How to Create Long Exposure


Thank You
To all my dear friends that encouraged,
motivated, proofed and critiqued.
Thank you for helping make this happen.

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1 Overview

2 Aperture & Shutter Speed

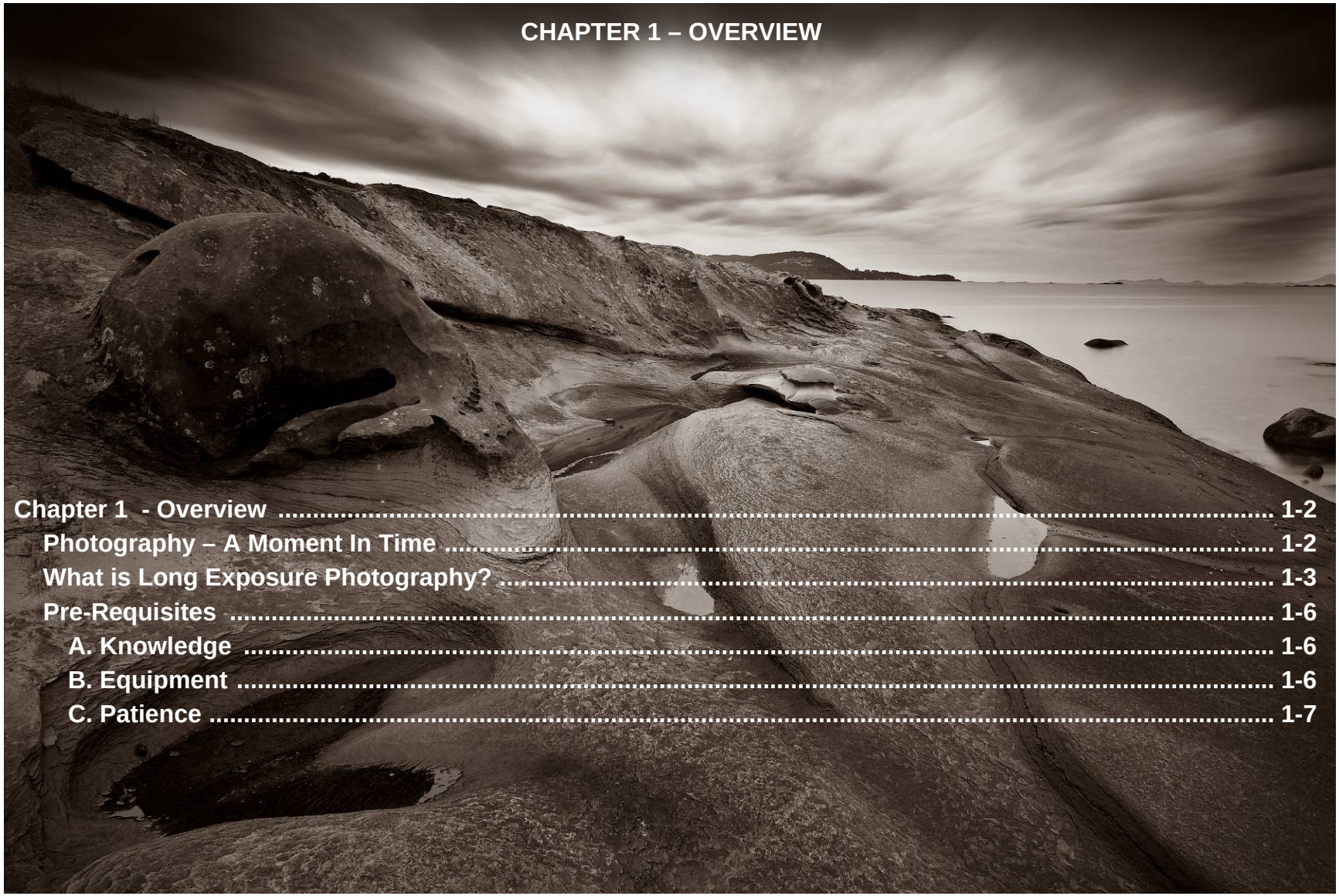
3 F-Stop, S-Stop and Filters

4 Histograms

5 The Digital Darkroom

6 Summing Up - Algorithm

* Bio and Stuff



CHAPTER 1 – OVERVIEW

Chapter 1 - Overview

Photography – A Moment In Time

Photography in its classic form freezes a moment in time. A split second event that is eternally captured. It can be anything from a baby's smile or a flap of hummingbird's wings to a breathtaking landscape, ranging in variety as life itself. However, in all instances we have no clue of what has happened before or what will take place after, looking at a photo we only get to witness a moment in time.

