

ESSENTIAL REFERENCE GUIDE TO  
***LONG EXPOSURE***  
PHOTOGRAPHY





ESSENTIAL REFERENCE GUIDE TO

# ***LONG EXPOSURE***

PHOTOGRAPHY

GRAHAM CLARK

VERSION 1

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OCTOBER 2015

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BREAKTHROUGH PHOTOGRAPHY

SAN FRANCISCO

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# 1

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## WONDERFUL WORLD OF LONG EXPOSURE

*"The unliberated photographers  
awareness is constricted by expectations  
about how things ought to look."*

PHILIP GROSS

What does a successful long exposure image look like? It's exposure time is generally between 30 seconds to 5 minutes, it's critically sharp, has naturally saturated color, exhibits zero shadow noise and the subject or environment is dramatically exaggerated by the fourth dimension - time.

I wrote this reference guide to show you step-by-step how to get these results.

The goal of this guide is to provide you with a practical and immediately executable approach. I've kept rambling and entertainment to a minimum here.

I've made all the mistakes and then some when it comes to long exposure photography. Unlike other areas of photography, long exposure calls for more attention to detail, a somewhat specialized equipment kit and a different approach to pre-visualization and composition.

We're going to go over that, too.





## LEARNING CURVE

Long exposure is a very unforgiving niche of photography with a somewhat steep learning curve. This is partly because in nearly all cases your exposure times will be beyond your cameras ability to meter.

Exposure then must be carefully balanced by *you*, not the camera.

## THE MAGIC OF LONG EXPOSURE

Life isn't like a stream, it's like a movie. Like a projectionist in the back room stitches together reels without audiences noticing, the brain collects the frames of reality sent to it and weaves them into one apparently seamless whole. The human shutter speed, if we may call it that, is somewhere around 1/125th of a second at the focal length equivalent of 50mm. That's what your eyes see.

The human shutter speed shows us life at a certain speed, but life can be much faster or slower if we change it.

## WHO THIS GUIDE WAS WRITTEN FOR

This essential reference guide assumes you already have a foundation in photography and you've mastered the basics. If you'd consider yourself intermediate, skilled or a professional then this reference guide was created just for you.

If you need a refresher or if you're just getting into photography for the first time check out my 'filling-in-the-gaps' book *7 Mistakes Photographers Make (And How To Avoid Them)*. Once you're up to speed come back to this reference guide and you're good to go!

**Next:** The *5 Essential Tools* required for long exposure photography.

# 2

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## THE 5 ESSENTIAL TOOLS

*"Composition is the strongest way of seeing."*

EDWARD WESTON

### 5 ESSENTIAL TOOLS

Before we begin you'll want to do a equipment checklist to ensure you have everything you need. There are 5 essential tools that you must have in order to proceed to the next stage.

Only a couple things are required that are not considered typical for a photographer to have: ND filter and a shutter release cable.

You might need to go out and buy these if you don't have them already. In many cases it doesn't need to be expensive or fancy, it just needs to perform a function. In other cases quality does matter. I'll provide you with my personal recommendation once you reach the crossroad.



## 1. CAMERA

Of all the equipment to spend money on, the camera is perhaps the thing you can think about the least. When it comes to color, image quality and the rest the differences between a cropped sensor and full-frame cameras are insignificant.



If you were just getting into photography and you're looking for a great camera for under \$300 [click here](#) to see what my current recommendation is. It's easy to overthink the camera when in fact it's the least important part of the equation.

With that said, there are a few equipment considerations to be aware of. One of the advantages of the full-frame cameras is that the ISO range drops down to ISO 50, which as you'll see later allows for more control over long exposure times.

My personal go-to cameras are the Canon 6D ([Review](#)) and Sony A7R ([Review](#)). I use the 6D 80% of the time.

[click here](#) to see my current camera recommendation

## 2. LENS

The world of long exposure is drastically different depending on the focal length you're using, with wide angle lenses allowing the photographer to significantly exaggerate time and movement. Good combination for long exposure.

