

## The Legacy of Contrast Management:

### THE ZONE SYSTEM

*Shutter Release*, March 2009

The Zone System has been the established methodology for precisely gauging and managing contrast in photography since the 1940s. In the contemporary digital era, only a small number of mostly film photographers expose their images according to original Zone technique with its quantitative scale for engaging differences in illumination. Nevertheless the principles and parameters of Zone methodology such as f-stop calculation continue to be used in manual photographic technique, and can be helpful in image planning for digital photography as well. Behind the scenes, essentials of Zone technique have been incorporated in the sophisticated automatic exposure capability taken for granted in advanced digital cameras.

#### Why the Zone System

A challenge of photography has been that film and digital sensors exaggerate differences of lighting within an image. Large variations among brighter and darker areas are difficult to capture without one or the other losing detail or fading out in print or on screen. The Zone System was designed to give photographers maximum control in analyzing and reducing such variation, so that no area of a photograph is too bright or dark to show detail, even in extremely diverse lighting conditions.

*The classic Zone System enables the photographer to precisely quantify the difference in brightness between the lighter and darker areas of a composition, assess the impacts of ways to reduce or increase contrast, and determine optimal exposure in anticipation of the selected adjustments.* The Zone System provides:

- ❑ a framework for understanding the effects of lighting variances, integrating factors that influence contrast including exposure, filters, optics, film, development and printing;
- ❑ a zone scale to measure differences in brightness within a composition; and through this precision,
- ❑ assessment of the effects of any one or combination of means to adjust contrast to a desired level.

It should be noted that the majority of photographic compositions are more or less uniformly illuminated, and do not require contrast reduction measures. Furthermore, since image capture has become mostly digital, there would appear little for the photographer to manage with respect to exposure. Still, photographers who never use film can benefit from background knowledge of Zone technique with respect to optimizing exposure conditions and latest contrast management tools for diversely illuminated compositions, including multiple exposures (i.e., High Dynamic Range Photography) as well as time-honored assists such as neutral-density filters, and dodging and burning in the (digital) lab. Meanwhile, practitioners continuing to shoot film manually can derive greater benefit from traditional Zone technique combined with modern digital processing in the “post-scanning” stage of image management.

For all its potential, contrast reduction techniques of the Zone System do not usually have to be used more than sparingly, for subtle effect, to lessen tension among lighter and darker features that can detract from a desired mood. Alternatively, Zone technique can be applied to add contrast for an increase in vibrancy, though the need arises less often.

Contrast reduction usually requires more exposure than normal. The Zone System provides for an accurate determination of exposure, taking account of planned contrast adjustments.

### History of the Zone System

Early films had relatively narrow exposure latitude (i.e., could record only limited differences in brightness within a composition) and were typically developed and printed by the photographer. Contrast modification was a function of personal technique applied mainly in the darkroom on the basis of the photographer’s experience with particular situations, films and chemistry. Practice began to change by the late 1920s as photography became affordable to much of the population. Photographers came to depend on a rapidly growing number of film processing and printing establishments. This together with the increasing complexity of the craft and rising expectations of quality created a need for a systematic and widely understood approach to exposure management, from picture-taking through to development and print production.

The Zone concept was conceived by Fred Archer, a photographer and instructor at the Art Center College in Los Angeles. In a series of articles in *U.S. Camera* magazine in 1939-1940, he set out a unified approach to determine the degree of adjustment necessary to improve contrast to remedy the effects of lighting differences in an image. Archer built on the system of aperture f-stops that had been adopted by the photography industry. He introduced a matrix that tied f-stop gradations to a virtual scale from absolute black to maximum light, allowing photographers to map images for brightness using readily applicable f-stop equivalents.

Ansel Adams read the material with interest, communicated with Archer and took the project in hand. Adams went on to further develop and popularize the Zone System, elaborating the framework in the terminology used today. In addition to the technical and analytical strengths of the Zone system, the lexicon has served to enable easy communication among photographers, technicians, and equipment and film manufacturers concerned with exposure.

### Ansel Adams's Heavenly Effects

Adams's most renowned Zone technique was the delicate tempering of the bright light and dark shadows that occur in many landscapes. When such extremes are moderated in a black-and-white image, a unique tension is created that can range from subtle excitement to a sense of warmth or aura. These effects were crucial to the success of Adams in portraying nature as marvelous and pristine as a heaven on earth.

Adams believed, and a sizable proportion of photographers accept, that moderating light and dark makes for the best possible imagery. *Adams conveyed the Zone System with the intent of helping photographers effectively expose all significant parts of a composition, so that none are too bright or dark to show texture, with detail clearly recorded, and an overall balance of illumination.* This dictum has been considered sensible conventional wisdom but cannot be universally accepted, of course, as it is a matter of personal approach to art. Notwithstanding Adams's own preferences, the Zone System became the established technique for analysis and management of contrast.