Figure 1-1 Capturing a Moment in Time (split second)

In life, as most of us know it, our senses can observe four dimensions, the first three being spatial (length, width and depth) and the fourth is time. It is the combination of these four that create a realistic experience.

In essence, the more dimensions an art form consists of, makes it more complex and sophisticated and therefore adding to its meaning and beauty.

Photography, unlike us humans, displays itself on a medium with only two dimensions, a flat sheet of paper (or screen) which has length and width. It is up to the photographer's artistic ability to convey a sense of depth through composition and focus areas, but to conveying time (the fourth dimension), is a bit more challenging.

What is Long Exposure Photography?

If you think about it, our conception of time is through movement and change; from the change of seasons defining a time-length of a year, to a glass of milk spilling on the table in a split second. If we can manage to capture movement or change in a photograph, we can add a fourth dimension to our image to create more depth and meaning to its subject matter. This is what Long Exposure Photography aims to achieve; it adds movement to the photo to convey a sense of time which results in enhancing the context and meaning of a photograph. Of course 'long' is a relative term, and we will see the effect of different lengths of time throughout this book and how they affect the image.

Figure 1-2 Motion Conveying a Sense of Time (seconds). Creating a hustle bustle feeling rather than a stagnant feeling.

Figure 1-3 Motion Conveying a Sense of Time (minutes). Notice the motion like sky while the rocks and land remain still, creating a sense of permanency of the land but change in the elements.

The Long Exposure Photography technique taught in this E-book explores the method where the camera shutter is open for time periods in the magnitude of minutes, thereby creating a soft appearance for objects that are in motion as shown in the Figures 1-4 and 1-5 below.

The beauty of this technique is created when pairing a static (hard) object such as a structure or a cliff, with a moving (soft) object such as clouds or water. The objective is to create a contrast of soft and hard which adds depth and strength to a photo and produces a Fine Art image.

Figure 1-4

Notice in Figure 1-4 how the clouds create a blurry, brush-like effect due to the nature of their movement making the sky look like “streaks”. The motion of the clouds creates a strong contrast to the stable buildings.

Photo Data of Figure 1-1:
Focal Length: 18 mm
Aperture: f18
Shutter Speed: 121 seconds (2 minutes)

Figure 1-5

Notice in Figure 1-5 how the Long Exposure completely eliminates the ripples in the water and the ocean appears like a marble slate.

Photo Data of Figure 1-2:
Focal Length: 18 mm
Aperture: f11
Shutter Speed: 545 seconds (9 minutes)

It can be seen (especially when looking at the clouds image in Figure 1-4) that the longer the exposure, the less “streaks”. Figure 1-4 was taken at a shutter speed of 121 s (2 minutes) and the continuously moving objects (clouds) appear streaky, compared to the smoother looking clouds and water in Figure 1-5, which was taken at a shutter speed of 545 s (9 minutes).

Pre-Requisites

A. Knowledge

This technique requires shooting in full manual mode and calls for fluent knowledge in metering (setting the shutter speed and aperture) as well as reading histograms.

Aperture and Shutter Speed are explained extensively in Chapter 2; it can serve as a fresh reminder of the topics or if you feel confident in the material, feel free to skip this chapter.

Histograms are explained extensively in Chapter 4; again, it can serve as a fresh reminder of the topics or if you feel confident in the material, feel free to skip this chapter.

