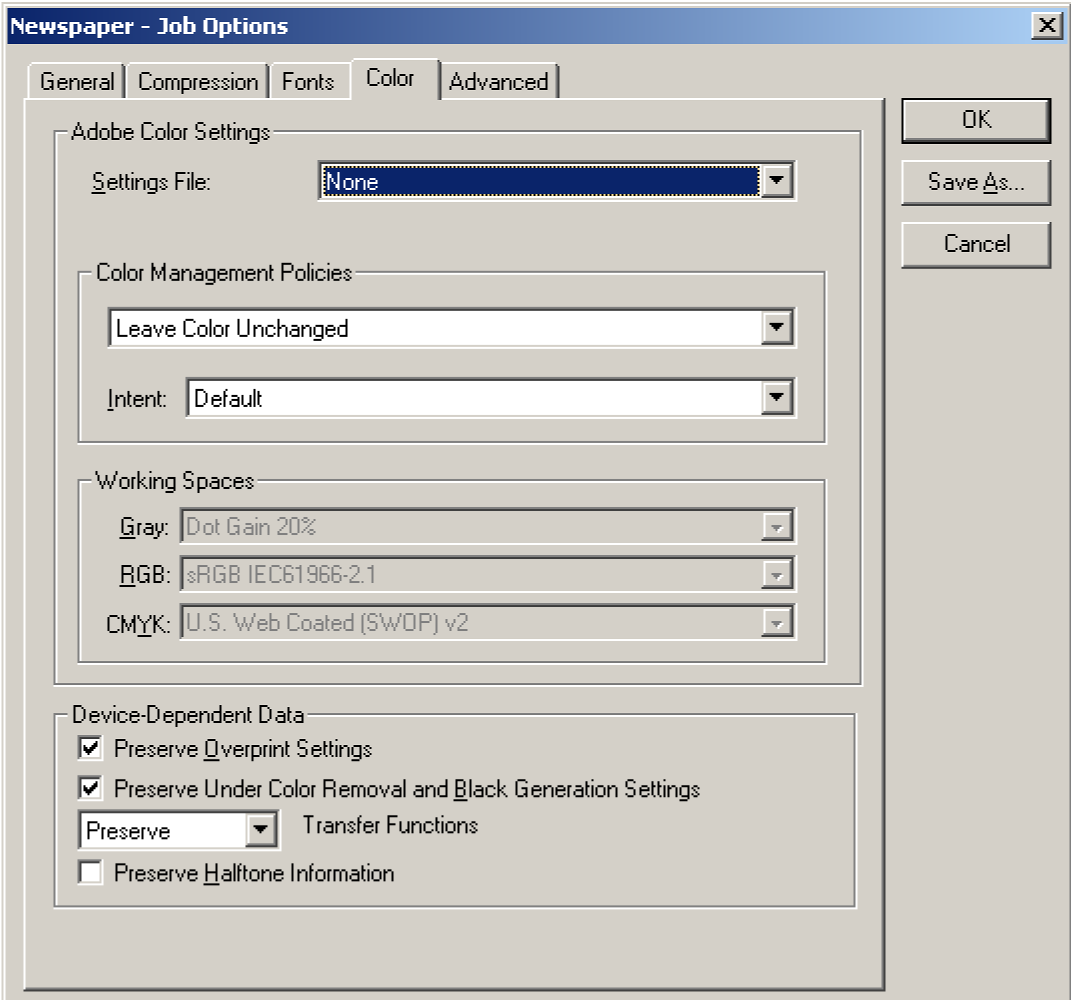
Photos should be placed as RGB. Color type and logos are placed as as CMYK. Distilling will convert the RGB to CMYK, but will not alter the CMYK builds.
Export as EPS selecting to leave all colors unchanged. Choose the appropriate Default Settings .joboptions from the drop-down menu, and distill.

