A Zone System Handbook

Part 1 – Exposure and Zone System Basics

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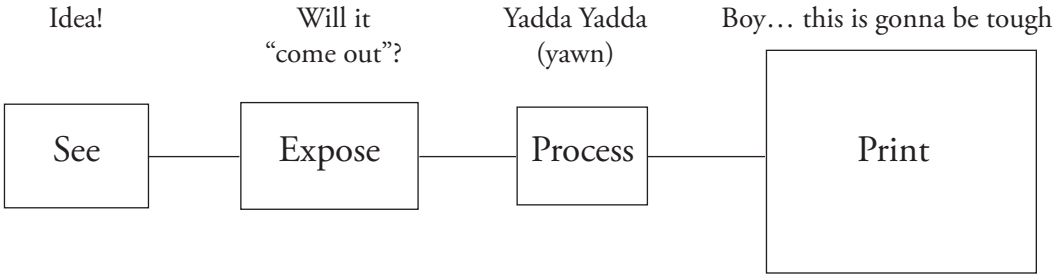
Seeing and Photographing

In virtually every form of communication, whether it is verbal, visual or written, there are clear lines of demarcation between the idea, the execution and the presentation. In few of the media are the lines so clearly drawn (or so it would appear) as they are in photography.

We are very aware, even at the outset, of the idea of composing the picture; putting it together so that it will be true to our intentions and interesting to look at. Once we have that arranged, we are confronted with problem of exposure, trying to figure out whether we can get the correct amount of light on the camera's light sensitive material, whether it's film or a digital sensor.

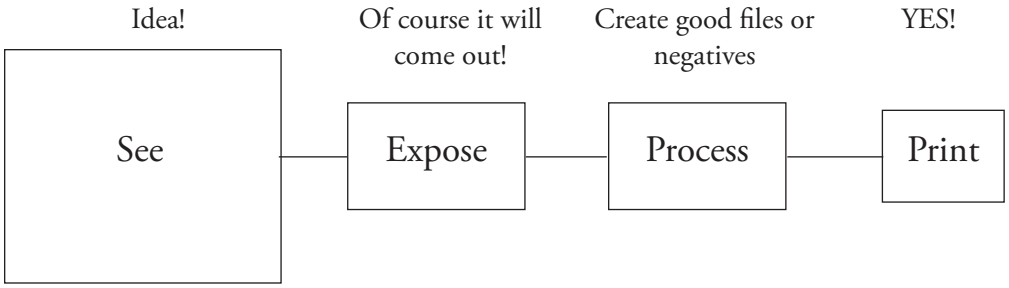
Then, we "develop" the photographs, either in the darkroom, a commercial photo lab or our our own computers. To us, this chemical or digital image processing seems completely insignificant, because we can't "see" anything happening; we are, either literally or figuratively, "in the dark." After that, we then are confronted by either film or digital files that may or may not be "easy" to print; we'll try to figure out the darkroom or computer magic that we need to have in order to get a print that mirrors our original idea, sometimes a very difficult proposition.

Our process of making a photograph usually looks like this:



In actuality, the chart should look be reversed; the idea should be the biggest and most important part of the process, and the rest of the steps should represent that original intention as clearly as possible. In other words, processing of the image afterwards, in the darkroom or the computer, shouldn't be regarded as a cure–all for previous haphazard work habits, but as a mirror of everything that you did correctly before getting into the darkroom, sitting at the comptuer or talking with your lab person.

Ideally, our process should look like this:



Reaching Towards the Ideal

So, once a good idea is in our heads, we frame the image the way we want to, paying particular attention to our proximity to the subject, camera angle and height, lighting and the like. This is the most important part and the part that should garner the most attention. Then, we quickly determine what exposure will put the correct amount of light through the camera's lens and onto its sensor; not too much so that the photograph is overexposed (negatives too dense or digital files blown out resulting in images that are too light) and not too little so that the photograph is underexposed (negatives not dense enough, or digital files that have no high values, resulting in images that are too dark).