B. Equipment

Necessary Equipment for Long Exposure Photography:

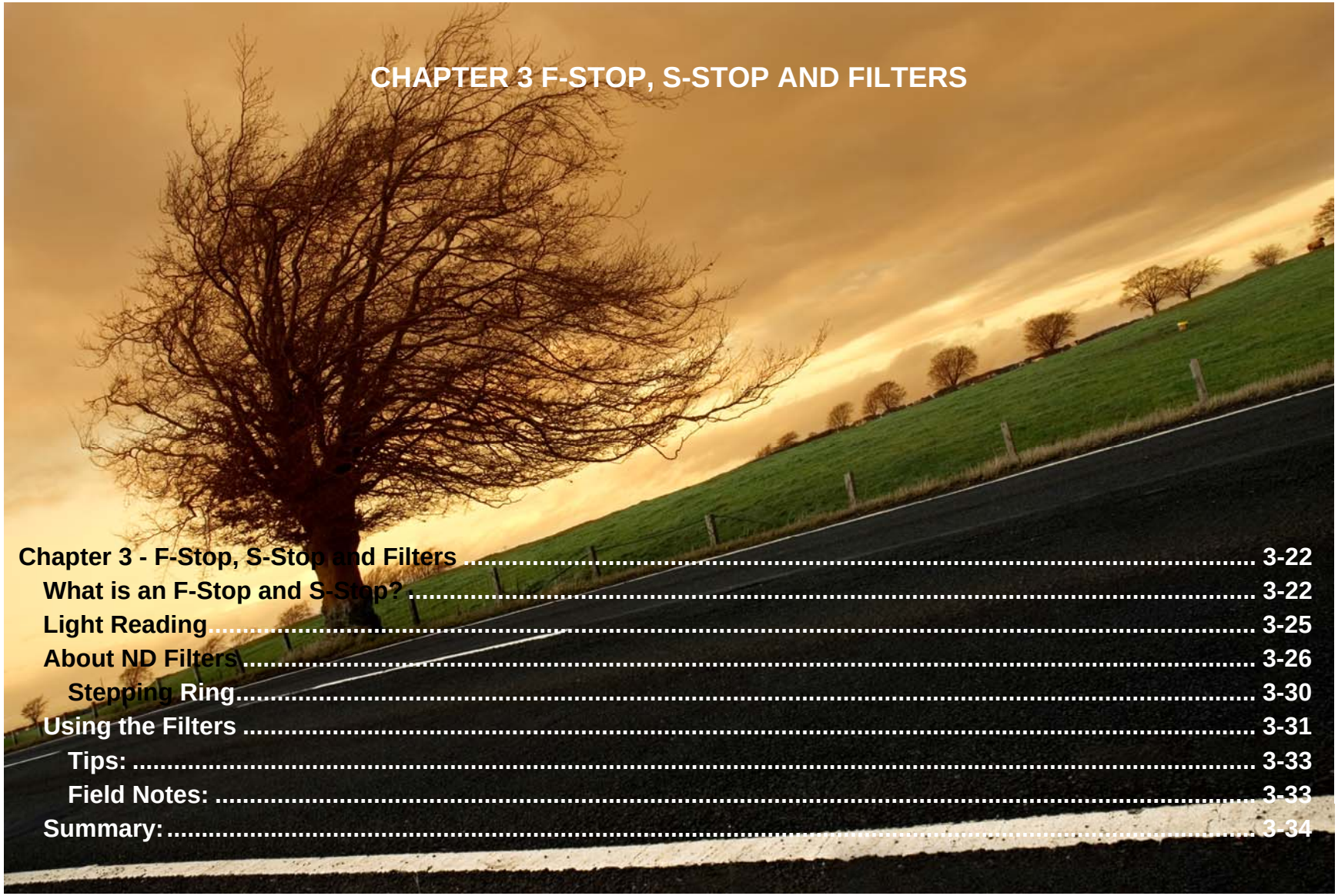
1. SLR Camera (digital or film, does not matter although this manual refers to digital photography post processing). It is highly recommended to have a digital SLR with a RAW file mode. A personal note here if I may, there is no need to go out and buy the latest and fanciest camera. Of course performances of various cameras will vary but the most important thing to keep in mind is that “it is not the camera, it is the photographer” – I can not stress this enough.
2. A sturdy tripod. Remember that you will be shooting on cloudy windy days and you want your landscape objects (clouds and water) to move, not your camera! A trick of the trade is to get a tripod that has a hook on its stem, once the tripod is set, place your bag on the hook to add weight and stability to the tripod.
3. A cable release or remote control to activate the camera.