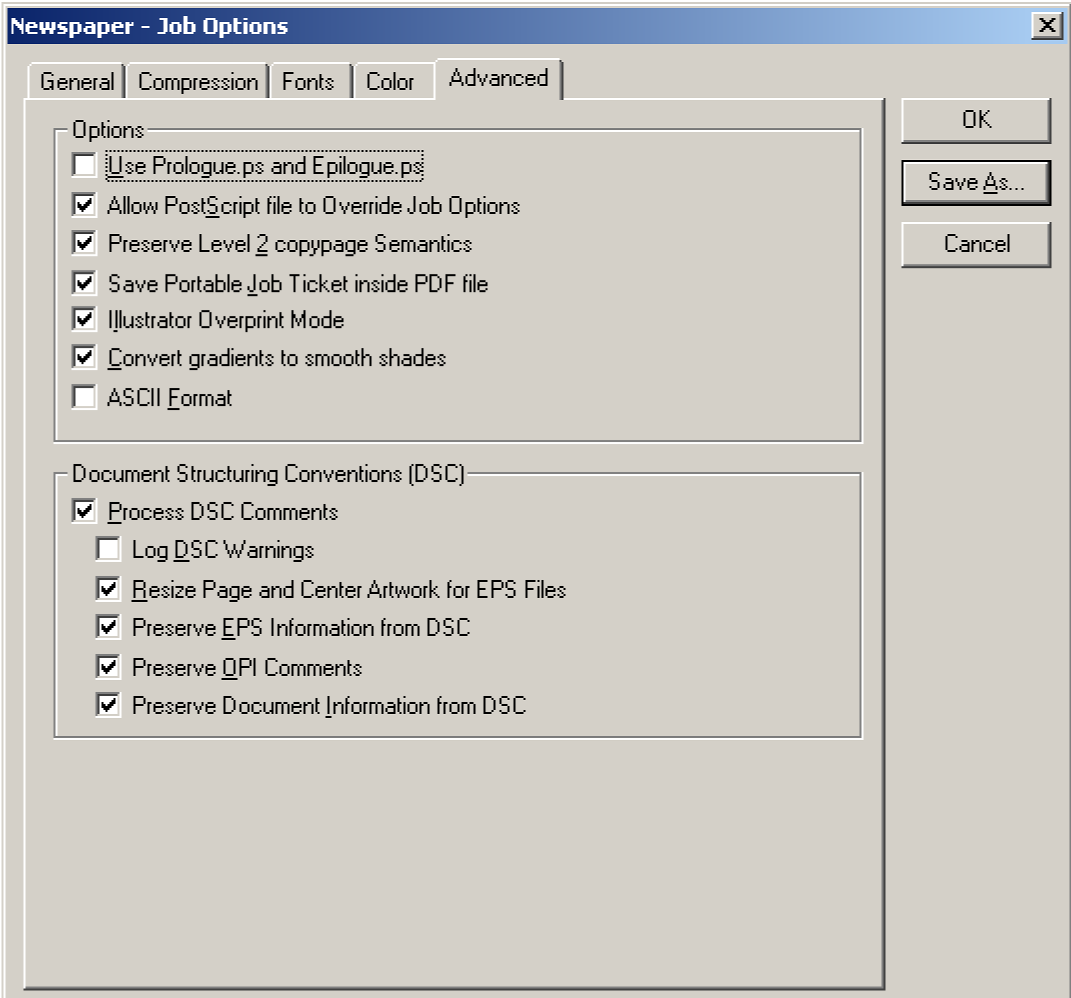
Postscript Settings for Photoshop




Newspaper - Job Options
General
Compression
Fonts
Color
Advanced
OK
Save As...
Cancel
Color Images
Bicubic Downsampling to
200
dpi
for images above:
250
dpi
Compression:
JPEG
Quality:
High
Grayscale Images
Bicubic Downsampling to
200
dpi
for images above:
300
dpi
Compression:
JPEG
Quality:
Maximum
Monochrome Images
Bicubic Downsampling to
1200
dpi
for images above:
1250
dpi
Compression:
CCITT Group 4
Anti-Alias to gray:
4 bit
Compress Text and Line Art


Newspaper - Job Options
General
Compression
Fonts
Color
Advanced
OK
Save As...
Cancel
Embed All Fonts
Subset embedded fonts when percent of characters used is less than:
100
%
When Embedding Fails:
Cancel Job
Embedding
Base 14 Fonts
Courier
Courier-Bold
Courier-BoldOblique
Courier-Oblique
Helvetica
Helvetica-Bold
Helvetica-BoldOblique
Helvetica-Oblique
Symbol
Times-Bold
Times-BoldItalic
Times-Italic
Times-Roman
ZapfDingbats
Always Embed:
Never Embed:
Add Name...
Remove


