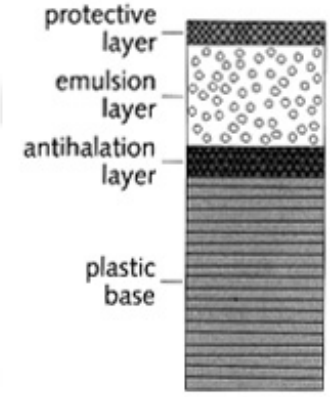
3 Black-and-White Film



Cross section of black-and-white film

There are many different types of film available and different reasons to use each type. Sometimes your choice of film is a practical matter; for instance, you may need a film sensitive enough to make a picture in low light. Other times your choice will be aesthetically driven; perhaps you need a film that reproduces all the subject's textures and tones as smoothly as possible. Whatever your choice, it's highly likely that the film you use will have a noticeable effect on the way the picture ultimately looks.

Black-and-white films consist of a clear, flexible, plastic support, called the **base,** coated with a microscopically thin **emulsion.** The emulsion is a chemical compound of light-sensitive **silver halide** crystals suspended in gelatin. It is coated with a protective layer to minimize scratching (and other physical damage caused by handling) and backed by an **antihalation layer** that helps promote image sharpness.

Film Characteristics

Different films often have strikingly distinctive characteristics, but sometimes the variations are quite subtle. These are the most important characteristics of black-and-white films:

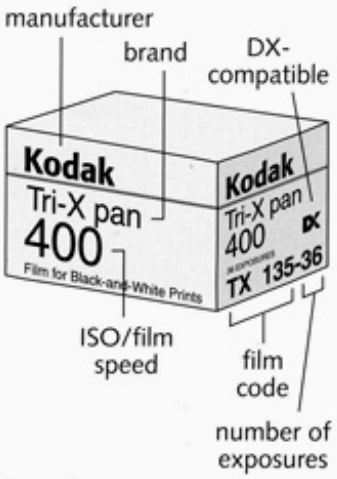
film speed
grain
tones
contrast

Film speed. Film speed is a measurement of how sensitive a film is to light. A film that is highly sensitive to light is called a **fast film,** or just "fast"; a film with low sensitivity is a **slow film,** or just "slow."

The most common way to quantify film speed is according to its **ISO** (International Standards Organization) rating. A film with a higher ISO number needs less light to properly capture an image than a film with a lower ISO number. For example, ISO 400 film is more sensitive to light than ISO 100; it will take four times more light to properly expose ISO 100 film as it will take to properly expose ISO 400 film (400 ÷ 100).

Film speed choices vary with manufacturers, but these are the most common for black-and-white films:

ISO 50	**slow**
ISO 100, 125, 200	**medium**
ISO 400	**fast**
ISO 1600–3200	**ultrafast**



Film package

DX: page 73

Medium- and slower-speed films are mostly meant for brightly lit subjects. You will usually need fast film in dimly-lit outdoor conditions, for sports and other action subjects (even in bright light) and almost always indoors, unless you're using a flash. But you also can use most fast films outdoors, even in bright light. Ultrafast films (ISO 1600 or faster) are useful in very dim conditions, such as at night or in clubs.

Grain. When film is developed, the silver halide crystals that were exposed to light form small black clumps of metallic silver, called **grain**, that make up the photographic image. Grain looks a little like particles of sand. You will recognize it when you see it, for example, when you're viewing your film through a magnifier or looking at an enlarged print. The size of the individual clumps can vary according to the type of film you use.

Slow- and medium-speed films (ISO 200 or lower) produce smaller particles of silver, and are therefore called **fine-grain films.** Such films reproduce subject tones smoothly and render subject detail finely and accurately. Fast-speed films (ISO 400 and higher) use larger particles of silver to create the image. Ultrafast

Film Speed

Slow film (low speed), such as ISO 100 (left) produces fine grain and smooth tones. Fast film (high speed), such as ISO 3200 (right) produces noticeable grain and a coarse look.

Low-Speed Film (Slow) High-Speed Film (Fast)

How Film Records an Image

The film's emulsion layer holds the key to understanding how a photographic image is formed. The emulsion contains silver halide crystals, which capture the light projected by the lens onto the film's surface. Certain areas of the film receive more exposure than other areas, since light areas of the subject reflect more light than dark areas. For instance, a white sweater reflects more light than blue jeans, so more light will expose the area of the film representing the sweater than will expose the area representing the jeans.

