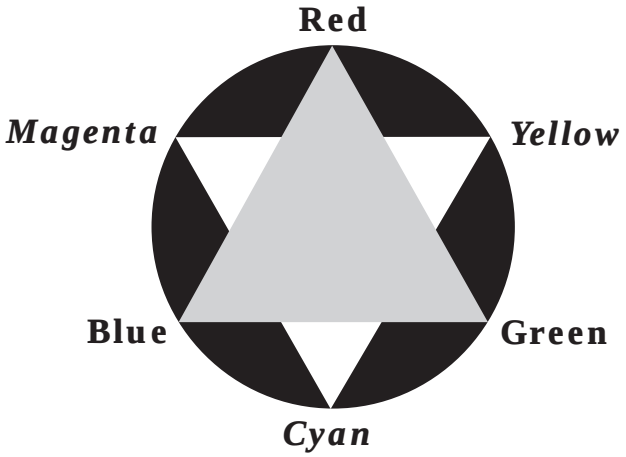
Filters for Black and White Film

Colored filters are used in Black and White photography to change the way tones of a scene record on film. Yellow filters are commonly used to deepen the tone of a blue sky. Because the light coming from clouds is white, it is not affected by the filter like that from the blue sky. Hence a yellow filter causes clouds to stand out more than usual. Many authorities believe that the effect caused by the yellow filter is closer to the tones perceived by the human eye.

A filter will pass its own color and block its complementary color. Note that blue and yellow are on opposite sides of the color wheel, meaning that they are complementary colors. That's why yellow filters darken blue skies. Because skies are actually more cyan than a true blue color, a red filter has a more dramatic effect than yellow for darkening skies. Because a filter passes light of its own color easily, it records as a light tone in the print. Hence, a red filter causes red things to have a lighter tone in print than usual. For a really spectacular effect, try photographing autumn leaves through either a red or orange filter to darken the sky, and make the leaves almost white.



The color wheel shown can be used to predict the degree of effect that a filter might have on another color. The colors on the opposite side of the color wheel from the filter color will be darkened most in the print. Less effect will be seen as the colors progress around the wheel toward the filter color.

Polarizing filters usually do not have a color, but have a profound effect on photographs having reflections. They are commonly used for eliminating the reflections from store windows, but they can also be used to darken the tiny reflections coming from leaves and blades of grass. Additionally, they can be used to see below the surface of water by reducing the reflected sky light.

Because filters are not clear, they reduce the light reaching the film. Exposures must be increased to compensate for the reduced light. It is safe to use the through-the-lens camera meter for lighter colored filters, however it is advisable to use a manual correction for deeply saturated filters. The light meters in most cameras are overly sensitive to some colors of light (especially reds and oranges), and may indicate a false reading that will lead to the dreaded underexposure. When using saturated color filters, it is best to meter without the filter, and then apply the appropriate correction to the reading. Alternatively, you can compare readings made with and without the filter to see if you are in agreement with the published correction factor. Be sure to meter a white or grey object for this comparison; colored objects will adversely affect the results. If the correction factor is not in agreement, you can increase or reduce the ASA/ISO set on the camera to provide automatic compensation. Some exposure corrections for common B/W filters are provided in the accompanying chart.

Real Life Example

My Minolta SRT 201 indicates 1/8 sec. when metering a light grey object without a filter, and indicates 1/2 sec. at the same aperture with a number 25 Red filter placed over the lens. This is only a 2 stop difference. The true correction is 3 stops for this filter, so I must give the film one stop more exposure than the meter

indicated with the filter in place. If I don't, I will get negatives underexposed by one stop. Because doing the extra math for each exposure is a nuisance, I cut the film speed (ASA/ISO) to half of my normal to automatically give the film the missing stop. After doing this, I can meter and shoot with the correct exposure indicated automatically.

A Practical Test to Find a Personal Filter Factor

Manufacturers base their suggested filter factors on average films, lighting conditions and subject matter. Using their guidelines is often better than metering through the filter and blindly using what the camera suggests, as illustrated by the example above. However, some critical photographers make tests of the filters that they use to find a *personal filter factor* that may be more correct than the manufacturers' guidelines, especially if they frequently use unusual films or lighting conditions (ie., florescent lights indoors, etc.). The test is simple and requires exposing only a few frames on a roll, and making a contact sheet.

Step 1: Obtain a grey card and place it in the light that you will use most often. This is daylight for most people.

Step 2: Focus the camera at infinity, and fill the frame with the grey card. Make an exposure without the filter in place. Write down the settings used.

Step 3: Place the filter over the lens. Make another exposure using the manufacturer's suggested filter exposure correction. Bracket this exposure by a couple stops in 1/2 stop increments. Write down all exposures in the order you made them.

Step 4: Process the roll of film normally and make a contact sheet showing the test exposures.

Step 5: Find the exposure that matches the tone of the first (no filter) exposure. From your notes, find how many stops different the two exposures were. This is your personal filter factor to use with that filter.

Because most photographers use average films and average lighting conditions, they may not find a departure from the corrections suggested by the manufacturer. However, Kodak's new T-Max films have extended red sensitivity, and would be good candidates for personal tests using red or orange filters. Because they "see" red easier than most films, they may not have as large a correction using a red or orange filter. You can now find out for yourself!