Newspaper - Job Options
General
Compression
Fonts
Color
Advanced
OK
Save As...
Cancel
Adobe Color Settings
Settings File:
None
Color Management Policies
Leave Color Unchanged
Intent:
Default
Working Spaces
Gray:
Dot Gain 20%
RGB:
sRGB IEC61966-2.1
CMYK:
U.S. Web Coated (SWOP) v2
Device-Dependent Data
Preserve Overprint Settings
Preserve Under Color Removal and Black Generation Settings
Preserve
Transfer Functions
Preserve Halftone Information



Postscript Settings for InDesign 2.0

These are the *Export EPS* settings as part of an RGB workflow, InDesign to EPS to Acrobat Distiller, using customized PDF or PDF/X-1a settings for each intended use/press. The key to a successful RGB workflow is **unchanged color** at the eps step. CMYK conversion of placed RGB images is configured in Distiller, rather than upon export from the page program.

This may display in other software as *Leave* (color) *As Is* or *Leave Unchanged,* but not *Device N.*

Appendix 8

CtP Plate Rub Back Procedure for RIP Transfer Curve Calibration

Summary:

This procedure assumes that the CtP unit, plate processor and chemistry are already set to nominal specifications for the equipment/substrate combination.

Once the equipment is operating at specification, this procedure is used to determine the RIP transfer curve settings to result in linear percent output to a rubbed back plate (i.e. 50%=50%, 40%=40%, n%=n%…) During RIP transfer curve calibration, the plate rub back procedure is applied to replicate the dot loss on press after 5000 impressions of printing.

The percent targets on a machine processed plate are firmly rubbed back with developer soaked Photex wipes. Then the surface of the plate is wiped clean and dried using fresh Photex wipes. Rubbed back plates are used to take the measurements with an appropriate plate dot reader. (Note: densitometers are not plate dot readers, a plate dot reader is a specific instrument designed for reading percent dot on this substrate) Plate rubbing back and adjustments of the RIP transfer curve are done until the rubbed back plate is at least within 1% from the target (i.e. 50% target should read 50% ± 1% on rubbed back plate).

Materials:

Figure 1 Materials

Protective Gloves

Goggles

Non lint wipes such as Photex wipes

BBA Nonwovens at (800) 338-7954.

Photex Scanner Wipes – Item 548026, 9 inch x 13 inch, 100/box

Plate dot reader

Developer in an appropriately labeled squirt bottle

Procedure

Ensure the CtP imager and processor is set up to specification and with fresh chemistry.

Set the RIP transfer curve to linear (i.e. 50%=50%, 40%=40%, n=n…). Different RIPs use different terminology and procedures for creating transfer curves but they usually all start with an uncalibrated linear curve.

Output a plate from each CtP line using the percent dot linearization image.

Measure the plate using the plate dot reader. The patches, 1% through 99%, are to be read and recorded immediately after the plate has exited the processor (before rubbing back). Set dot patches to match the rip curve calibration chart for your software.

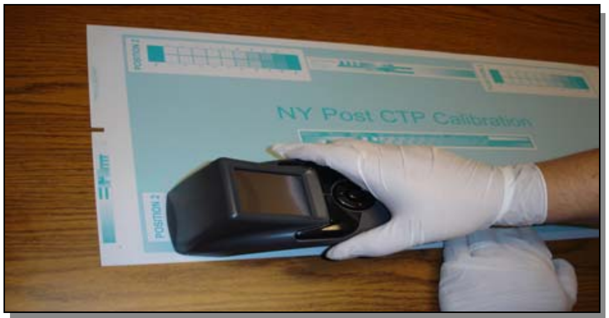


Figure 2 Measuring a Plate

Wearing rubber gloves and goggles, place one plate on a flat surface, take a few Photex wipes and liberally dampen them with plate developer.

Figure 3 Photex Wipes being dampened with Plate Developer

Firmly rub back the percent dot area on the plate. Don't be shy with the rubbing back– the printing press will be very aggressive on the plate – use as much force as would be used to scrub a dirty pan caked with burned food.