When you take a picture, an image of your subject forms as an invisible pattern of altered silver halide particles in the emulsion. This is called a **latent image.** Chemical development converts the film's exposed silver halides to black particles of metallic silver, making the image visible.

Film development takes place in proportion to exposure. In other words, when film is exposed, a lot of silver forms in the brighter areas of the subject and renders those areas dark on the film; relatively little silver forms in darker areas, which renders these areas as light on the film. Thus your developed film contains a tonally reversed image—a negative. The light areas of the original scene are dark and the dark areas of the scene are light. Making a print from the negative reverses the image to produce a positive, correctly representing the tones of the subject.

films (ISO 1600 and higher) are sometimes called **coarse-grain films,** or simply grainy, and reproduce image tones and details more roughly and with less subtlety. ISO 400 films are generally considered medium-to-fairly-fine-grain.

The choice of film, with its inherent grain characteristics, is one of the most important controls you have over the final look of your work. Some subjects, perhaps a lush landscape or an elegant flower, may look best when photographed with a fine-grain film that reproduces the scene with smooth, rich detail. Other subjects, such as a gritty urban scene, may feel more real when photographed with grainier (coarse-grain) film. It's very much a matter of individual preference.

Film exposure: chapter 6

Developing film: chapter 9

Note that film type is only one factor that determines grain. Other factors include film exposure, film development, and print size. Even film speed isn't a totally reliable gauge of graininess. An ISO 400 film from one manufacturer may produce finer or coarser grain than an ISO 400 film from another. Some manufacturers even offer more than one film choice with the same ISO, but different grain characteristics.

Tones. A black-and-white photograph is rarely just black and white. Instead, it is made up of a range of shades—blacks, grays, and whites. These shades are called **tones,** and the variety of tones from dark to light contained in an image is called the **tonal range.** For instance, a photograph of a chess board might have a limited tonal range, since it consists mostly of blacks and whites; a photograph of the surface of a lake would have a much longer tonal range, since it is made up of dozens of subtly different values ranging from black to gray to white.

Some films are capable of reproducing more of a subject's tones than others. As a general rule, slower films, such as ISO 50 and 100, reproduce more tones than faster films, such as ISO 1600 or 3200; the fine grain of slow-speed films captures more information to better render subtle differences. Note that several other factors can play a large role in tonal range, including the inherent tonal characteristics of the subject, film format, and film exposure and development.

Contrast: pages 113–14, 152–57, 171–73

Contrast. **Contrast** refers to the relative difference between dark and light tones in the original subject or in the negative and print that represent the subject. All other things being equal, some films inherently produce more contrast than others. Higher contrast films produce dense blacks and bright whites, with few shades of gray, while lower contrast films produce more grays and a subtler transition from the darkest tones to the lightest.

As with other film characteristics, contrast is a function of several factors other than the film you use. The original subject lighting is critical, as is film exposure and development; when printing, you can use different papers and/or colored filters to vary the image contrast.

Film Formats

35mm film cassette

Film format refers to the size of the film used by a particular camera. Over the years, there have been many different film formats, but today they can be generally classified as follows:

35mm
medium format
large format

35mm. By far, the most common film format is 35mm, which measures 35 millimeters wide. It is packaged in rolls that produce 12, 24, or 36 exposures; the narrow strip of film is coiled around a plastic spool and encased in a metal cassette for protection and to keep light out. You also can buy some types of 35mm films in longer rolls, known as **bulk film,** for reloading into reusable cassettes.

See bw-photography.net for more on bulk film.

Because 35mm is a relatively small format, most of the cameras that use it also are small. This makes it an ideal choice for spontaneous and action work, such as candid portraits, photojournalism, and sports photography.

Thirty-five millimeter cameras almost always produce images measuring 24 x 36 mm (a little less than 1" x 1½"), but sometimes they produce different sizes and shapes depending on the rectangular opening in the back of the camera body. The most common alternative size is called **panoramic,** because it provides a wide panorama of a scene. In most models, the camera's manufacturer achieves this wider view by masking out the top and bottom of the 35mm

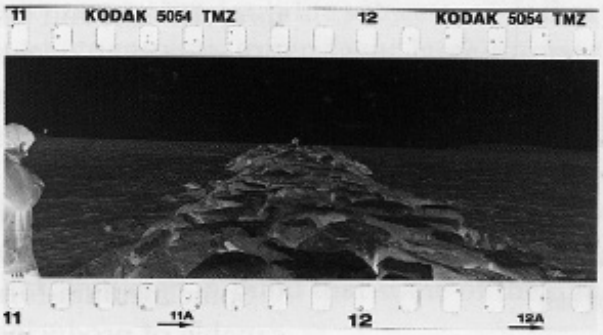
Film Formats

Film comes in several formats (sizes), producing negatives of varying sizes and shapes.