4. Neutral Density (ND) Filters, which will be discussed in detail in Chapter 3.
5. A stop watch. Most SLR cameras shutter speed only goes up to 30 seconds. You will need to set your Shutter Speed to BULB and time it manually.

C. Patience

No joke here. If you are the fast shooter that needs the adrenaline rush of war zone photojournalism, this technique will not be your cup of tea. Long Exposure Photography requires the patience of a painter. You will be scoping an area to find the best composition and patiently framing a shot that can take anywhere from a few minutes to as long as thirty minutes if not longer and most likely it will be on a cold cloudy day. I highly recommend a good pair of gloves, wool hat and a down coat to make crawling out of a warm bed at the crack of dawn on a winter day slightly less painful.

These are the basics. We will revisit this list at the end and add a few essential “tricks” to the toolkit in Chapter 6–Algorithm to Long Exposure Photography.



CHAPTER 3 F-STOP, S-STOP AND FILTERS

Chapter 3 - F-Stop, S-Stop and Filters

What is an F-Stop and S-Stop?

As discussed earlier, the Shutter Speed affects the **duration** of light hitting the film / sensor, while the Aperture affects the **amount** of light per given time reaching the film / sensor. Traditionally speaking, F-Stop is the increment in which the Aperture diameter is changed. However, for the purpose of explaining this Long Exposure technique I will take the liberty of creating a new term in the lingo of photography called "**S-Stop**", **which will refer to the increments in which the Shutter Speed is changed**.

In this Long Exposure Technique, most of the subjects will be landscapes requiring a very large depth of field with an optimum aperture of f-11 to f-18 (depending on what type of lens you have and its optimal performance) which will remain constant. **It will be the Shutter Speed which will change to allow more or less light to enter the camera**. Therefore, as mentioned previously, for the purpose of this technique, when I use the term S-Stop, I will be referring to Shutter Speed increments.

Table 3-1 Full Stop F and S Stop

Each increment is a full S-Stop.

Each Stop is twice as long, and thus by increasing your S-Stop you are letting in twice as much light. Conversely, by decreasing your S-Stop you cut the amount of light by half.

Shutter Speed	Aperture
8 seconds	f/1.4
4 seconds	f/2.0
2 seconds	f/2.8
1 second	f/4.0
½ second	f/5.6
¼ second	f/8
1/8 second	f/11
1/16 second	f/16
1/30 second	f/22
1/60 second	
1/125 second	
1/250 second	
1/500 second	
1/1000 second	

Note: modern digital cameras can set the increment of the Stops to ½ or 1/3 an F-Stop (Fractional Stops) and S-Stops, therefore increasing the range of increments between one step to the other by two or three; i.e.: If your settings are set on half an S-Stop, then between 1/30 second to 1/60 second you will also have 1/45 second. See Tables 3-2 and 3-3 below (added in red italics are the additional increments):

Table 3-2 Half Stops

Shutter Speed	Aperture
8 seconds	f/1.4
6 seconds	*f/ 1.8*
4 seconds	f/2.0
3 seconds	*f/2.4*
2 seconds	f/2.8
1.5 seconds	*f/3.5*
1 second	f/4.0
1/1.5 second	*f/4.8*
1/2 second	f/5.6
1/3 second	*f/6.7*
1/4second	f/8.0
1/6 second	*f/9.5*
1/8 second	f/11
1/10 second	*f/13*
1/15 second	f/16
1/20 second	*f/19*
1/30 second	f/22
1/45 second	
1/60 second	
1/90 second	
1/125 second	
1/180 second	