### The Zone System Scale

Structured in successive gradations corresponding to f-stops, the Zone scale was conceived both for measurement and ease of exposure adjustment. The scale is set out on the following page.

**THE ZONE SCALE:  
MEASURING DIFFERENCES IN BRIGHTNESS**

Zones I – II or III are too dark for most digital sensors or films to manage under normal conditions. Zones X – IX or VIII are too bright. By increasing or decreasing exposure up or down the scale and applying contrast-reducing measures, the limited tonality and any texture and detail in marginal areas can be brought out satisfactorily. In less extreme conditions, for subtle shading or nuance, darker areas may be brightened or lighter areas darkened by less extensive measures not necessarily requiring an increase or decrease in exposure.

Zone	Equivalent F-stops Over/Under Zone V	Description
0	n.a.	Unexposed—no density. Complete black in print.
I	+4	Absolute minimal exposure or reflectance. Near black tonality, no texture.
II	+3	Deep, dark tones, with traces of texture. Darkest part of image in which a semblance of detail is needed.
III	+2	Dark color with features visible. Average dark paint, shadows in cloudy bright landscapes such as bark on shaded side of tree; very dark skin. Adequate texture and detail.
IV	+1	Medium dark with good texture and detail. Dark green foliage, shadows in bright, sunlit landscapes and in controlled studio portraiture. Brown skin in sun and light skin in shadow.
V	-	<i>Middle gray value of reflectance to which reflected-light meters are calibrated (i.e., basic in-camera metering).</i> Kodak 18% gray card, medium green foliage, average red brick, clear blue north sky at midday. Light brown or olive skin.
VI	-1	Medium light color. Light foliage, wood and stone; shadows in snow in sunlit snowscapes. Average white skin. Good texture and detail.
VII	-2	Lightly colored objects, weathered white paint, very light skin, silvery gray hair. Adequate texture and detail.
VIII	-3	Whitish objects with hint of texture. Weathered, textured snow in cloudy-bright sun, fresh snow in shade. Very light skin in bright sun.
IX	-4	Nearly white. Glaring white surfaces, fresh snow in bright sun.
X	-5	Light sources. Rendered as pure white of paper surface.

Each zone is twice as bright as the previous zone; Zone IX is 256 times brighter than Zone I. Digital sensors may cover the middle seven or eight zones; color negative (print) film slightly less. The range of color slide film is usually about six zones (projected on screen) or five zones (in print). Exposure range further varies by make of film.



©Bill Katzenstein/IconicPhoto

Zones I through X are represented in this black-and-white image photographed on film. Zone I, effectively black, features in the deep shadow in the balconies. Zones II and III blend into the darker areas of the stage in the foreground. Depending on the angle of illumination, the wooden paneling and benches range from Zone IV to Zone VI. The white paneling at the back of the theater is at Zones VII-IX. The lighting is Zone X. [Note: tonalities of the image may vary from the original depending on screen settings.]

To allow for acceptable representation of all 10 zones, four contrast-control measures were applied in capturing this view: (1) The image was exposed one f-stop brighter than normal (i.e., for Zone IV) for overall contrast reduction and to bring out detail of the darker woods. (2) A darkening filter (graduated neutral density filter) was applied to reduce the luminance of the candelabra lights and surrounding white paneling. (3) The image was exposed with a small aperture (f16.5) to reduce intrusive glare from the candelabra lights (which produced the starburst effect). (4) In printing, the image was dodged (lightened) on the lower sides, and burned-in (darkened) to reduce glare in the center of the stage.

## A Textbook Application of the Zone System

Consider a classic problem of landscape photography: A photographer desires a black-and-white image composed partly of medium to heavy shade, with a remainder of lightly colored rock in brilliant sunshine. Using an incident light meter (or roughly estimating brightness with a reflected light meter in a camera), the photographer measures the shaded areas as falling in Zones II-IV, while the sunlit stone covers Zones VII-IX. The photographer desires to capture adequate texture and available detail in both the shaded and sunlit areas, but the film cannot cover the range of 8 zones. Moreover, the photographer determines that the gap should be decreased to 5 zones maximum to produce an aesthetically balanced image, requiring a reduction of 3 zones.

In resolution, the photographer selects three contrast-reducing measures (see below for a summary of common techniques). First, using the “expose for shade” rule (referring to negative film), the basis for overall exposure is increased by one f-stop (i.e., exposure is increased to accommodate the darker Zone IV, rather than a normal Zone V midtone exposure. [Note: As a general rule, for a scene including dark and bright segments, it is better to adjust exposure to some extent for the darker rather than the lighter because detail in the dark areas could be irrevocably lost if not adequately exposed in the first instance, whereas detail in the brighter areas can be recovered despite a corresponding (moderate) overexposure.]