35mm (1" x 1½")

4" x 5"

120 (2¼" x 2¼")



35mm panoramic (1" x 3")

Film Storage and X Rays

For safe storage, keep all film in a relatively dry environment (low humidity) and away from heat, whenever possible at a temperature of 75°F or lower. This applies to unexposed or exposed film, and even processed negatives. You can store unexposed film in a refrigerator or freezer to prolong its freshness, but be sure to keep it in its original package, and let it reach room temperature before taking it out of the package and putting it in your camera. It's good practice to keep film in its original packaging at all times until you are ready to use it, and to process film as soon as possible after you expose it.

Film is sensitive to radiation, such as the X rays used by airport inspection systems. Film exposed to radiation can be fogged, exhibiting random streaks of density or an overall darkness when developed. To avoid such fogging you should never keep film in checked baggage, which is subject to high-intensity X rays. Also, you should have film hand-inspected whenever possible, rather than put it through the screening machines used at airport gates. High-speed films (ISO 800 or higher) are most susceptible to X-ray exposure, but all films are vulnerable, especially if they go through these machines more than once. The damaging effects of radiation exposure are cumulative.

opening. A few cameras have a bigger opening in their back to produce a larger image on 35mm film.

Medium format. Medium-format film is larger than 35mm film, so it produces larger negatives that, with rare exceptions, produce prints that are sharper, less grainy, and render more gray tones. This film format is generally used by advanced and professional photographers for such subjects as fashion, portraiture, still life, and landscape.

120 roll film

Rather than packed inside a protective cassette, medium-format film comes as a roll wrapped tightly onto a spool, with an opaque paper backing to prevent unwanted exposure to light. Medium-format film is sometimes called roll film for this reason. The most common medium-format size is 120; the far less common size 220 film allows double the exposures per roll. Both 120 and 220 films measures 2⅜" wide.

Some medium-format cameras produce one size image only, while others are capable of producing more than one size with the use of masking attachments or different film backs. Many medium-format cameras have interchangeable film backs that attach to the back of the camera, much as interchangeable lenses attach to the front, and take different-size pictures; these include film backs as well as digital backs that do not require film at all. Other cameras accept masking attachments that fit into the back of the camera.

Digital cameras: page 21

Medium Formats

The image shape and size, as well as the number of exposures per roll, varies with the particular medium-format camera. Some models produce square pictures, while others produce rectangles of various proportions, including panoramic. The most common medium-format sizes are 6 x 4.5 cm, 6 x 6 cm (sometimes called "2¼," since its square image area measures 2¼" x 2¼"), and 6 x 7 cm. Cameras producing these image sizes are widely available, but more specialized sizes also can be found. Following are almost all of the available medium-format options. Note that the number of exposures can vary slightly depending on the camera and how you load the film.

IMAGE SIZE		NUMBER OF EXPOSURES	
Centimeters (cm)	Inches	120 Film	220 Film
6 x 4.5 cm	2¼" x 1¾"	15–16	30–32
6 x 6 cm	2¼" x 2¼"	12	24
6 x 7 cm	2¼" x 2½"	10	20
6 x 8 cm	2¼" x 2¾"	9	18
6 x 9 cm	2¼" x 3¾"	8	16
6 x 12 cm	2¼" x 5½"	6	12

4" x 5" sheet film

Large format. **Large-format film** is much larger than 35mm or medium-format. It comes in single sheets rather than rolls—and is thus called **sheet film**—and produces only one picture per sheet. Sheet films come in a variety of sizes, including the most common size, 4" x 5", and the less common, 8" x 10".

Large-format cameras are used by advanced and professional photographers who want extremely sharp and grainless results with the widest range of tonality. Photographers working with architectural and still-life subjects, as well as many landscape and formal portrait photographers, often favor large-format film.

Special Black-and-White Films

See bw-photography.net for more on film suppliers.

There are several specialized black-and-white films available, originally made for a particular purpose, such as for medical or graphic-arts images. You can use some of these films for creative effect. Here are a few of the most interesting special black-and-white films, but keep in mind that some of them may be hard to find.

High-contrast. Sometimes called **litho** films, these films can be used in the camera to make high-contrast original negatives, or they can be used in the darkroom to make copy negatives and positives for a variety of darkroom manipulations.

See bw-photography.net for more on copy negatives.