For this reason I prefer to use wide angle lenses about 80% of the time, which is between 16mm and 24mm full-frame (10mm - 16mm on cropped cameras).

Optics is where money does matter, so unlike with the camera body, the more you spend on the optics the sharper and more durable the end result will be.

I recommend the Canon 17-40 L and Nikon 16-35 F4. [Click here](#) to see the current price and reviews.

Another option is the new [16-35 F4 IS](#) by Canon, which is currently the king of critically sharp wide angle lenses with virtually no chromatic aberration anywhere in the focal range.

There's also ultra-wide angle zooms like the new [Canon 11-24mm L](#) and the [Nikon 12-24mm](#), and although I love my 12-24 I rarely use it due to them not having standard filter thread sizes, making them cumbersome when working with ND filters.

A good lens for long exposure will perform critically sharp, reproduce colors accurately, have a low amount of flaring and will have very little to no chromatic aberration. A bad lens for long exposure will be soft at the corners, colors will look more flat and chromatic aberration only becomes worse with the larger the sensor or print size.

My personal go-to lens is the [Canon 16-35 F4](#).

[click here](#) to see my current lens recommendation

[Click here](#) for my review of both lenses.









### 3. NEUTRAL DENSITY FILTERS

Neutral Density (ND) filters allow photographers to predictably control the environment by slowing down exposure time, as measured in stops.

‘Neutral’ refers to the glass being color neutral, without color.

‘Density’ refers to how dark the ND filter is. You can measure how dark a ND filter is by determining the number of stops of light it reduces.

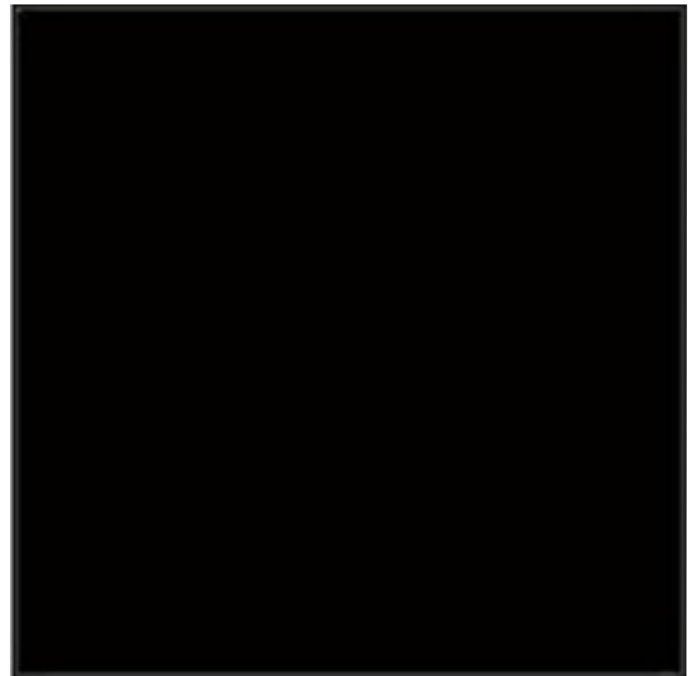
#### RECTANGULAR OR CIRCULAR?

If there are two filters that photographers often times get confused, that’s Graduated Neutral Density (GND) and Neutral Density filters.

*Graduated Neutral Density*



*Square Neutral Density*



GND filters must be square because they have to be aligned and tilted with the subject by sliding up and down in the GND holder, however ND filters are solid and therefore do not have this special requirement.

The downside to having a square ND filter is simple: light leak is the enemy when it comes to long exposure photography and the GND holders often allow small amounts of light in. They’re also expensive, require a holder and are cumbersome to carry around.

My personal recommendation is to only buy **circular NDs** and **square GNDs**.