Second, a graduated darkening filter is applied to effectively darken the bright light from the sunlit rock by 3 f-stops before it reaches the film. In combination with the one-stop uniform increase in exposure, this reduces the zonal gap from 8 to 6 zones.

Finally, when the negative is developed and printed, the photographer decides to selectively over and under-develop the lighter and darker areas—“burning in” or darkening the lighter areas by half an f-stop, and “dodging” or lightening the darker areas by half an f-stop, resulting in a cumulative contrast reduction from 8 to 5 f-stops. [Note: Burning and dodging can also be done with color negative film to some degree, and in the digital lab (e.g., Photoshop has explicit burning and dodging adjustments). Transparency film for color slides cannot be burned-in or dodged.]

### Greater and Lesser Effects Depending on the Medium

Contrasty photography can benefit from the Zone System regardless of the medium, be it digital, or black-and-white, color negative or slide transparency films.

In terms of *exposure latitude*—ability to convey extremes of contrast without sacrificing image quality—digital capture is best, followed by color negative film, black-and-white film, and lastly transparency film. Of course there are tradeoffs. With near-perfect exposure, the narrow latitude of transparency film can provide unsurpassed brilliance and color rendition of sunlit imagery, and of strong subtle coloring as well.

As to *potential for contrast adjustment* through Zone techniques using films, black-and-white film has the greatest latitude for improvement, followed by color negative film. Transparency film has the least potential for adjustment.

### Means of Contrast Adjustment

When extremes of lighting indicate that contrast adjustment will be necessary to improve or save a photograph in the making, many options are available. Experienced photographers ready their gear for such eventualities on setting out for a shoot. If not, it is still possible, especially with black-and-white and to some extent color negative film, to plan for contrast modification in the film development and printing processes, or digital darkroom. Whatever the case, *awareness of relatively straightforward means of contrast control can make or break an image, whether or not formal Zone methodology is applied.*

Contrast-control measures are summarized below in two groups: Ways of decreasing or increasing contrast uniformly over an entire image, and means of contrast adjustment of selected areas within an image.

#### Uniform Contrast Control of an Entire Image

- ❑ ***High Dynamic Range Photography:*** This term has evolved since 2005 to mean digitally merging multiple exposures of the same composition but of varying brightness, to produce an optimized single image of lower contrast than would otherwise be possible. Images may be captured digitally or on film that is later scanned for processing. Through this technique, extremes of lighting can be greatly reduced if not eliminated, by first suitably exposing all significant areas of the image through multiple takes as required, then applying Photoshop (ideally CS3 or CS4, as of this writing) or other specialized program to automatically select and combine the best exposure segments into one uniformly optimal image. Use of a tripod in high dynamic range photography was originally considered a must, but with improvements in image stabilization as well as digital processing, hand-held multiple exposures are often workable. People pictures, however, continue to be problematic as with any technique of multiple exposure.
- ❑ ***Contrast adjustment of digitized imagery*** through Photoshop or other digital lab—whether originally photographed with a digital camera or after scanning—is technically the *easiest* way to adjust contrast. Nevertheless, the medium used in the photography itself helps determine the potential for belated contrast adjustment.
- ❑ ***Selection of medium:*** With or without High Dynamic Range Photography, digital imaging is most accepting of sharp contrast, and is responsive to a number of contrast-reducing measures. Color print film comes in second, followed by black-and-white film. Color slide film has the narrowest range of tonal rendition, notwithstanding its vibrancy.

*Tip for film photographers: When shooting color film where conditions are unfamiliar, it is best to try both color negative and transparency emulsions—often one or the other will produce markedly superior results, depending on overall contrast and quality of lighting and reflectance.*

- ***Fill-in flash:*** Most photographers are familiar with the benefits of daylight flash to bring people or objects in a shadowy foreground up to the brightness of the background. Unfortunately this basic contrast-adjusting technique is usually not applicable in applications such as landscape or architectural photography, nor with very wide-angle or telephoto lenses.
- ***Use of the ideal aperture range:*** Every lens has a range of about two apertures at which it conveys superior contrast and detail. As a rule, shoot between f8.5 and f16 (or about 2-3 f-stops above the maximum aperture of the lens, e.g., if f4 is the widest setting, the lens will typically convey extremes of contrast most accurately at f11-f16). However if shooting directly into bright lighting, it is best to shoot at f16-f22.