Figure 4 Rubbing back the Plate

Dry the rubbed back area using a fresh Photex wipe.
Re-measure and record (1%-99% patches) the rubbed area using the plate dot reader. Depending on the plate system characteristics, this can be up to 5-12 percent different than the intended value at certain percent dot readings.

If the output is not linear within ±1 percent of the intended value, adjust the RIP transfer curve and enter the necessary values.

Output a plate after adjustment has been made to the CtP system and confirm linear results (1% tolerance from target for all patches).

Repeat the steps until the rubbed back plate is within 1% from the target (i.e. 50% target should read 50% ± 1% on rubbed back plate)

Tips: Linearization should be performed for every color.

If the RIP is not connected directly to the CtP device and it services many CtP devices, measure the plates from the different CtP devices used in the operation and average the results to develop a compromise RIP transfer curve.
If multiple RIPs are used to create files for a CtP device (a RIP Farm), ensure that they are all programmed to use the same transfer curves.

Glossary

ABSORPTION (1) Optical term for the partial suppression of light in passage through a transparent or translucent medium or material. (2) The property of a porous material, such as paper, which causes it to take up liquids with which it is in contact.

AD/FLEX™ Standard Flexo color inks tested and approved by the Newspaper Association of America (NAA) for process and spot color reproduction.

AD-LITHO Standard Lithographic color inks tested and approved by NAA for process and spot color reproduction.

AdPro® Standard Letterpress color inks tested and approved by NAA for process and spot color reproduction.

AIM (AIM POINTS) The targeted values that the process should be managed to achieve in a consistent manner. SNAP recognizes that every process must anticipate variation, which is reflected by inclusion of tolerances. SNAP also recognizes that every process needs a target or aim point at which the process should be operated.

ANSI The American National Standards Institute (ANSI) is a nonprofit organization that provides administrative support to standards development activities within the United States. It is the sole U.S. member body to the International Organization for Standardization (ISO) and is the organization through which all official U.S. input to ISO takes place. It has four basic functions: (1) facilitate U.S. standardization policy developments (2) accredit national standards developers (3) promotes U.S. standards interests globally and (4) provides information and training on standardization.

APERTURE A small opening. In cameras, the aperture is usually variable in the form of an iris diaphragm and regulates the amount of light which passes through the lens.

BASIS WEIGHT The number of pounds per ream of paper of a stated size. The weight of 500 sheets of 24 X 36 paper for newsprint (other paper types vary in basis size). The standard basis weight of newsprint is typically 28 to 30 pounds.

BLANKET A sheet of rubber reinforced with fabric that is used on an offset press to transfer the image from the plate to the paper.

BLEED Printed colors that run all the way to the edge of a page. To accommodate the bleed, the printer must make the bleed area larger than the final trim size. The page is then trimmed right through the bleed area. This cannot be done on a normal newspaper run but can be done using commercial coldset press equipment.

BLEND Sometimes called a vignette or degrade, a blend is a halftone image tint in which the background or a portion of the illustration gradually shades off until the lightest tones or extreme edges appear to merge either with a second blend printed using a different color or with the paper on which the one-color is printed.

BRIGHTNESS According to the GATF Encyclopedia of Graphic Communications, brightness in printing refers to the amount of lightness or darkness in the printed image, described apart from the hue and saturation of that image. In papermaking, brightness is an optical property of paper that describes its reflectance of blue light, typically at a wavelength of 457 nanometers, which is the wavelength at which the yellowing of paper is most easily gauged.

BLUE LINE A single-color (dark blue image on a light blue or off-white background) photographic proof created for checking the accuracy of layout and position before the printing plates are made.

BROADSHEET A full-sized newspaper page. It has no standard dimensions but is between 12 to 16 inches wide by about two feet long. The actual size depends on the size of the web used and the cutoff of the printing press. In commercial printing, the broadsheet product is sometimes referred to as a "Standard."

CGATS The Committee for Graphic Arts Technologies Standards (CGATS) is the accredited standards development committee under ANSI responsible for graphic arts industry standards. The mission of CGATS is to have the entire scope of printing and publishing technologies represented in one national standardization and coordination effort, while respecting the established activities of existing accredited standards committees and industry standards developers. It is charged with the overall coordination of graphic arts standards activities and the development of graphic arts standards where no applicable standards developer is available.