Table 3-3 Third Stops

Shutter Speed	Aperture
8 seconds	f/1.4
6 seconds	*f/ 1.6*
5 seconds	*f/1.8*
4 seconds	f/2.0
3 seconds	*f/2.2*
2.5 seconds	*f/2.5*
2 seconds	f/2.8
1.6 seconds	*f/3.2*
1.3 seconds	*f/3.5*
1 second	f/4.0
1/1.3 second	*f/4.5*
1/1.6 seconds	*f/5.0*
1/2 second	f/5.6
1/2.5 second	*f/6.3*
1/3 seconds	*f/7.1*
1/4second	f/8.0
1/5 second	*f/9.0*
1/6 seconds	*f/10*
1/8 second	f/11
1/10 second	*f/13*
1/13 seconds	*f/14*
1/15 second	f/16

Light Reading

When you enter a dark room after being in the sunshine, at first everything seems dark and it takes a few minutes for your eyes to adjust to the new amount of light present. When inside a dark room looking out at a bright window, the human eye can adjust to the different degree of light from a variety of sources. A camera cannot. A camera will take a 'spot' light reading (i.e. from a predefined point in your frame), or it will create an average of multiple points in your frame and will give you the recommended aperture and shutter speed (depending on the light meter settings you have). Many times you will notice that some areas within your frame will require more light, and some less light than the camera's light meter recommendation.

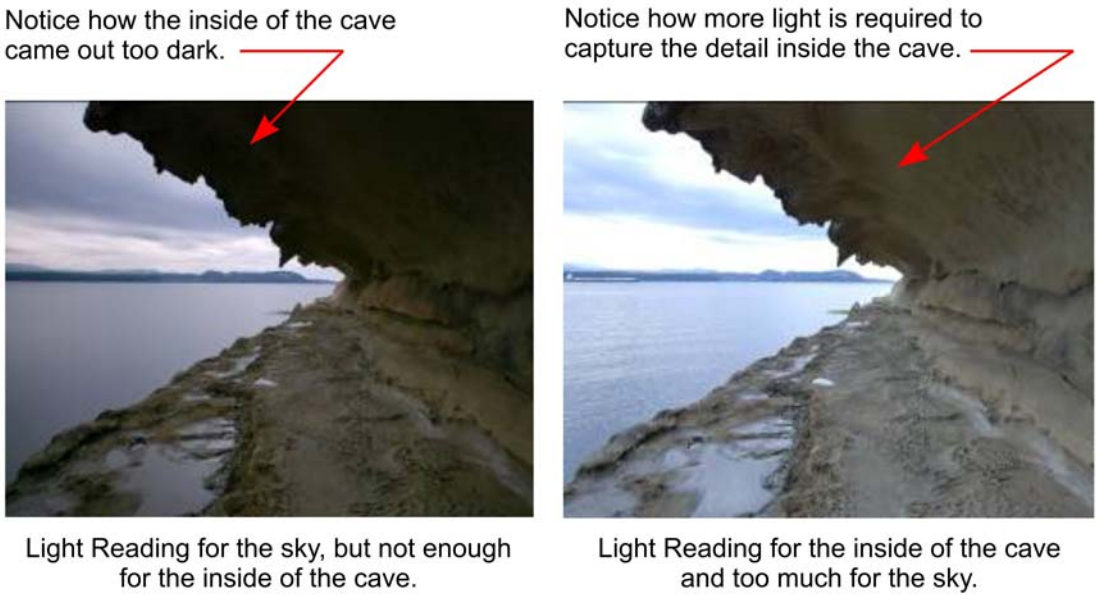


Figure 3-1 Light Reading

To overcome this problem photographers take a few shots (with a tripod of course, to ensure that all objects remain in the same place), while leaving the aperture constant and changing the shutter speed to increase or decrease the amount of light accordingly. This is called **Bracketing**. Afterwards in the Digital darkroom, the images can be combined to create one image where all portions have the correct light exposure (also known as HDR – High Dynamic Range). **Bracketing for this technique should be done with leaving the aperture constant and changing the shutter speed**. Keep in mind that if you Bracket with leaving the shutter speed constant and change the aperture, you will get different images with a different depth of field, as explained in Chapter 2.

While you are still learning the skill, my personal advice would be to keep your settings on a full stop or at half a stop. By having less increments it will be easier to notice changes when bracketing.