NEUTRAL DENSITY FACTORS

There are three primary ND filter strengths: *3-stop*, *6-stop* and *10-stop*. However, many manufacturers of ND filters don't call the densities by stops, instead they use secondary and tertiary terminology, as illustrated below:



X3 ND 6-stop



HOYA ND4



B+W ND 0.6

F-STOP	SECONDARY	TERTIARY	TRANSMISSION
1-stop	ND2	ND 0.3	50%
2-stop	ND4	ND 0.6	25%
<b>3-stop</b>	ND8	ND 0.9	12.5%
4-stop	ND16	ND 1.2	6.25%
5-stop	ND32	ND 1.5	3.125%
<b>6-stop</b>	ND64	ND 1.8	1.563%
<b>10-stop</b>	ND1000	ND 3.0	0.098%

Yes, it's all very confusing but you need only be concerned with understanding *stops*, which is photography terminology used when talking about exposure time.

Due to some manufacturers of the filters using the secondary way to describe the darkness strength, others the tertiary way, a little reference chart like the one above can be useful when picking up your ND filter. Just convert the various measurements into stops and you're all set!

## WHICH STRENGTH SHOULD I GET?

The 3-stop ND filter is one of the most versatile of the ND filters. And when combined with a circular polarizer, low ISO and high F numbers you can get dramatic results immediately, especially during sunrise or sunset.

A 6-stop nearly doubles or triples the exposure time of what a 3-stop would, with exposure times typically ranging between 2-5 minutes at sunset.

This is a great exposure range for long exposure, and it's my personal favorite. Once exposures reach the 5 minute mark the 3-stop takes over.

My personal recommendation is to get a 3-stop first, a 6-stop second, and when stacked together you get 9-stops. No need to buy a 10-stop!

## WHAT MAKES A GOOD ND GOOD?

If performing critically sharp is a determining factor between a good and bad camera lens, then a ND filter performing as completely color neutral as possible is what separates the good NDs from the bad.

'Neutral' Density, as the name implies, means color neutral. But very few are truly color neutral. Typically a lower price correlates very strongly to a more apparent color cast, but this is not always the case.

Of the three images below the one in the top left is the one without any filter (control) at all. Notice how the two NDs exhibit yellow and magenta hues?





CONTROL AUTO



HOYA AUTO



CONTROL AUTO



B+W 3-STOP AUTO



CONTROL AUTO



X3 10-STOP AUTO



Any color cast is greatly amplified as the ND density increases. If a 3-stop ND performs with a yellow color cast you can simply expect to see a multiplied effect if going darker with the same type, or brand.

This is why a vast majority of 10-stop ND filters exhibit incredibly strong color casts. The ND 3-stop and 6-stop filters from the same brands also have the same color cast, it's just much less pronounced at lower densities.

The side-by-side comparisons on the preceding page are hardly perfect due to the ND densities not being equal, but it should give you an idea of how pronounced color casts are between different brands of filters when compared to no filter at all (control).

## **CAN I REMOVE COLOR CAST IN POST-PROCESSING?**

Not completely.

Let's say you're shooting a sunset and you have lots of reds, oranges and magentas, and the ND is covering your image with a strong magenta cast. By removing the color cast you're also stripping away the layers of hues that were of similar hues in the color cast. You saw them with your eyes, the color was in the real world, but of course it's impossible to differentiate in post-processing.

But more importantly you should strive to shoot everything in-camera as much as you possibly can!

## **WHAT ABOUT VARIABLE NDs?**

Variable Neutral Density filters allow you to adjust the ND strength from 2-stops all the way to 10-stops, all in one filter. That means you only need to buy one and you're all set to go! Unfortunately it's too good to be true...

There are two main reasons why:

The first, is that the the effect of the variable ND is achieved through the use of double polarization being rotated in opposing directions which causes a very apparent 'X' on wide angle lenses, as seen on the following page.



'X' factor present on variable NDs

The 'X' factor starts to occur at around 24mm and wider on full-frame setups. At 25mm it becomes less of an issue, disappearing completely at around 30mm.

The second reason is again due to the double polarization: polarizers are inherently not color neutral, as seen in the above photo which exhibits a very strong yellow cast. Combining two layers of polarizing film, both of which are not color neutral, simply makes the problem much worse.