If we give the correct exposure in the camera, whatever "post-capture" processing we do, whether it is in the darkroom or the computer, will be much easier, because we are fitting the amount of light in the scene to the range of sensitivity that the material has. It's that range of sensitivity that we're not that accustomed to, because in spite of all of the photographic evidence to the contrary, we would like to think that film or digital cameras have the same capabilities that our human eyes and brains have. Truth be told, our bodies are much better at coping with extremes of contrast than our cameras are.

So, when we then take that carefully crafted negative into the darkroom or digital file to the computer with the aim of making a print that is a reflection of the original idea, a step that should now be more simple, as we have good technology supporting our original idea for a picture.

Of course, getting from the "old" way of doing things to the "new and better" way of doing things is a journey of sorts. First of all, it means unlearning some old, bad habits. Secondly, it means acquiring some new, good habits and some new information about how to think about exposure. Once these ideas are learned, they can be tucked securely into your "back pocket" so that you can concentrate on what is really important about photography — making images.

The Zone System is the best, fastest and most logical way to get to gain technical facility in photography. It is a codification of a whole set of principles that have always existed in photography, presented in a way that allows us to think about how photography works. This is true regardless of whether you're working with film or with digital.

It is important to note that this system was conceived by Ansel Adams and some of his pals; guys whose main interest was in making great images. They wanted a way to get past the technical problems of photography; something that would allow them to concentrate on their ideas. It is also important to note that, even as photography undergoes its digital revolution in the 21st century, these basic principles of exposure and contrast control are, and will continue to be viable.

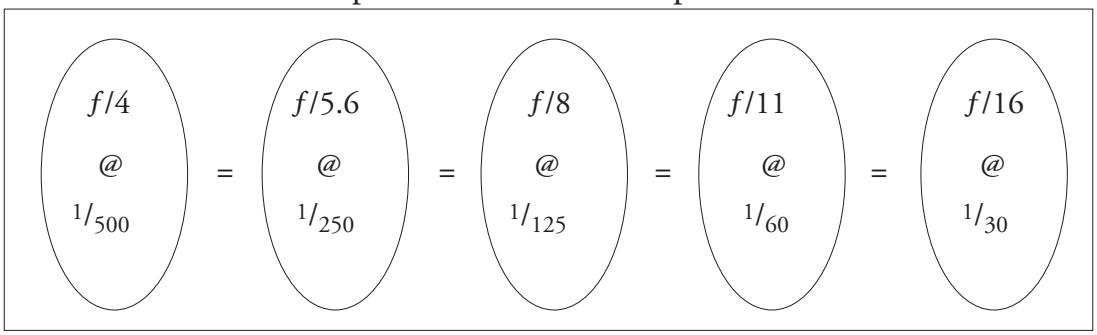
Reviewing the Basics

In order to start learning the Zone System, its important to have a clear understanding of the basics of photographic exposure. For many of you, this will be a review, but it's important to get a "baseline" so that we can all use the same language to describe the same things.

The amount of light that enters the camera is controlled by two devices: aperture and shutter. The aperture controls the amount of light in terms of volume; the bigger the hole, the greater the amount of light that enters the camera. The shutter controls the amount of light in terms of time; the longer the shutter is open, the greater the amount of light that enters the camera. Combining the two controls gives us a wide variety of ways to let differing amounts of light into the camera. Different aperture sizes produce differing amounts of depth–of–field and different shutter speeds produce changes in the way motion is depicted.

To make it possible to accurately control exposures from picture to picture, a system of identifying the positions of the aperture and shutter speed controls has evolved. The numbers that appear on our lenses and in our cameras' viewfinders allow us to repeat the same combination over and over, or to trade off depth–of–field for motion stopping ability or vice–versa. When we look at the chart below, it is significant to note that each pairing of aperture and shutter speed (the ones that are circled) gives equivalent exposure to every other pairing, though not necessarily an equivalent image, owing to motion–stopping and depth–of–field changes.