About ND Filters

Looking at Long Exposure images, one might get the impression that they were taken at night. The contrary is true, although dawn and dusk are also good photography hours, many of my Long Exposure images were taken in cloudy weather in mid day. There are a few reasons for this:

1) At night, bright features such as city lights, stars or the moon are significantly brighter than the dark features. This extreme difference will be very difficult if not impossible to overcome and will create extreme overexposed areas and extreme underexposed areas in the photo. More on over and under exposed images will be discussed in Chapter 4 – Histogram.
2) Since clouds play a major role in Long Exposure photography, there needs to be sufficient light to highlight them, which is something that is hard to achieve at night.
3) Night time long exposures will require a much longer duration of exposure, resulting in significant digital noise (as explained in Chapter 2).
4) We have no measure for the duration of exposure required at night (the camera only gives light readings up to 30 seconds). We would have to do trial and error to discover the correct exposure for each shot.
5) A night time exposure could require an exposure of over an hour. If you are shooting with a film camera this might not seem to be a problem, but with a digital camera your battery might drain out.

Long Exposure Photography is a technique in which we create a darker reality so we can leave the Shutter Speed open for a longer period of time. We do this using Neutral Density (ND) Filters. ND Filters reduce the amount of light from all wavelengths or colors equally. Different ND manufactures may use a different way to indicate the amount of light an ND filter can reduce, but there are three typical systems in which a filter's strength is quantified as shown below:

1. **F-Stop Reduction**[1], the number of F-Stops in which a filter reduces the amount of light entering the camera; i.e. once a 3 Stop Filter is placed on the lens, it will reduce the amount of light entering the camera by 3 F-Stops, therefore, once the filter is mounted on the camera, to get a correct exposure you will need to increase shutter speed duration or aperture by 3 F-Stops.

2. **Density,** is measured by this formula, as in Tiffen and B&W filters, for example:

Density = (0.3) x (F-Stop Reduction)

Therefore, when shopping for a Tiffen or B&W filter that reduces the amount of light by 6 F-Stops, you will look for a filter with a Density of:

Density= 0.3 x 6 = 1.8

3. **Filter Factor**, which refers to the multiplicative amount of light a filter blocks. The number of F-Stops required to correct the exposure with a given filter may also be calculated using the formula:

Filter Factor = 2^x

Where 'x' is the number of F-Stop increases required. i.e. a filter that reduces the amount of light by 3 F-Stops will have a Filter Factor of:

2^3=8 2 to the power of the f-stop reduction, so 2 to the power of 3 is 8 and will be displayed as **8x**.

[1] Although referred to as F-Stop, it also applies to S-Stop.

I will take a B+W filter for example: All of these three measurements are printed on the filter as such (example for a 10 F-Stop Reduction Filter) and also shown on Figure 3-2:

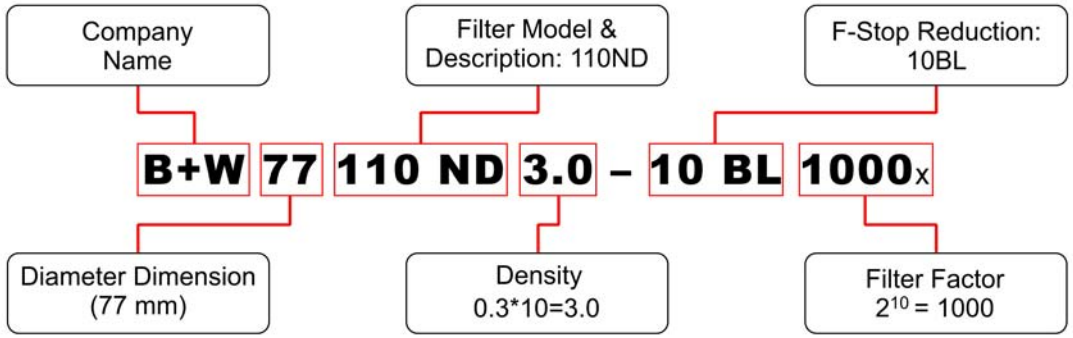


Figure 3-2 Filter Readings[2]

Figure 3-3 – The ND Filter

[2] Although 2^{10} is 1024, for the sake of simplicity it was rounded to 1000.