CHARACTERIZATION TARGET A target that is scanned or imaged and then measured in order to characterize (also referred to as to map or to describe) the range or gamut of colors that a scanner or camera can perceive, an imagesetter or platesetter can image, or a proofer or printing press can depict.

CIE The Commission Internationale de l'Eclairage (in English: International Commission on Illumination). It is a technical, scientific, and cultural non-profit organization whose objectives are to provide an international forum for discussion of all matters relating to science, technology, and art in the fields of light and lighting; for the interchange of information in these fields between countries; and for the development of basic standards and procedures of metrology in the fields of light and lighting.

CMS Color Management System (CMS) refers to a software program that compensates for the different color characteristics of input devices such as scanners and digital cameras and output devices such as imagesetters, digital proofers, and printing presses.

COLDSET PRINTING Printing process sometimes referred to as non-heatset and open web that prints only on uncoated papers and typically on uncoated groundwood sheets such as newsprint, using ink systems that rely primarily on absorption and to a lesser degree oxidation first to set and then to dry.

COLOR BARS Printed tonal scales of the process colors used to monitor ink density, dot gain/tone value increase, and other print characteristics on proofs and printed sheets.

COLOR MANAGEMENT A process that draws on characterization targets and CMS software as tools to translate and map the gamut of colors achievable using each component of the reproduction system--e.g., digital and conventional cameras, scanners, imagesetters and platesetters, and proofing systems and printing press--with every other component of the system. The goal of CMS is to provide predictable, consistent, and efficient color and tone compression as an image moves through the graphic arts process.

CONTENT PROOF Sometimes called a position proof. It is a color or black and white image, either hard copy or softcopy, used to verify the content of the film or file.

CONTRAST The difference of tonal graduation between the light and dark areas within an image.

CONTINUOUS TONE (CT) According to the GATF Encyclopaedia of Graphic Communications, continuous tone, sometimes referred to as contone, is essentially a photographic image that is not composed of halftone dots. Examples include photographs, transparencies, and digital proofs that do not employ halftones, such as xerographic, dye transfer, and ink jet proofing systems. The term continuous tone also refers to a digital image that has been scanned prior to being screened into halftone dots. Continuous tone also refers to a bitmap file of a scanned image.

CRM Certified Reference Material, which is a material such as a plaque, tile, or other designated reflective or transparent target that is traceable to national and international standards and which users can employ to verify the accuracy and precision of a measurement device such as a densitometer.

DMAX The area of maximum density (darkest area) of a reflection or transmission photographic material.

DMIN The area of minimum density (lightest area) of a reflection or transmission photographic material.

DENSITOMETERY A method of measuring density, dot gain/tone value increase, and other characteristics. Densitometers are the name of the device used to measure the transmission or reflectance of specific colored light through or from transparent or reflective copy samples.

DENSITY The light-absorbing property of a material, expressed as the logarithm of the reciprocal of the reflectance or transmittance factor; higher density indicates more light is absorbed.

DENSITY, ABSOLUTE A measurement of light reflected from a target or other patch that includes the density of the substrate on which the ink, colorant, or material being imaged appears.

DENSITY, REFLECTION A measurement of light reflected from a target or other patch imaged on a substrate such as paper, boxboard, or some other opaque surface.

DENSITY, TRANSMISSION A measurement of light transmitted through a target or other patch imaged on a substrate such as clear polyester film, glass, or some other translucent surface.

DENSITY, RELATIVE A measurement of light reflected from a target or other patch that excludes the density of the substrate on which the ink, colorant, or material being imaged appears

DIGITAL COLOR CUTTING The process of digitally creating flat tints that, when overprinted, mimic but do not duplicate the appearance of the process color reproduction. Sunday and publication comics as well as newspaper inserts represent markets that make use of this process.

DIRECT LITHOGRAPHY In contrast to offset lithography, which uses a blanket to carry the image from the plate to the paper, direct lithography is the method of printing lithographically by direct transfer of the ink from the plate to the paper. In conventional offset lithography, the image on the plate is in the same direction as that of the printed result (RRED – right-reading emulsion down). For direct lithography, the image area must be inverted to produce the correct direction on the printed result (WRED – wrong-reading emulsion down). The emulsion side should always be down or next to the plate when the burn is made.