Apertures and Shutter Speeds



Note that the reason that each pair is equivalent to every other pair is that each shutter or aperture number lets in either one half as much or twice as much light as the number next to it. So, $f/11$ lets in half as much as $f/8$; $1/60$ of a second lets in twice as much light as $1/125$ of a second. It is a relationship of 1:2; twice as much or half as much.

As you'll see, the Zone System utilizes this 1:2 relationship to help us determine how reflectance values in the real world will get translated into tonal values in our photographic images. What happens is that the Zone System uses another way of referring to the twice–as–much/half–as–much relationship, and ties that into the way light meters work.

Light Meters

Light meters work by looking at the scene in front of them and determining how bright that scene is. Of course, the light meter is a "dumb" instrument that only knows a couple of facts. One fact it knows is the ISO (International Standards Organization) speed of the light sensitive material (film or digital sensor) it's dealing with. It knows this because you "tell" it what that speed is, either by setting it on the camera, allowing the camera's built–in sensors to read the coding on the film cassette or letting your digital camera's automatic ISO-setting circuits do their thing.

The other fact that a light meter knows is that whatever it sees, it wants to make into middle gray. In your photographic travels, you may have seen a photographic gray card; one that reflects 18% of the light that falls on it. If you haven't seen one, any good camera store will have them and it's one of those "must have" tools in any good photographer's toolkit.

The gray card's reflectance is photography's center point; the value that the light meter attempts to create when it examines a scene. Most of the time this works out reasonably well, as when the meter sees a variety of objects in the scene, they often average out to middle gray. The problem comes, of course, when there is a predominance of light or dark objects in the scene that fool the light meter into thinking that those things are more important than the other things in the scene. In that situation, the meter suggests an exposure that might not be in keeping with what you want in your final image.

When the meter gets fooled into making an incorrect exposure suggestion, we photographers (who are smarter than light meters) need to fool it back by making sure that the light meter has a limited amount of information to work with so it can give us better answers. If we don't show the light meter all of the information in the scene, we can avoid showing it the reflectance values of things that are so bright (or so dark) that they throw off the meter's ability to give us good information. We just have to do some thinking (remember, we're smarter than light meters) and tell the meter what specific reflectance values it should look at so it can give us better information and exposure suggestions. The more specific we are about what reflectance values in a scene are important to us, the better the information we get.

When a light meter looks at just one reflectance value (an object that reflects light) in a scene, it will give an exposure (aperture/shutter combination) that will make that value into middle gray. It doesn't matter what that object is; it could be a black dog, a white shirt, a red car or a blue flag. If the meter sees only that single object and is "blind" to surrounding objects, it will suggest an exposure that will reproduce that object as a middle gray. Note that "middle gray" can be an actual gray in a grayscale image or a middle value (lightness-to-darkness) of any color. This, by the way, is one of the basic concepts of the Zone System – using the meter to read the reflectance of a single object in a scene rather having the meter examine all the tones in a scene.

Now that we have some basic photography information in hand, let's move on to using that information to help us understand the Zone System.

Zone System Basics

Photographers are creative people. We'd generally rather deal with the abstract side of things than the concrete memorization of facts and figures. Our chosen creative medium, however, is a mixture of art and science, so there are some facts and figures that we must memorize.

In devising the Zone System, what Adams and his buddies wanted to do was to create a method by which photographers could cut through the technical problems of photography and get on with making pictures. They wanted photographers to be able to stop worrying about the mechanics of the medium and have confidence in the science that we were using for self–expression.

To that end, what they did was divide up the tone scale of a photograph into eleven (11)* separate areas that they called Zones. They used the word Zone because it allowed them to talk about an area of similar, adjacent tones, not a particular tone.

They also decided to name the Zones with Roman numerals, as they figured that photographers had enough Arabic numerals (f/8, $^1/_2$ second, etc.) to worry about. In addition to the Zone numbers, they created verbal descriptions about each Zone so that everyone would understand not only where each area of tone stood in relation to the others, but also what each looked like.