Assignment:

Part One: Obtain a filter for your lens. Any color will do. If you choose a yellow filter, make sure that you photograph something containing blue, i.e., blue sky. If you choose another filter type, be sure the scene contains something of its complementary color. Make two photographs - one with a filter and one without a filter. Discuss the differences between the two photos and explain why.

Part Two: Meter a grey or white subject with the filter and without the filter in place. Note and record the two readings. Calculate the f-stop difference between the readings. How does this compare with the suggested correction for your filter? If significantly different, what new ASA/ISO would you use to provide automatically correct readings?

Commonly Used Filters for Black and White Films

Filter No.	Color	Old Designation	Suggested Uses	f/stop increase: Ortho Film Daylight	Ortho Film Tungsten	Pan Film Daylight	Pan Film Tungsten
6	Pale Yellow	K1	For use outdoors with all B/W films. Provides partial correction of panchromatic films to visual appearances. Slightly darkens blue skies, emphasizing clouds.	1	2/3	2/3	2/3
8	Yellow	K2	Widely used filter for darkening blue skies, emphasizing clouds and rendering foliage closest to visual appearances. Most accurate tonal renditions with panchromatic films.	1-1/3	1	1	2/3
9	Deep Yellow	K3	Deeper yellow for dramatic cloud effects. Overcorrected sky rendition compared to actual visual appearances.	1-1/3	1	1	2/3
11	Green	X1	Yellowish green, for panchromatic films only. Corrects type B panchromatic films to match eye response to objects exposed to tungsten illumination. Said to render more pleasing skin tones in outdoor portraits.	—	—	2	1-2/3
13	Green	X2	Dark yellowish green. For pan films only. Makes skin appear “swarthy” under tungsten light. Sometimes useful for male portraits. Correction similar to number 11 filter for high green-sensitive films.	—	—	2-1/3	2
15	Deep Yellow	G	More dramatic sky effects than number 8 or 9 filter above. Useful for lightening yellow stains and darkening blue ink when copying old documents.	2-1/3	1-2/3	1-2/3	1
16	Orange	—	Yellow orange. Greater overcorrection of skies than number 15 yellow. Some green absorption. For pan films only.	—	—	1-2/3	1-2/3
21	Orange	—	For pan films only. Blue and blue–green absorption. Darkens blues in marine scenes.	—	—	2-1/3	2
23A	Light Red	—	For pan films only. Absorbs greens, darkens sky and water. Darker foliage.	—	—	2-2/3	1-2/3
25	Red	A	Dramatic sky effects with pan films. Cuts through haze, often used with infra-red film for heightened effect. Good for darkening blue lines when copying blueprints and other documents.	—	—	3	2-2/3
29	Dark Red	F	Used for color separation and tricolor printing.	—	—	4-1/3	2
47	Dark Blue	C5	Accentuates haze and fog. Blue tricolor for color separation work. Produces tones approximating 19th century blue-sensitive emulsions.	—	—	2-1/3	3
47B	Dark Blue	—	Deeper blue than number 47. Accentuated fog and haze. Used with No. 25 Red and No. 58 Green for tricolor printing and color separation work.	2-2/3	3	3	4

Filter No.	Color	Old Designation	Suggested Uses	f/stop increase: Ortho Film Daylight	Ortho Film Tungsten	Pan Film Daylight	Pan Film Tungsten
56	Light Green	—	Absorbs some blue and red. Darkens skies somewhat, good flesh tones outdoors. Pan film only.	—	—	2-2/3	2-2/3
58	Dark Green	B	Used for tricolor work with No. 25 Red and No. 47B Dark Blue. Lightens foliage in sunlight.	3	2-1/3	3	3
87	—	—	For infra-red film only. Opaque to the eye.	Varies according to use and processing. Experiment for best results.			
87C	—	—	For infra-red film only. Opaque to the eye.				
—	Polarizer	—	For all films, color and B/W. Reduces reflections from non-metallic surfaces. Increases color saturation in color film.	2	2	2	2
—	Neutral Density	—	For all films, color and B/W. Evenly reduces the light reaching film for special effects.	Various densities available in 1/3 stop increments.			

Exposure Corrections

Exposure corrections for filters historically have been listed in an absurd system called “filter factors”. This system was used by multiplying the indicated shutter speed by the filter factor. Because most cameras today do not have one-third stop shutter-speed increments, the system is essentially useless. A listing of corrections in f-stops is more useful. For your information, a cross–listing of filter factors and corresponding f-stop corrections is given here. It may be useful if you have a filter with the correction marked in the older system. The chart of filters shown in this handout shows corrections in f-stops.

Filter Factor	Increase in Exposure (Stops)	Neutral Density	Percent Transmission
1-1/4	1/3	0.1	80
1-1/2	2/3	0.2	63
2	1	0.3	50
2-1/2	1-1/3	0.4	40
3	1-2/3	0.5	32
4	2	0.6	25
5	2-1/3	0.7	20
6	2-2/3	0.8	16
8	3	0.9	13
10	3-1/3	1.0	10
100	6-2/3	2.0	1
1,000	10	3.0	0.1
10,000	13-1/3	4.0	0.01

From *Kodak Filters for Scientific and Technical Uses*, Kodak Publication B-3, Eastman Kodak Co., Rochester, NY 1981.