There are three different strength levels of ND Filters I recommend working with: 3, 6 and 10 (F-Stop Reduction). Up to two filters can be placed on the lens at a time without optically degrading the optics of the image. Placing two filters at once at the end of the camera lens adds to the sum of their intensity, therefore a 10 filter together with a 3 filter will result in a total strength of 13 and reduce the amount of light entering the camera by 13 F-Stops. By working with the three recommended filters: 3, 6 and 10, you can create the strength combinations of 3, 6, 9, 10, 13 or 16.

These higher value ND Filters are hard to find at your local camera store and will require a special order. You can also consider shopping online.

Note: The higher end filters have a brass ring. I personally recommend these for two reasons:

1. It makes them more durable and,
2. It is easier to thread two filters together without having them stick.

Practical Tip:
I recommend keeping the filters in a filter bag. Cokin makes a great one that can be mounted on a belt or a side bag where each filter sits in its own cushioned slot (see Figure 3-4). I personally find this extremely handy when in the field and changing filters or setting up.

Figure 3-4 - Side bad with filter bag mounted.

Stepping Ring

Filters come in different diameters according to the diameter of your lens. If you decide to pursue the Long Exposure technique you will soon discover that ND Filters can be quite expensive, and as every digital photographer knows, the gear we use gets constantly upgraded with a more advanced model. Therefore, **I recommend buying your filters at the largest diameter available (which is 77 mm),** and add to your shopping cart a $10.00 Stepping Ring to adapt it to the lens diameter you will be using with the filters. By doing this, you will always be able to use your filters for every lens as long as you have a Stepping Ring to match it.

Steeping Rings have two measurements: **from** and **to.** The first number is the lens side which is a male thread that screws onto the lens. The second number is the filter size which is a female thread allowing the filter to be attached.

If you shoot with a lens that has a diameter of 67 mm, you will look for a Stepping Ring 67mm to 77 mm. You should have no problem finding a Stepping Ring at your local camera store.

Figure 3-5 Photo of two filters and stepping ring in the center.

Using the Filters

To understand which filter or combination of filters to use, the following procedure needs to be understood:

When you look through the view finder (without filters) and compose your shot, adjust your aperture and shutter speed according to the camera's light reading (while in full manual mode of course). This reading is what I will refer to as the **Original** light reading. Typically, you will want to set your shot to a fixed aperture value (as discussed earlier to achieve a large depth of field). It will be your shutter speed that you will want to change and adjust to the new light requirements **after** placing the filters, because as discussed earlier, the filters prevent light from entering the camera and you will have to compensate that with a longer shutter speed. I will refer to the shutter speed required after placing the filters as the **Actual** shutter speed.

BEFORE PLACING FILTERS = **ORIGINAL** LIGHT READING
AFTER PLACING FILTERS = **ACTUAL** LIGHT READING

I hope that you have enjoyed reading this Ebook and have gained knowledge on the technique of Long Exposure Fine Art Photography. For any questions or comments, please contact: sharon@SharonTenenbaum.com