There is a use case where these can be useful, however, and that's video. 35mm and longer is normal for video, so these have a very practical application there but they're essentially useless for still photography.

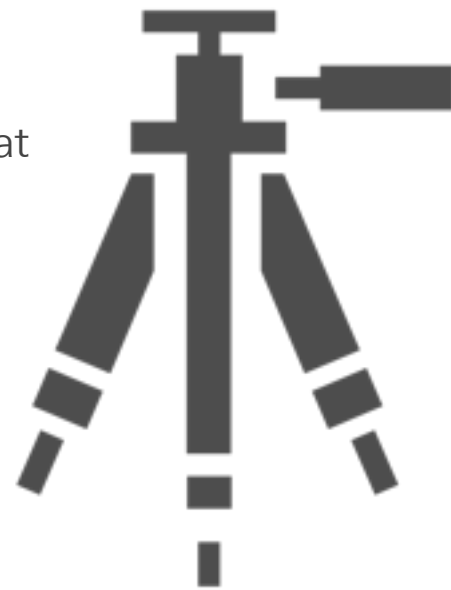
My personal recommendation: stay away from these, but if you're in the market for one because you're a video shooter go for the color neutral **Singh-Ray Vari-ND**.



#### 4. TRIPOD

Stability and image sharpness are intrinsically linked, and for that reason a tripod is one of the five essential tools.

I have quite a few expensive carbon tripods but the one I use most frequently when shooting on the coast is a \$100-something aluminum one I bought on Amazon. [Click here](#) to check it out.



[click here](#) to see my basic yet stable tripod recommendation

#### 5. SHUTTER RELEASE CABLE

Cameras meter up to 30 seconds, and since we're going way past that a shutter release cable is needed.

Image sharpness and stability are important to any long exposure photograph, because often times it's the in-sharp subjects juxtaposed against movement that creates a compelling image.

Getting a critically sharp long exposure image however is like a intricate dance, with one misstep and the entire dance must be repeated. Even the slightest hand movement touching the camera while camera is exposing could soften the image.

It's for this reason that the shutter release cable is required. If you don't have one I'd recommend [this one](#), or one like it.

[click here](#) to see my shutter release cable recommendation









# 3

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## ANATOMY OF A LONG EXPOSURE

*"Why limit yourself to what your eyes see  
when you have an opportunity to extend  
your vision?"*

EDWARD WESTON

This section is all about the technical nuts and bolts of getting perfectly balanced long exposures, so let's assume all the images on the following pages suck.

For a moment I just want you to view a set of images and their corresponding exposure settings as opposed to asking yourself "is it pretty or does it suck?" as we all naturally do. It's in these simple and in some cases completely unedited images there will be three very important patterns that will emerge.

Now I want you to ask yourself is 'How can I make my exposure longer in-camera?' There are three answers to this question. This should be review, but let's examine the answers as on the following pages very little will make sense if this doesn't:

1. **Higher F number** lets less light in (like F22 or F32)
2. **Decreasing ISO** to the lowest setting (ISO 100 or ISO 50) making the sensor less sensitive to light
3. Selecting **Shutter Priority**, selecting longest shutter and letting the camera adjust the ISO and F number up or down to compensate

## **PROS AND CONS OF IN-CAMERA METHODS FOR LONGER EXPOSURE**

This might seem overly simple, but bear with me because there's a shortcut hidden in this simple stuff that allows you to control ND filters with ease.

### **1. HIGHER F-NUMBER**

Increasing the F number decreases the shutter diaphragm which results in significantly less light coming in. When you've mastered long exposures you'll frequently use just F numbers to control the duration of exposure.

From an image quality perspective the downside to increasing the F number is that each lens performs critically sharp somewhere in the middle of its respective F range. If a wide angle lens ranges from F4 to F22 it will resolve critically sharp somewhere around F8 - F16 with details softening the higher or lower you go outside this range.

### **2. DECREASING ISO**

The image quality on your camera is determined by what ISO you have selected. The higher the ISO the less color saturation and sharpness. The advantage of a higher ISO then is to increase the shutter speed to be very fast, which is in the opposite direction for where we want to be.

