

Lenses

Defining the lens:

Focal Length:

The distance from a point in the lens assembly, based on its optical design, to the focal plane (film or sensor) of the camera.

Long focal length lenses have a narrow field of view thus producing a magnified image of objects at a distance.

Short focal lengths have a wide field of view.

Normal lenses are in the range of 40mm to 60mm.

Telephoto lenses are in the range of 70mm and longer.

Wide angle lenses are in the range of 35mm and shorter. Wide angle lenses in the range of 10mm to 15 mm can be of rectilinear design or curvilinear design, also known as fisheye.

Aperture:

The aperture of a lens is the largest opening of the diaphragm of the lens (f stop). The larger the aperture of the lens, the more light can be passed through it; therefore, allowing faster shutter speeds. Lenses with large apertures are referred to as “fast” lenses.

Type:

Prime – lens with a fixed focal length.

Zoom – lens with a variable focal length.

Lenses are defined then by the combination of the focal length and the aperture. For example:

- 500mm, f/4
- 400mm f/4
- 400mm, f/5.6
- 50mm, f/1.7
- 70m – 200mm, f/2.8 Zoom
- 70mm – 300mm, f/4 – f/5.6, Zoom
- 24mm – 70mm, f/2.8, Zoom
- 24mm – 70mm, f/2.8 –f/4.0 Zoom

Zoom Lenses with Variable Aperture

Zoom lenses are designed as either fixed or variable aperture. A fixed aperture zoom lens will require larger glass elements at the longer end of the zoom range resulting in a heavier, more expensive lens. By designing the lens for a smaller aperture at the long end of the zoom range, smaller glass elements can be used and the lens will be lighter and less expensive.

Prime vs. Zoom

As a general rule a prime lens will produce a better quality image than a zoom lens. There is only one focal length and the design parameters are fixed. In a zoom lens, the designer must make trade offs in the design parameters to achieve acceptable performance over the full range of zoom focal lengths. The payoff for this is a lens with a broad range of functionality. Note that there are zoom lenses today with extremely good quality at reasonable prices.

Sharpness and Depth of Field

We have talked about depth of field and that photographing at higher f/stops (smaller apertures) will result in greater depth of field. You need to weigh this against the fact that your lens will produce sharper images at the middle apertures. In most lenses this will be at f/8 or f/11. This comes into play most often when working with the wide angle lens. With a 24mm lens, set at f/8 and focusing on a point 12 feet into the picture, you will be in focus from 6 feet to infinity and you will be working with the sharpest part of your lens.

Teleconverters

A teleconverter is an optical device that will change the focal length of the your lens. The teleconverter is placed between the lens and the camera. They are commonly available in 1.4X and 2X designs. A 1.4X TC used on a 300mm lens will change the focal length to 420mm (300x1.4) and you will lose one stop of light. A 2X TC used on a 300mm lens will make the focal length 600mm (300x2) and you will lose two stops of light.

Using a TC may affect the autofocus of you camera and lens system. The autofocus system needs light and depending on lighting conditions you may not have enough light to operate the system. Some camera systems will read the f/stop of the lens and will shut down if it is higher than a preset number. Many TCs have electronic components that convert the f/stop. So if you are using a a 1.4x TC on an f/5.6 lens, the TC will convert that by one stop to f/8, causing the auto focus to turn off. Kenko makes a “dumb” TC that does not do this conversion and allows the autofocus to work provided there is enough light. The downside is that the exif data recorded with the image file does not record the adjusted f/stop. When using the 2x TC you are now at f/11 and the autofocus will have an even harder time working.

You can push the envelope and stack a 1.4x and a 2x TC. This arrangement on a 300mm lens will change the focal length to 840mm and you will lose three stops of light. For the f/5.6 lens of our example the lens is now an f/16 lens. Autofocus will not work with this arrangement.

NOTE – There are electronic circuit components in the TC for communication between the camera and the lens so it should always be mounted to the lens first and then the lens/TC combination mounted to the camera. DO NOT put the TC on the camera without a lens.

Macro Lenses

Many prime and zoom lenses have a macro capability. The macro capability enables the lens to focus at very close lens to subject distances. The macro capability will be defined as a ratio. A ratio of 1:1 means the lens is capable of recording the subject at life size on the film or sensor. A macro capability of 1:2 is capable of recording the image at one half life size on the film or sensor. When these images are enlarged to viewing size you have a very large, well focused picture of the subject.

The depth of field on a macro shot is very small so you need to take care in setting up your shot that you get as much of your subject as possible in the same plane and that plane must be perpendicular to the camera's lens axis.

On zoom lenses the macro feature will be available at one of the zoom settings. On my lens it is the highest zoom setting.

Extension Tubes

An extension tube can be used to allow you to get closer to your subject. The extension tube is mounted between the camera and the lens. This moves the lens away from the film or sensor plane and makes the image projected on that plane larger. It also brings the maximum and minimum focus range closer to the camera. You lose one stop of light with the extension tube.

Field Techniques

The main objective of picture taking is to get a sharp, in focus capture of the subject. You can be in focus but lose sharpness because of “motion blur.” The likelihood of getting motion blur increases as the focal length of the lens being used gets longer. Use of a sturdy tripod and tripod head will eliminate much of the problem. Many photographers find that using a tripod even with a wide angle lens improves their photography. They find that it slows them down and they take more time composing the image and checking for distracting elements. When photographing with a long focal length lens it is practically impossible to get a blur free image without a tripod.

When using a long lens on a tripod there are other factors that can cause blur. Just pressing the shutter release can cause camera shake. To help with this problem you can use a remote shutter release, a cable release or even the cameras self timer. If your camera has a mirror lock-up, that will help in slow shutter speed situations.

Time of Day

The early morning light and late afternoon light is filtered through the atmosphere giving a nice warm yellow or pink glow. When the sun is high in the sky the atmosphere is thinner and the light is flatter and less appealing. Although it seems that in the fall on a day with a cold air mass and a clear blue sky the light is pretty good. In the winter the sun never gets really high in the sky so the light can be good most of the day.

Weather

It all depends on what you want. Clear days are good. Stormy days can be dramatic. Fog can present another good opportunity.

Using a Polarizeer

On bright days a polarizer can be used to reduce the glare of the sun and unwanted reflections. The polarizer can also be used to make a blue sky more dramatic. A rainbow picture will be improved by a polarizer.

The polarizer is most effective when the sun is on your right or left shoulder. It will have little effect with the sun behind you. And not much works when you are shooting into the sun.

Camera Program Modes

Many cameras have programmed modes. When using one of these modes the camera will set the shooting parameters such as aperture, shutter speed, flash syncing, metering mode and autofocus that best fit the situation. The camera will allow some of these settings to be changed and others are locked. The photographer has little control of the camera.

If you use one of these modes, remember to reset your camera to either aperture or shutter priority when you finish or the next time you use your camera you will wonder why certain features are not working.

Check your users manual to see what programs are available and how the camera will be set for that mode.