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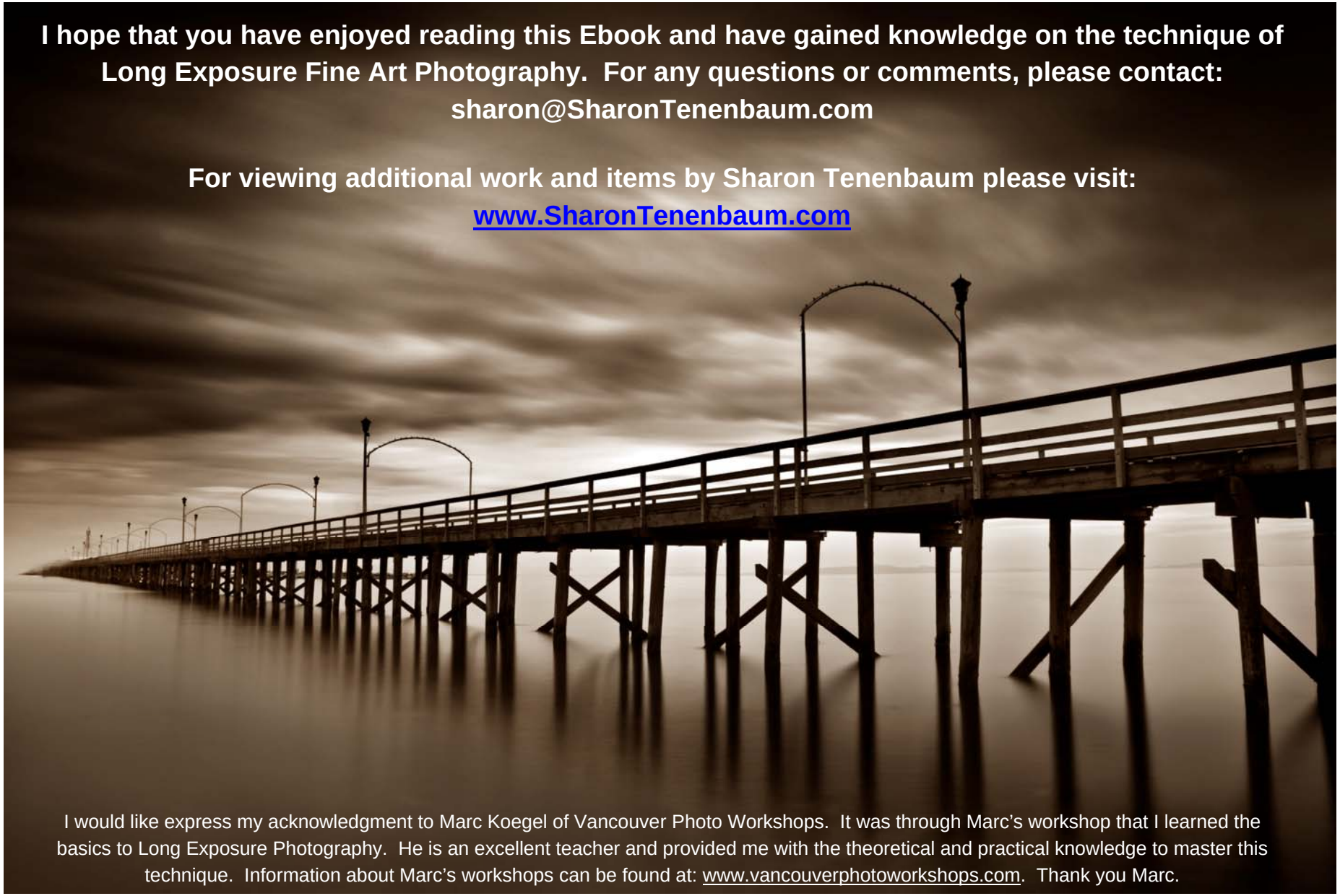

I would like express my acknowledgment to Marc Koegel of Vancouver Photo Workshops. It was through Marc's workshop that I learned the basics to Long Exposure Photography. He is an excellent teacher and provided me with the theoretical and practical knowledge to master this technique. Information about Marc's workshops can be found at: www.vancouverphotoworkshops.com. Thank you Marc.

Sharon Tenenbaum was educated as a Civil Engineer in Israel, and practicing as a Professional Engineer in Vancouver Canada. In late 2007 she made a decision to part from engineering in order to pursue her passion for photography after being inspired by a life changing journey to South East Asia. After Jostling through the streets of Delhi, trekking the Himalayas and cycling through Myanmar (Burma). She chose to express her fascination of all she witnessed through photography. Returning home to Vancouver, B.C., she began to see her home town through a new pair of eyes and expressed it all through photography. These backyard discoveries gave birth to her 'Vancouver Portfolio', which eventually turned into a fascinating Photography book, *Vancouver Like No Other*.

As a Photographer, Tenenbaum is mostly a self-taught artist, having learned her craft through personal research and practical experience behind the camera. Sharon has chosen to combine her engineering side with her artistic side to create a "Bridges" Portfolio. Although an emerging artist, in a relative short period she has managed to define an artistic direction and distinctive style in her work, acquiring international recognition in the process. Some of her achievements are a first place award in the 2008 International Photography Awards for her Capilano Suspension Bridge and a recent publication in National Geographic.