### **3. SHUTTER PRIORITY**

You can ignore this one, you'll never use it again.

We're on the same page, right? Ok now let's look for patterns.









## IMAGE 1

ZION NATIONAL PARK, UTAH

25s • F22 • ISO 50 • 20MM

CANON 5D3 • CANON 17-40 • B+W CIRCULAR POLARIZER

In this image you'll notice that the color tones appear to be well saturated and it looks natural. Important: ISO 50 is actually ISO 100 pulled down - it's not a native ISO. Although I haven't personally noticed any highlight headroom difference between the two, it's preferable to stay at ISO 100 that way you have the ability to increase exposure simply by dropping the ISO if you like.

For example had we shot this at ISO 100 and we wanted to go to 50 seconds we could have dropped the ISO down to 50 without the need for a ND filter.

In order to increase exposure time F22 was selected, with the adverse side effect of lowering sharpness across the entire frame, and you'll come to this sharpness vs. duration (technical vs. aesthetic) tradeoff quite often.

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## IMAGE 2

GREAT BASIN NATIONAL PARK, NEVADA

30s • F22 • ISO 50 • 24mm

CANON 5D3 • CANON 17-40



This is the first image in the sequence shot at the lowest ISO setting.

But even at the lowest ISO and highest F number the camera would only meter to about 30 seconds - it was bright that night! At this point I put on a 6-stop ND (yes, at night!) and pushed the exposure out to about 900 seconds.











### IMAGE 3

GREAT BASIN NATIONAL PARK, NEVADA

901s • F8 • ISO 100 • 24mm

CANON 5D3 • CANON 17-40 • B+W ND 6-stop

With the 6-stop ND I increased ISO to 100 to have the flexibility to half it at ISO 50 if needed.

This particular lens performs sharpest between F8 - F11, so I started it at a conservative F8 and put on the 6-stop ND filter.

It took a few shots to get it right. The first frame I guessed at 400 seconds... too dark. 700 seconds... too dark. 800 seconds... almost there. 900 seconds... that's it.

The result is the moonlit landscape looks sunlit in the distance, and we even have clarity and details under the water. Notice the trees silhouetted in the distance? Two very different results simply by increasing exposure.

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### IMAGE 4

SOMEWHERE IN THAILAND

60s • F8 • ISO 100 • 24mm

CANON 6D • CANON 24mm L • X3 ND 6-STOP



On this exposure I calculated the correct exposure time to be 60 seconds by using the camera's metering system, even though it has a 30 second limit. This trick is very useful and I use it frequently. Here's how it works:

Setup camera with composition ready, in this case F8 and ISO 100 set, but I don't know what duration it should be because the camera's meter just blinks with '30"', meaning it's unable to meter the scene.

As I increase the ISO up one notch at a time (enable ISO increments in your custom functions menu) I wait until the camera is able to meter again.

It locks onto metering at ISO 200, so I double 30 seconds to 60 seconds.

That's it! If you'll recall I used that same technique at Zion National Park.











## IMAGE 5

YOSEMITE NATIONAL PARK, CALIFORNIA

112s • F13 • ISO 50 • 24mm

CANON 6D • CANON 17-40mm • X3 ND 6-STOP

**F13** The small and sharp ice patterns in the center area, and the saturated sunset red against the sky had to be sharp for the end result to look right, so for this image I was manually focusing in live view on the ice patterns.

**ISO 50** I had everything the same except for ISO 100 at 35s (almost within range of metering), then dropped ISO to 50 and tripled exposure.

As light rises and falls fast at sunset, especially in the mountains, tripling exposure time is always necessary during sunset when shooting with a 6-stop ND. About 20 - 30 minutes after the sun sets I immediately change the 6-stop ND for a 3-stop.



## **IMAGE 6**

SAN FRANCISCO SUNRISE

131s • F18 • ISO 100 • 17mm

SONY A7R • CANON 16-35 F4 • X3 ND 6-STOP

### **F18**

The fog-like water was achieved by pushing exposure out, and the misty haze a result from the sea mist completely covering the filter.