DOT GAIN/TONE VALUE INCREASE (TVI) An attribute of printing wherein the halftone dot size increases through successive stages of the reproductive process. Total Dot Gain, sometimes called Apparent Dot Gain, describes the combined effects of both the mechanical and optical increases in tonal rendition. It represents the difference between the halftone dot on the film or specified in the file and the appearance of that halftone dot on the piece being measured. As the industry embraces digital workflows and digital imaging methods that do not employ halftones, the term *tone value increase* is being recognized as the more inclusive term to describe this phenomenon.

DOT AREA (APPARENT)/TONE VALUE More accurately referred to as Apparent Dot Gain/TVI. When measured objectively using a reflection densitometer or similar device, it refers to the size of the halftone dot, including mechanical plus optical components, that is imaged or reproduced on opaque materials. The Apparent Dot Area/Tone Value minus the halftone dot on the film or specified in the file equals Dot Gain/Tone Value Increase.

DOT AREA, FILM: When measured objectively using a transmission densitometer or similar device, it refers to the size of the halftone dot, including mechanical plus optical components, that is imaged or reproduced on translucent materials.

DOT GAIN CURVE The name for a graph illustrating dot gain values reproduced from highlight and quartertones values through midtones and three-quartertone values and including solids by an imaging device, including a digital or analog proofing system or a printing press.

dpi Dots per inch (dpi), sometimes referred to as spots per inch (spi), is a measure of the resolution of the printer, imagesetter, platesetter, or other output device.

DRYBACK The change in the print density from the time of printing as the ink is absorbed into the sheet of paper. Densities typically decrease in value as dryback occurs.

EPS Encapsulated PostScript (EPS) is a file format developed by Adobe Systems Inc. According to the GATF Encyclopedia of Graphic Communications, the EPS format provides an output device-independent PostScript representation of page, graphic element, or other object. In addition to including a low-resolution bitmap file of the page or image to permit quick on-screen viewing, EPS files are able to image smooth lines and curves at the output resolution called for using the output device.

FILE COMPRESSION According to the GATF Encyclopedia of Graphic Communications, file compression, in computing, refers to a means for reducing the size of a file so that it occupies less space when stored or takes less time when transmitted.

FILE TRANSMISSION Sending, or transmitting, a digital file from one computer to another computer using copper or fiber optic land-based lines, satellites, and other means.

FINAL PROOF A color or black and white image, either hard-copy or soft-copy, used to predict the final job on press.

FOR POSITION ONLY For Position Only (FPO) refers to physical or electronic images included on a hard copy or electronic mechanical to indicate only the position of the final artwork or scan and which are not intended to print. When employed, they are placeholders in the page or on the file for high-resolution images or alternate text, graphics, or pictures.

GAMUT According to the GATF Encyclopedia of Graphic Communications, gamut, sometimes referred to as the color gamut, is the range of colors that can be reproduced with a specified set of inks or other colorants on a specified paper or substrate while using a designated printing press or other imaging device.

GRAMMAGE The weight in grams of a single sheet of paper with an area of one square meter.

GRAY BALANCE The relationship of cyan, magenta, and yellow inks required to reproduce a neutral gray scale within a given printing system.

GRACoL General Requirements for Applications in Commercial Offset Lithography

GRAY COMPONENT REPLACEMENT (GCR) An electronic color scanning capability in which the least dominant process color is replaced with an appropriate value of black in process work. Any color which is reproduced using all three chromatic process inks may be thought of as having a neutral component. This is defined by the lowest tone value and its gray balance equivalents of the other two inks. It is possible to replace all or some of the neutral component by black ink. GCR and UCR (Under Color Removal) are two techniques for achieving this. UCR is limited to near-neutral colors only, whereas GCR generally provides no such limit.

GRAY SCALE A strip of standard gray tones, ranging from white to black. In the case of color-separation negatives for determining color balance or uniformity of the separation negatives.

GUTTER The inside margin of a newspaper. On the plate cylinder, the space between the head and toe of the plate or plates. On a tabloid plate, the space grooved for the inside margin, the center fold, of the paper.

HARD COPY A physical document of the image on some substrate.

