

Topic 1 - A Closer Look At Exposure – Shutter Speeds

Learning Outcomes

In this lesson, we will look at exposure in more detail: ISO, Shutter speed and aperture. We will be reviewing some of the pitfalls associated with these three exposure values and how we can try to overcome them. It's important to remember that there is this give and take relationship between all three of them, in order to get the proper exposure in a given photograph.

A Closer Look At Exposure - Shutter Speeds

Shutter Speed: Revisited

We can use a slow shutter speed to capture a lot of motion in a photograph. On the other hand, we can use very fast shutter speeds to allow us to arrest the motion of your subject within the frame. This is especially useful if you do not have a tripod because no matter how still you are, you will always shake, ever so slightly, as you take a photograph.



You will recall that the shutter speed refers to the speed of the opening and closing of the curtains in front of the sensor. Generally speaking, you need a lot of light to use fast shutter speeds.

This is why as the day gets darker, you sometimes find that your camera's shutter is a little slower to take the shot when you hold down the exposure button. This is because the shutter needs to remain open for a longer period of time in order to gather enough light onto the sensor.

A slow shutter speed is not something you will usually want during the day. Lets take an example. Perhaps you're trying to take a picture of your pet cat or dog, they might be very active. If you have a long/ slow shutter speed here, its very likely that you'll just capture a lot of blur. Sometimes, though, there will be occasions in which you want to capture this blur. To do this, you will need a tripod or a steady surface. If not,



A Closer Look At Exposure - Shutter Speeds

its very difficult when you're trying to keep the camera steady while keeping a slow shutter speed when going handheld. Keeping the camera close to your body or leaning a against a wall would definitely help with this when you have very little light and you need a slow shutter speed.

One of the tricks that we can use to our advantage pertains to this idea that maybe we can mix motion blur with getting a sharp image to convey a sense of motion itself. Let's look at helicopter blades spinning as an example. This is one scenario in which you can get both a sharp image and motion blur to capture a sense of motion. In this instance, a shot of a helicopter in mid-air, looking as though its floating isn't exactly realistic when you think about it. We expect to see some blur or perception of movement, given the fact these things move pretty fast and that there is actually a mechanical action at work to keep the helicopter off the ground.



Shutter Speed: 1/ 800th



Shutter Speed: 1/ 60th



A Closer Look At Exposure - Shutter Speeds



The picture above was taken at $1/1000^{\text{th}}$ of a second. We know it's fast when the water appears the way it does and the splashes have detail, frozen in time. But what if we wanted to make the shutter speed slower and we wanted to capture some of the motion that was happening in this scene, we would have to modify that shutter speed. So, let us say that we change one stop, and we take this photograph at $1/500^{\text{th}}$ of a second. Does this mean that there is twice as much light? Or does this mean that there is one half of that light as a result?

The answer is more light. Why? Well the shutter is open longer so more light is allowed in. $1/500^{\text{th}}$ actually means that the shutter is now open twice as long and, as a result, there are twice as many photons allowed in. This means that it is one stop brighter. As a result, we can make other modifications to other exposure values such as ISO or Aperture. By changing one of these to some requisite amount we can maintain the image we have onscreen. If we made either of those a stop darker we would be able to do this, depending on which one we would want to use. This way, we would maintain the same exposure but be able to modify the shutter speed, and hopefully minimise the other effects of the other exposure values.



A Closer Look At Exposure - Shutter Speeds

Let's do some math so that we can further understand this:

Let's say that we have a photograph at $1/60^{\text{th}}$ of a second and we want one stop brighter, how fast will the shutter speed have to be? The answer is $1/30^{\text{th}}$ because we want to let in twice as much as light, which goes back to the rule that we either half or double the amount of light.

Let's say that we have one second and we want to make it one stop darker? What will our shutter speed need to be? The answer is half a second.

THE FOCAL LENGTH VS. SHUTTER SPEED RULE

If you're struggling to decide what the lowest shutter speed is that you can actually deal with, we have a concept to help you figure that out.

The simplest answer to how slow of a shutter speed you can use and still get a sharp picture is to use this rule that we have in photography, known as the 1/focal length rule. The shutter speed/focal length rule states that you simply take the focal length you're shooting at (let's say 50mm, for an example), and make the denominator in your shutter speed.

So, if you're shooting with a 50mm lens, the rule says that you shouldn't pick a shutter speed slower than $1/50$ if you want a sharp picture. So, you could shoot at $1/80$ or $1/100$ and there shouldn't be a problem, but don't go to $1/40$ or $1/20$.