### **ISO 100**

If we had wanted to increase exposure time we would have had the convenience of going down to ISO 50. Whenever faced with the tradeoff of going down in ISO or going up in F numbers to achieve the same result, always go down in ISO.



## **IMAGE 7**

BANFF NATIONAL PARK

240s • F18 • ISO 50 • 17mm

CANON 5D3 • CANON 17-40mm • X3 ND 6-STOP

### **F18**

Again to increase exposure F18 was chosen

### **ISO 50**

I had previously shot a sequence at ISO 100 at 90 seconds, so I dropped it to ISO 50 and nearly tripled again because of falling light









## IMAGE 8

GRAND TETON SUNRISE, SUMMER

40s • F14 • ISO 50 • 30mm

CANON 6D • CANON 17-40mm • X3 ND 3-STOP

### F14

Without a significant foreground subject it frees the photographer to get closer to the best lens performance

Long exposure images contain movement that occurs within a given time frame, and colors that come and go within the range stay too. Here the orange background on the left and the yellow sunlit mountains occurred at different times to the human eye (at 1/125th of a second) but in one single frame here.

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## IMAGE 9

GRAND TETON SUNRISE, WINTER

180s • F18 • ISO 100 • 30mm

CANON 5D3 • CANON 17-40mm • X3 ND 6-STOP

### F18

Here even though it's the same frame I had foreground subjects

### ISO 50

What was true in the last frame is true here too: the delicate purple gradient of twilight is juxtaposed against the sunrise hitting the teton peaks, even though to the human eye they were two separate events. Long exposure then contains more color than the 1/125th speed of our eyes.







### **IMAGE 10**

WHAT LOOKS LIKE A FACE OVER SAN FRANCISCO

205s • F20 • ISO 100 • 20mm

SONY A7R • CANON 17-40mm • X2 ND 3-STOP

The night of the event this was shot I was doing a sunset photography event with a bunch of photographers from San Francisco, and when this exposure was completed to everyone's surprise it looked like a face looking down on San Francisco.

Unexpected results occur when you're stuck at seeing the world at 1/125th.







## IMAGE 11

SAN FRANCISCO SUNRISE TWILIGHT

260s • F18 • ISO 100 • 20mm

CANON 6D • CANON 17-40mm • X3 ND 6-STOP

Although it was pretty dark this was the result on the back of the camera screen when the exposure had finished. The water is turquoise, however our eyes can't see in the dark, but the morning twilight with enough exposure time blankets the entire environment with soft light.

Remember, it's nearly impossible to overexpose with long exposure photography in low light when using ND filters.

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## IMAGE 12

SAN FRANCISCO SUNRISE SUN

150s • F22 • ISO 50 • 30mm

CANON 5D3 • CANON 17-40mm • X3 ND 6-STOP

Without a moments notice the sun immediately started shining and I threw everything aside moving the F number to the maximum, ISO to the lowest and guessing around half the exposure time - but this harsh light wouldn't compare.

Indirect natural light is your friend, harsh direct light is your enemy.







## IMAGE 11

RODEO BEACH, SAN FRANCISCO

176s • F22 • ISO 50 • 17mm

SONY A7R • CANON 17-40mm • X3 ND 6-STOP

There's a number of exceptions to the tradeoffs, and when at a crossroad between F number and ISO if you're within the Minimum Focusing Distance (MFD) or close to it as specified by the lens manufacturer and you want the entire frame to be in focus you must always take the F number road.

That's what happened here, as the camera was only 3 feet away from the closest subject.

Highest F number and lowest ISO plus a 6-stop ND filter, I guessed around 2 1/2 minutes, but again it's nearly impossible to overexpose so I went for 30 seconds more.

As seen in previous images a range of colors present during the start and finish of the exposure is visible, including water colors that only appear when the water appears fog-like.