The following techniques apply solely or mainly to film photography:

- ***Selection of film:*** If the preference for image capture is film, its selection offers some discretion in engaging contrast. Among color negative films, Fujicolor Superia Reala 100 and the Kodak Portra NC series handle contrast satisfactorily. (In my experience, high-speed Portra 800 performs especially well.) Among black-and-white films, Kodak Tri-X 400 and Ilford Pan F+ offer a fairly wide range of control. As to color transparency films, Fuji Astia has relatively broad exposure latitude, while Velvia 50 and 100, and Kodak E100VS, are high-saturation films with a narrower tonal range.
- ***Pushing or pulling exposure:*** Black-and-white films offer a unique option for contrast adjustment. Differences between the lightest and darkest areas of an image can be reduced by up to about 2 f-stops throughout a composition (which requires that the film be overexposed and subsequently developed for less time than usual). Contrast can be increased by underexposure, which correspondingly entails more development time. When submitting film for processing, an instruction to reduce development time is commonly called “pulling” the film, by a number of equivalent f-stops. Increasing development time is expressed as “pushing” the film. [Note: Color negative films can also be “pushed” or “pulled” (when a faster or slower shutter speed or aperture are desired) but the process hardly affects contrast.]
- ***Paper:*** The choice of paper on which an image is printed may affect overall contrast. Glossy paper gives the appearance of higher contrast, brings out detail and is best for scanning. Matte paper makes images seem less contrasty. Further, in printing black-and-white images, the choice of tonality of the paper can affect the appearance of contrast.

- **Contrast filters:** The Tiffen filter company produces three types of optic to control contrast. Such filters are not commonly used, perhaps because they affect color rendition or may mildly distort. *Low-contrast filters* diffuse brighter light and use localized glare to brighten shadow. *Soft-contrast* filters absorb more bright light than low light; a drawback is that shadow areas are not brightened, and that an increase in exposure is necessary to avoid reduction of detail. Ultra-contrast filters are a newer product that are claimed to lighten shadows with surrounding ambient light.

### Selective Contrast Adjustment

- **Graduated neutral density filters:** Among the most straightforward means of lightening or darkening particular areas of an image are variable, partly shaded darkening filters. The optics are available as glass filters that rotate about the lens, or as rectilinear glass, plastic or gelatin filters with adjustable mounts. The photographer positions the filter to darken specific areas of the image, and can overlap filters in complex situations. Most graduated neutral density filters are available in strengths of one, one and a half, and two f-stop equivalents. The darkening is not abrupt but gradual, hence the term *graduated*. *Neutral density* means that the darkening does not affect color rendition. A significant proportion of professional photographers, shooting digital and film, regularly use graduated neutral density filters.
- **Dodging and burning:** Images from color and black-and-white negative films, and digital imagery as well, can be lightened and darkened in specific areas of the composition. The bigger the enlargement, the greater the precision. The potential magnitude for brightening an area of an image through dodging is 2-3 f-stops depending on the quality of the negative or digital capture. As to darkening, it is possible in extreme situations to burn-in an area by 3 or even 4 f-stop equivalents. Color slides cannot be dodged or burned-in per se, but transparencies can of course be scanned and some dodging or burning adjustments made digitally.

### The Zone System in Contemporary Photography

Only a scattering of photographers apply the complete Zone System, i.e., carefully measure zonal values with a light meter and attempt to precisely calibrate the effect of contrast-adjusting techniques. Compared to emulsions of 15 years ago, not to mention 50 years ago, digital capture and current films both offer substantially broader exposure latitude. Development and printing processes are considerably more adaptable and precise. Notwithstanding contemporary “high” prices of batteries, storage, film and printing, the overall cost of photography has dropped substantially. As a result, it is much easier for photographers in fleeting, high-contrast situations to try intuitive reckoning, trial-and-error and ad hoc experimentation, rather than drawn-out zone calibration. Still, an essential knowledge of Zone methodology and techniques will increase the odds of success.

## Zone System Lite

Indeed, many photographers use “Zone System Lite”. . .are well aware of light variation over f-stop equivalent zones, and practice one or a couple of personally preferred methods for reducing contrast in the kinds of imagery in which they specialize, with or without a light meter. As with many conceptual methods, the Zone System incorporates what experienced practitioners innately consider in dealing with unfavorable contrast.

For these reasons, fastidious application of the Zone System is seldom necessary in contemporary photography. That being said, there will always occur uncommon conditions of extremes of illumination, over which the difference between the lightest and darkest subjects of an image can easily exceed the exposure range of digital capture or film. And there are times when artists want to apply ultimate nuance to fulfill their visualization of a dream image. In such situations, use of Zone concepts—consciously or intuitively—is necessary to produce high-quality images. The value added by the comprehensive methodology—exacting analysis applied to a wide range of possible ways to improve the image—is knowledge and precision leading to a higher probability of superior results. Photographers with the desire, wherewithal and patience find it worthwhile.

Practitioners of the classic Zone System take satisfaction in working through the process: students of all ages enamored of classic photography; exacting portrait, landscape and architectural photographers; and those who shoot black-and-white film with cherished view cameras. All enjoy Zone technique for its own sake as well as its premium results. . .a labor of love.

©Bill Katzenstein