HALFTONE An image having a tone pattern composed of round, square, elliptical, or a combination of dots of uniform density but varying in size.

HIGHLIGHT The lightest tonal areas in a halftone or color separation film and reproduction. Highlights encompass halftone values ranging from 1% to 15% dots.

HUE ERROR Hue error indicates a deviation from a theoretically perfect process hue.

HUE One of the three attributes of color, the others being saturation and brightness. Hue is determined by the color’s dominant wavelength in the visible color spectrum.

ISO The International Organization for Standardization (ISO) is a worldwide federation of national standards bodies from over 100 countries. Its mission is to promote the development of standardization and related activities in the world with a view to facilitating the international exchange of goods and services, and to developing cooperation in the spheres of intellectual, scientific, technological, and economic activity. The ISO Technical Committee responsible for the graphic arts is TC 130.

KELVIN In printing, a unit of measure used to describe the color temperature of a light source, such as the 5000 degrees K standard viewing condition.

LINE COPY According to the GATF Encyclopedia of Graphic Communication, line copy, sometimes referred to as line art, is text or artwork containing no tonal values, or shades of gray, and which can be imaged or printing without the need for halftone screens.

LIVE AREA Sometimes referred to by commercial printers as finished page size.

lpi Lines per inch is a measure of the frequency of the halftone screen used to print an image.

MAKEREADY Tasks such as installing the web through the press, changing or washing blankets, hanging plates, achieving proper densities, and registering completed colors to the printing press prior to printing salable copies for a job.

MIDTONE The middle tonal areas in a halftone or color separation film and reproduction. Midtones encompass halftone values ranging from 40% to 60% dots.

MOIRE Undesirable patterns occurring when reproductions are made from halftone proofs or steel engravings. These are caused by conflict between the ruling of the halftone screen and the dots or lines of the originals and usually are due either to incorrect screen angles or to misregister of the color impressions during printing.

MURRAY-DAVIES EQUATION The equation specified by SNAP to calculate dot gain/tone value increase.

NEWTON RINGS An objectionable series of irregular colored circles caused by the prismatic action of interfacing different smooth surfaces together, such as in contact frames, and on other scanner cylinders.

OPACITY The measure of the amount of light which will not pass through a substrate or ink.

ORTHO RESPONSE Descriptive of the sensitivity of photographic films or other photosensitive materials to *blue*, *green*, *yellow*, *orange*, and *ultraviolet* light, but not to *red* light. An advantage of orthochromatic film is that it can be handled safely in a red darkroom light, unlike *panchromatic* film, which is sensitive to light of all wavelengths.

PDF Portable Document Format, or PDF, is an updated page description software published by Adobe Systems Incorporated, the software company that created PostScript™.

POINT Each pica measure is broken down to 12 points per pica.

PPI Pixels per inch in a digital file. Each pixel represents the smallest tonal element in a digital imaging system.

PRINT CONTRAST A method of evaluating and optimizing the *density* of the ink deposited on the *substrate* during printing. The ink strength--or print contrast--is determined to take into account the solid ink density, the density of the ink in *shadow* areas of the image, and the *dot gain*. Print contrast is calculated by measuring the ink density of a solid area and the ink density in a 75% tint.

PRINT DENSITY The light absorbing ability of the printed image or base material.

QUARTERTONE In imaging and photography, the portions of an image (such as a photograph) with tonal values between those of highlights and middletones, containing halftone dot sizes of approximately 25% dot area.

RASTER IMAGE PROCESSOR (RIP) A device which converts an image into a bit-map suitable for *Digital printing* (Computer-to-print). The electronic bit-map indicates every spot position on a page in preparation for an actual printout.

REGISTER Exact correspondence in the position of individual separations/plates in color printing.

REGISTER MARKS Small crosses, guides, or patterns placed on the originals before reproduction to facilitate registration of plates and their respective printing.

RESOLUTION The capability of making distinguishable the individual parts of an alphanumeric or other image.

SCREEN ANGLE Any of the particular angles at which a halftone screen or the original itself is placed for each of the color separation negatives, in order to prevent formation of interference patterns (moiré') in the completed color reproduction. Angles of 30^{o} between colors produce minimum patterns.