# 4

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## 3 ESSENTIAL LONG EXPOSURE TECHNIQUES

*"The deliberate physical actions necessary to transform a pre-visualized image to achieve success are quite straightforward to learn."*

GALEN ROWELL

If you get nothing from this short guide except for these three essential techniques you're already way ahead the crowd by a long shot.

Why? In no small part because two of the three techniques have only become available within the past few years by way of technological breakthroughs. And one is so seemingly innocuous most people don't know it exists.

### 1. GETTING CRITICALLY SHARP LONG EXPOSURE IMAGES

When using an ND filter, manually focusing through the viewfinder is impossible. The good news is that the autofocus performance on some cameras (6D) can still obtain a good AF lock on your subject even if it's dark in the viewfinder.

The bad news is that we don't want the image to be autofocus sharp, we want it to be *critically sharp*.





Here's the simple process for getting tack sharp long exposure images:

1. Switch your lens to *Manual Focus*
2. Turn on *Live View* and while mounted to a tripod
3. Select the *Magnify* button to toggle between 5x or 10x magnification.
4. With the focusing ring on your lens, dial in the sharpness so the edge of your subject is as sharp as it can be.

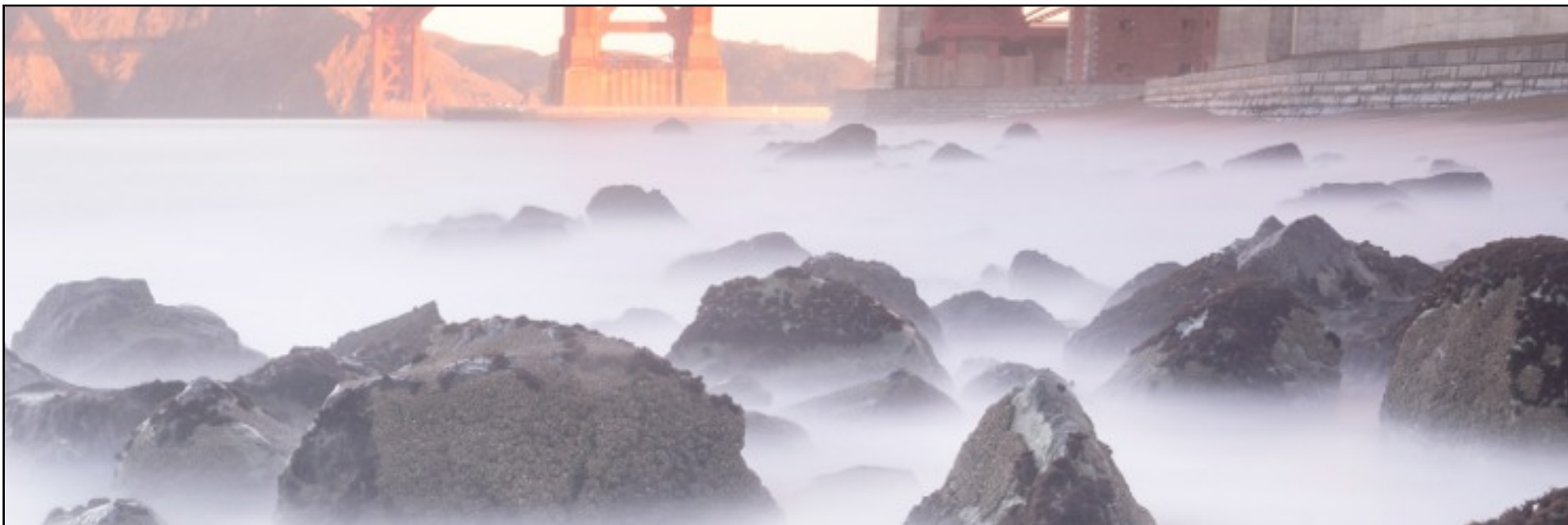
A couple things to keep in mind when manually focusing with Live View:

1. If you adjust the focal length of your lens, move the camera or re-frame your composition, *you must repeat the Live View magnification process*. This is a common *gotcha* about achieving critical sharpness.

