

# Apertures in Photography

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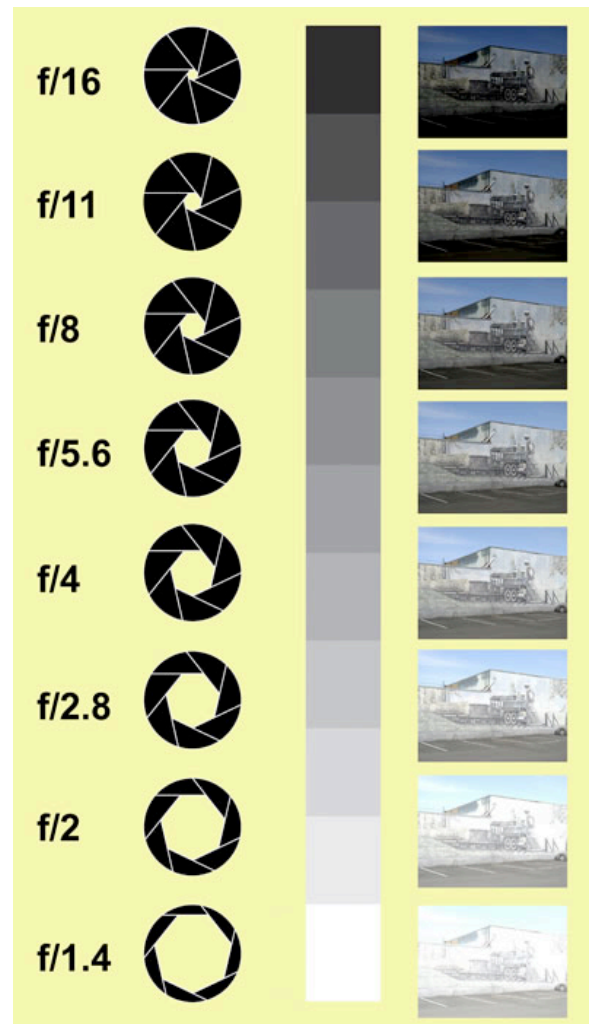
Think of the light entering your camera during an exposure as a quantity of **light flowing through a pipe**, instead of a fluid. You can vary the length of the pipe and the diameter of the pipe to get the amount you want. You can trade either dimension and still have the same desired amount of light (called Exposure Value). The length of the pipe represents the shutter speed; the width of the pipe is the aperture.

The **Aperture** is the circular curtain inside a lens that controls one aspect of the amount of light passing through to the camera's sensor (or film). It quickly moves from full open to a smaller opening and back, if necessary, during the shot. You see the view only while the aperture is fully open. This is good to have a bright viewfinder for better focusing, etc (and a good reason to buy a lens with a larger aperture). The only time you would see a view through a "stopped down" lens is by actuating a lever or button that is called something like "depth of field preview" on advanced cameras.

***f*-stops** (or *f*-numbers) are measurements of the opening of the lens aperture compared as a ratio to the length of a lens. Lenses use a standard *f*-stop scale that corresponds to the sequence of:

*f*/1.4, *f*/2, *f*/2.8, *f*/4, *f*/5.6, *f*/8, *f*/11, *f*/16, *f*/22, *f*/32, etc. Think of "*f*" as a fraction. *f*/1 would be the widest opening (the pipe would be as wide as it is long), and each of these numbers are smaller, each cutting the light in half. *f*/22 and larger numbers are like the holes in a cocktail straw. Sharpness declines with smaller apertures, due to "diffraction." Technically, the best quality image from an APS-C lens is probably 2-3 stops down from the widest aperture. An *f*/2.8 lens would theoretically have best sharpness/focus ("sweet spot") at *f*/5.6 or *f*/8. An *f*/2 or *f*/2.8 capable lens is referred to as a "fast" lens, meaning a corresponding faster shutter speed can be used. With fast lenses, we think big, heavy, and expensive. Most zoom lenses have a variable maximum aperture, such as *f*/2.8 (wide end) to *f*/3.5 (telephoto end). We say "stop down" to a smaller aperture like *f*/22, or "open up" to a larger aperture like *f*/2.8.

**Depth of Field** (or Focus) is a function of the exposure's *f*-stop and focusing distance. Wider apertures cause the range of good focus to become shorter. At a close up distance, a flower's pedals may be out of focus at its tips when you use a wide aperture, such as *f*/2.8. The depth of field/focus may be only an inch or two. A wide-angle at *f*/22 could keep a sharp focus from a few feet to infinity. The smaller digital sensor causes the depth of field to be deeper by the sensor's crop factor, compared to 35mm systems. A digital camera with a crop factor of 1:1.5 would yield a depth of field at *f*/2.8 that is equal to a 35mm's *f*/4.8 (something ½ way between *f*/4 and *f*/5.6). If you like to shoot narrow depth of field images, get as fast a lens as you can afford. In any deep subject case, set your focus point about 1/3 the way into the zone you want in sharp focus (sometimes called "hyperfocal distance" when the outer edge is at infinity). Wide-angle lenses have a greater perceived depth of field than a telephoto lens at the same aperture. For scenics, go wide-angle and small *f*-stops, focus about 1/3 of the way to the horizon. For portraits, go short telephoto and relatively large apertures, focus on the eyes. Some cameras



Exposures with the same shutter speed

have icons to represent the type of image you want. (Flower for close up, person-shoulders up for portrait, mountains for maximum depth of field.)

Look at the **specifications of a lens** before you buy it. Common Point-and-Shoot cameras may have only one aperture! Better ones make have only a few, and they might not be in one-stop intervals. They rely on a limited shutter speed range to get a decent exposure on a good day. Fortunately, their small sensors improve depth of field. Moving up to something with more controls, like a compact, single-lens-reflex camera with a built-in zoom lens may have to make some trade-offs, and have a maximum aperture of  $f/4$  to  $f/5.6$ . First, it is going to be tough looking through a dim optical viewfinder, which will probably be traded off for an LCD screen, anyway. Second, those nice portraits with dreamy backgrounds will instead capture that truck in the background just fine. Third, you are going to need slower shutter speeds (longer pipe) to make up for the narrow pipe (Where did I leave that tripod?). As a minimum, I prefer something wider than  $f/4$ , and go down to at least  $f/8$ .

**Rule number one** of photo-journalism is said to be “ $f/8$ , and be there!” When time permits, go up or down the scale based on what you want. The cameras these days might be smart, but they do not know what you want. You are going to need to shift from P (Programmed) mode to A (Aperture Priority), or M (Manual) control to get the depth of field you want.