Perhaps the most important thing that the creators of the Zone System did was decide that each Zone would exist in a relationship of 1:2 with the Zone next to it. In other words, the Zones exist in the same relationship as do apertures and shutter speeds. Moving one shutter speed or aperture in one direction or another (more or less overall exposure) moves each tone in the picture up or down one Zone.

A chart that lays out the Zones, their tone values and the descriptions for each Zone is on the next page. Take a look at the chart now and look at the descriptions of each Zone. Pay particular attention to Zone V and note what the description says. Also note that this system was set up when traditional black and white silver-based photography was the only game in town for serious photographers, so it uses a lot of terminology that relates to that world. Later, we'll apply this to color photography in both digital and film.

The Zones

0 I II III IV V VI VII VIII IX X

* You may find variations on the Zone System that don't include Zone X and thus contain only ten (10) Zones. The reason for this can be seen in the Zone Scale diagram on the previous page; Zone IX and Zone X are often the same tone, especially with 35mm negatives. The classic Zone System as Adams devised it is being presented here.

The Zone Scale

Value Range	Zone	Description
Low or Dark Values	Zone 0	Total black in print. No useful density in the negative other than filmbase plus fog.
	Zone I	Effective exposure threshold of the film. First step above complete black in print with slight tonality but no texture.
	Zone II	First suggestion of texture. Deep tonalities representing the darkest part of the image in which some slight detail is required.
	Zone III	Average dark materials and low values showing adequate texture.
Middle or Gray Values	Zone IV	Average dark foliage, dark stone or landscape shadow. Normal shadow value for Caucasian skin portraits in sunlight.
	Zone V	Middle gray (18% reflectance). Sky as rendered by panchromatic film, dark skin, gray stone, weathered wood.
	Zone VI	Average Caucasian skin in sunlight, diffuse skylight or artificial light. Light stone, shadows on snow in sunlit landscapes
	Zone VII	Very light skin, light gray objects, snow with acute side lighting.
High or Light Values	Zone VIII	Whites with texture and delicate values, textured snow, highlights on Caucasian skin.
	Zone IX	White without texture approaching pure white, thus comparable to Zone I in its slight tonality without true texture. Snow in flat sunlight. With small–format negatives printed with condenser enlargers, Zone IX may print as pure white not distinguishable from Zone X.
	Zone X	Pure white of the printing paper base. Specular glare or light sources in the picture area.

Putting it Together

So, let's put this all together. We remember that light meters, when confronted with objects in the world, want to make those objects middle gray. We can simplify the light meter's job by forcing it to look at only one object so that it can tell us more about something we find important in our scene.

We also now know that we can say either "middle gray" or "Zone V" to describe what a light meter looks for. If we meter a single object in our scene and do exactly what the meter tells us to do, then well get a great picture of that object as a middle gray thing.

But what if that object isn't middle gray in reality? Or, what if we don't want to present that object as middle gray in our image? Well, remember that the Zones exist in the same 1:2 relationship as shutters and apertures do; each Zone is exactly twice as light or twice as dark as the one next to it. So, if we create more exposure than the meter suggests by exactly one unit (using shutter speed or aperture) then we'll make the object into Zone VI in our final print. If we do the opposite and produce exactly one unit less exposure than what the meter suggests (again, using either aperture or shutter speed) then well make the object into a Zone IV.

Taking this a step further, what if we metered an object that was dark; an object that we decided should be a Zone III? Well, remember the meter would see that object as a middle gray or Zone V, and then we could reduce the exposure by two (2) exposure units to force the object into being Zone III instead. The inverse would also be true: if we saw an object that we thought should be light, say a Zone VII, we could meter it, remembering that the meter is going to give us a middle gray, Zone V object. We would then know that we'd have to give the film two exposure units more light to make that object into Zone VII.

In the language of the Zone System, we call this placing a tone. We place a tone that we find to be an important one on a particular Zone that suits our idea of what our eventual print should look like. When we do that, we are, in the language of the Zone System, visualizing what the photograph will look like after it is finished.

But what about the other end of the scale? What if we decide to make a particular object in our scene into a Zone III tone in our photograph? How do we know what the other, lighter tones will look like? Well, here is another place where we can use the light meter.