2. Your photograph will only be as sharp as the quality of optics in the light path. Filters reduce the lens quality down to the filter quality. If you're not seeing critically sharp images its due to one or all of three reasons: *A. Diopter adjustment is off B. Filter quality is poor, get a new filter or C. Lens quality is bad, get a new lens*

This is an example of a critically sharp shot achieved just by using this simple and effective technique of using Live View at 100% magnification with manual focusing.

276s • F18 • ISO 50 • 20mm









## 2. COMPOSING WITH ND FILTERS

When using a 6-stop ND filter or greater viewing anything in the viewfinder is impossible. Up until just a few years ago with the advent of incredibly high ISOs photographers were just guesstimating on compositions because viewfinders were nearly pitch black when using ND filters. Definitely not a good thing to guess about!

Now with high ISOs combined with Live View, you have the ability to use the high ISO for the purpose of composing.

Let me clarify one thing here as lots of photographers get snagged at this point: 99.99% of the time we use ISO 50 - 100, right? Right. The high ISO is used here *only for the purpose of Live View playback* on the camera's LCD screen. The camera uses the image processor for video playback and ISO performance.

So the higher the ISO the better, *for the purpose of composing an image on the LCD*.

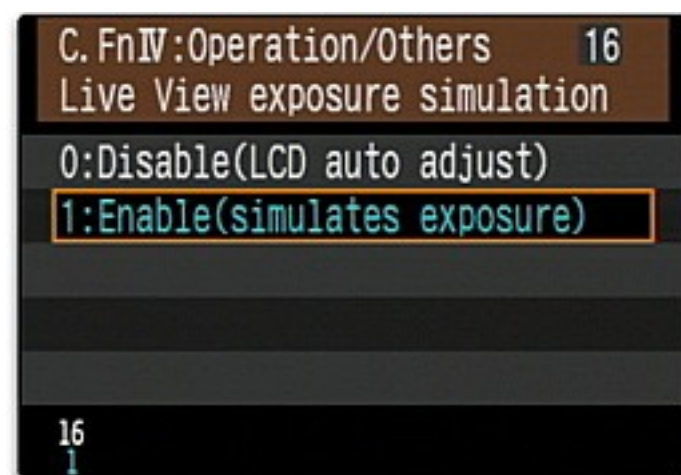
Conversely, cameras with very low ISOs make for very poor long exposure cameras because it's nearly impossible to compose with 6-stop NDs or greater without a direct light source.

For example, my Sony A7R has a ISO limit of ISO 25,600. My 6D has a limit of ISO 102,600. If we have both cameras side-by-side the Sony A7R has a black LCD display, whereas the Canon 6D has a perfectly visible scene displayed on the screen, allowing us to compose perfectly fine.

But there's a catch. By default there's feature called *Exposure Simulation* that's turned on, which displays on-screen what your exposure parameters are.

That's bad, so turn that off and keep it off. On the 6D you can turn it off in the normal settings menu; on the 5D3 it's under custom functions as pictured here to the right.

Once disabled you're all set to begin composing as normal, even with 6-stop ND filters or darker.





**3. LIGHT LEAK**

This is a simple and very short one, but often overlooked and important: light leaks through your SLRs viewfinder and adversely affects exposure.

Any stray light affects exposure therefore you should always cover the viewfinder when exposing.

On mirrorless systems like the A7R you don't need to do this, only SLRs. I cover mine with a black lens cloth underneath the gravity of the neck strap, as pictured below.

SLR Vertical



SLR Horizontal



N/A













# 5

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## THE END

*"It took years to become spontaneous & simple."*

MARTHA GRAHAM

Well, I hope you were able to learn a few things from this guide.

If you're ever in the San Francisco area [click here](#) to see if I'm hosting any meetups where we go over much of this stuff in person.

If you're ever in the market for an ND filter, [click here](#) to check out the X2 ND, and [here](#) the X3 ND.

Happy shooting,

A handwritten signature in black ink that reads "David G. Clark". The signature is stylized with a large, sweeping 'D' and a cursive 'Clark'.

Graham

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