SCREEN RULING In halftone photography, the number of lines of *dots per inch* on a halftone screen. Each line (or row) and each column contain a certain number of dots at a particular density.

SEPARATION Sometimes referred to as Color Separation. (1) In color photography, the isolation or division of the colors of an original into their primary hues, with each record or negative used for the production of a color plate. (2) The act of manually separating or introducing colors in printing plates. In lithography, direct separations are made with the use of the halftone screen; indirect separations involve continuous-tone separation negatives and screened positives made from these.

SNAP Specifications for Newsprint Advertising Production. SNAP outlines pre-press and printing specifications for coldset offset, letterpress, and flexographic printing on uncoated groundwood sheets (newsprint).

SOFT COPY A screen presentation of the image on a display monitor.

SOLID INK DENSITY (SID) In imaging and *color*, the perceived darkness of a substance, material, or image caused by the absorption or reflection of light impinging on the material.

SPECIFICATION A precise statement of a set of requirements to be satisfied by a material, product, system, or service that indicates the procedures for determining whether each of the requirements is satisfied.

STANDARD A printed product sometimes referred to as a broadsheet, it is a common printed product format used by commercial coldset printers, typically having a 21" height and 10" to 15" width.

STATUS T A standard, wide-band densitometric response specified in ISO 5/3 and ANSI PH2.18 to be used for color measurements in the graphic arts.

STOCHASTIC A type of digital halftone screening that varies the pattern of dots while keeping the size of the dots constant.

SWOP® Specifications for Web Offset Publications. SWOP outlines pre-press and printing specifications for heatset web offset and gravure printing on coated groundwood No. 5 paper.

TABLOID A newspaper or commercial product with a page size one half or less the broadsheet/standard page size of the press, about 1/2 of the size of the standard newspaper page size.

TAGGED IMAGE FILE FORMAT (TIFF) In computer graphics, TIFF is the most commonly used *file format* for saving and transporting bitmap images. Essentially, TIFF saves an image with little information beyond the values of the pixels contained in the image, and a header (or tag) describing the output size and the resolution of the image.

THREE-QUARTERTONE In imaging and photography, the portions of an image (such as a photograph) with tonal values between those of *middletones* and *shadows*, containing *halftone* dot sizes of approximately 75% *dot area*.

TONAL RANGE Alternate term for density range, or the gamut of tones in an original or reproduced image.
Density range: expressed as the difference between the area of maximum density (the darkest portions of an image) and the minimum density (the lightest tones).

TONE VALUE The percentage of an area on a film or print or in a digital file to be covered by colorant. Also known as apparent dot area.

TONE VALUE INCREASE (TVI)/DOT GAIN Difference between the tone value on a print and the corresponding value on a halftone film or in a digital file. Also known as dot gain.

TONE VALUE SUM The sum of the tone values on all the color separations in the darkest area of an image. Also know as total area coverage.

TOTAL AREA COVERAGE (TAC) The sum of the tone values on all the color separations in the darkest area of an image.

TRAP (APPARENT) The ability of a printed ink film to accept the next ink printed on top of the first.

TRAP (IMAGE) In multicolor printing, an allowance of overlap for two colors printed adjacent to each other as a means of compensating for misregister and to avoid gaps between colors.

TRAP (INK) The action of printing an ink film on top of another ink film.

UGRA PLATE CONTROL WEDGE A test target used to control the plate-making process. The five elements of this target measure exposure level, resolution, minimum dot sizes, tone reproduction, and directional effects of imaging.

UNDERCOLOR REMOVAL (UCR) A form of process color reduction that decreases the dot sizes of the cyan, magenta, and yellow inks in the neutral shadow areas and compensates by increasing the dot size of the black printer. See GCR.

UV RESPONSE Descriptive of the sensitivity of photographic films or other photosensitive materials to *ultraviolet* light.

VELOX A positive image reproduction imated on to paper using a camera, exposure frame, or imagesetter.

VIGNETTE (Also known as Fade Away) (1) A small decorative design or illustration of any kind on or just before the title page, or at the beginning or end of a chapter of a manuscript or book. (2) An original piece of copy. (3) Halftone printing plate of impression in which the background or a portion of the illustration gradually shades off until the lightest tones or extreme edges appear to merge with the paper on which they are printed.

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