If the meter sees everything as a middle gray, we can use it to measure both light things and dark things in our image and determine how far apart in reflectance they are. If the difference in reflectance between a dark object and a light object in our scene is 4 "stops" and we place the dark object on Zone III, then we can use simple math to add 4 stops (Zones) to Zone III and discover that the light object will end up as a Zone VII. In the language of the Zone System, when we "place" one object, the other objects that have different reflectance fall in the tone scale relative to our initial placement.

A question that burns in every Zone System neophyte's mind is: "How do I know what Zone something is supposed to be? What Zone should I pick for this object?" The answer to those questions is that it's up to you; there are no "right" or "wrong" Zones. The Zone System allows you to choose, within reason, the tones you would like to have in your image.

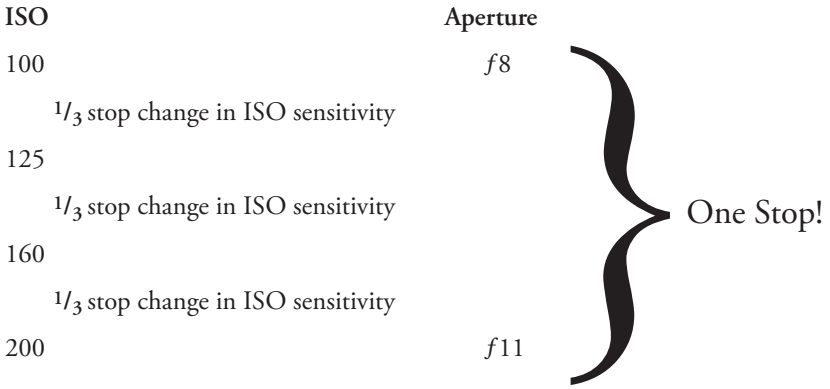
That's it; the basic concept of the Zone System. It's not really any more complicated than that. There are some refinements, to be sure, but if you can wrap yourself around what's been covered so far, then the refinements are no big deal.

Aperture, Shutter Speed and ISO: The Exposure Family

We've already seen that a camera's Aperture and its Shutter Speed exist in a relationship of 1:2, such that each aperture or shutter number setting allows either half as much or twice as much light to enter the camera as its adjacent number.

It wouldn't surprise you to learn, then, that there is a relationship between ISO, Aperture and Shutter. Every jump in ISO numbers represents $^1/_3$ of a stop. A jump in 3 ISO numbers, then, represents $^3/_3$, or one stop.

For example:



So, when we change the ISO number of a film or change our digital camera ISO setting by one number, it's changing our exposure by $^1/_3$ of a stop.

Older cameras, those which have the aperture adjustment on the lens barrel, usually have "clicks" at each aperture setting. Some have "clicks" both on the standard aperture number and also on the "half-stop," or the spot in between, say, *f*/5.6 and *f*/8, which would be *f*/6.8.

On modern cameras, especially when aperture is set on the camera body, *f*-stops are often divided more finely, resulting in half stops. as above or in third stops. The latter system is becoming more common, since it matches the ISO system of film speeds.

For example, the aperture that is one third stop smaller than *f*/2.8 is *f*/3.2, two thirds smaller is *f*/3.5, and one whole stop smaller is *f*/4.

More modern cameras are also showing up with shutter speeds that are in one-half and one-third increments. Again, this is because it matches the ISO system of film and digital camera sensitivity speeds and gives greater photographic control.

So, in one-third stop increments, aperture and shutter speed numbers have a sequence like this:

Apertures in 1/3 Stops												
2.8	3.2	3.6	**4.0**	4.5	5.0	**5.6**	6.3	7.1	**8**	9	10.1	**11**
Shutter Speeds in 1/3 Increments												
500	400	320	**250**	200	160	**125**	100	80	**60**	50	40	**30**

We can see, then, that Aperture, Shutter Speed and ISO all govern the exposure of our film image. They can be used interchangably because they're all related; They're the Exposure Family!