Let us look at another example for some more clarification:

Let's say you're shooting at 200mm, the rule says you should not shoot slower than $1/200$. So, $1/400$ or $1/600$ or faster is perfectly fine, but don't choose $1/180$ or anything else under $1/200$.



A Closer Look At Exposure - Shutter Speeds

There are several problems with taking the 1/focal length rule as the final word:

- (1) If you are using a crop sensor camera, do you add the crop factor to the equation?
- (2) What about image stabilization, wouldn't that allow you to achieve a sharper shot at a slower shutter speed?
- (3) Does the rule break down at very long and very short shutter speeds?

The answer to all three of these questions, is "yes!"

HOW CROP FACTOR AFFECTS THE SHUTTER SPEED RULE

Generally speaking, when photographers talk about different focal lengths, they mean the focal length on a full frame camera. If you use an APS-C (so called "crop sensor") DSLR, then you need to multiply the focal length by 1.5 (Nikon, Fuji, or Sony crop sensor) or 1.6 (Canon crop sensor) in order to get the equivalent focal length. So, a 50mm lens, when put on a full frame camera is 50mm. But when it's put on a crop sensor, it has the equivalent focal length of about 75mm.

		HANDHELD - NO IMAGE STABILIZATION										
Full Frame	Crop Sensor	1/10	1/20	1/25	1/60	1/80	1/100	1/200	1/400	1/640	1/1000	
		16mm	10mm	FAIR	GOOD	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT
24mm	15mm	POOR	GOOD	GOOD	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	
50mm	32mm	POOR	POOR	FAIR	GOOD	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	
70mm	43mm	POOR	POOR	POOR	GOOD	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	
200mm	130mm	POOR	POOR	POOR	POOR	FAIR	GOOD	GREAT	GREAT	GREAT	GREAT	
400mm	250mm	POOR	POOR	POOR	POOR	POOR	FAIR	GOOD	GREAT	GREAT	GREAT	
600mm	380mm	POOR	POOR	POOR	POOR	POOR	FAIR	GOOD	GREAT	GREAT	GREAT	
940mm	600mm	DON'T	EVEN	THINK	ABOUT	IT	BAD	POOR	FAIR	GOOD	GREAT	

		HANDHELD - IMAGE STABILIZED										
Full Frame	Crop Sensor	1/10	1/20	1/25	1/60	1/80	1/100	1/200	1/400	1/640	1/1000	
		16mm	10mm	GOOD	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT
24mm	15mm	GOOD	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	
50mm	32mm	POOR	POOR	GOOD	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	
70mm	43mm	POOR	POOR	FAIR	GOOD	GREAT	GREAT	GREAT	GREAT	GREAT	GREAT	
200mm	130mm	POOR	POOR	POOR	FAIR	GOOD	GREAT	GREAT	GREAT	GREAT	GREAT	
400mm	250mm	POOR	POOR	POOR	FAIR	GOOD	GOOD	GREAT	GREAT	GREAT	GREAT	
600mm	380mm	POOR	POOR	POOR	POOR	FAIR	GOOD	GOOD	GREAT	GREAT	GREAT	
940mm	600mm	ICK!	SICK!	STOP!	NO!!!	POOR	FAIR	FAIR	GOOD	GREAT	GREAT	



A Closer Look At Exposure - Shutter Speeds

That may leave you wondering why; the numbers for crop sensors are all lower than the full frame numbers. The reason is the field of view, which is the number we need for the proper calculation above. In that scenario, we are not saying that the same lens is put on both cameras, we're trying to show what focal lengths produce the same field of view, and what shutter speeds can be used at those focal lengths to produce a sharp image.

If you happen to forget about this chart, and you just want to do the calculation on your own for the 1/ focal length rule, then you would first figure out the equivalent focal length, and then use the rule normally. So, if your lens is zoomed to 40mm, you would need a shutter speed not of 1/40 (which is the rule for a full frame shutter speed calculation). You would multiply 40mm x 1.5 (or the crop factor for your crop sensor) and get an answer of 60. Now apply the 1/focal length rule and you know you need a shutter speed of at least 1/60.



A Closer Look At Exposure - Shutter Speeds

What have we learned today? A Summary

In this lesson, we have learned more about how shutter speeds can affect our photography and how important they are when considering exposure.

We've also looked at the 1/ focal length rule, which, as we've seen, can be useful as a basic standpoint but remember that you'll need to modify this slightly yourself, depending on the situation and available light.

