

Use Your Eyes!

Zone System Testing Without a Densitometer

by Paul Wainwright

INTRODUCTION

OK, OK, I know what you are thinking: the world needs another article on the Zone System about as much as it needs a hole in the head. Much has been written about the Zone System. Countless hours can be spent making careful measurements of negative densities, with fancy graphs, in order to precisely tune the light meter and film development times to a particular photographer's needs. I have to admit that I've fallen into this trap myself! While it's important to understand as much as you can about your artistic medium, the best understanding comes from what you see with your eyes, and not from what a machine tells you.

While a careful analysis of negative densities may make for an interesting Masters' thesis, it misses the most important thing about photography: **we exhibit prints, not negatives**. And when we look at prints, we use our eyes, not a densitometer. So with this in mind, let me offer an approach to Zone System testing without a densitometer that I teach in my summer workshops at the New Hampshire Institute of Art.

MAKING THE NEGATIVE

I begin my testing of a film by making a test negative. As shown in Figure 1, in the darkroom I sandwich a sheet of film and a slightly modified 21-step step tablet (available from Stouffer Graphic Arts, www.stouffer.net) into a film holder. It's a tight fit, but with some practice it becomes routine. Although it probably doesn't matter for these tests, I try to hold the step tablet by its edges to avoid fingerprints that might affect its density.

I've modified my step tablet by punching a hole in it to permit a circle of light to reach the film without any



attenuation at all, and by placing a piece of light-proof black tape over a small area to completely block light from reaching the film. This area on the negative will then be my “film base plus fog” reference.

I take the loaded film holder to my camera, which is set up outdoors on a nice bright sunny day. The camera is focused on infinity to avoid bellows extension corrections, and is aimed at a white card in sun so that the white card completely fills the ground glass. With a clear blue sky, the light is not likely to change much if multiple exposures are needed. With the light meter set to the advertised film speed, I meter the white card, place it on Zone X, and expose the film. The step tablet attenuates the light in half-step increments, so the film receives 21 exposures from Zone X to Zone zero.

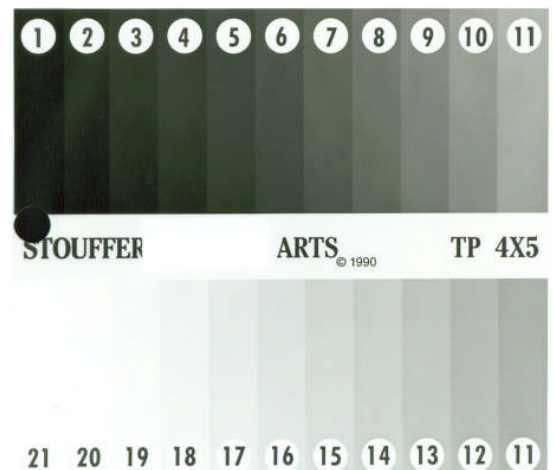
I develop the film for what I think will be the “normal” development time – the exact time is not critical at this point. For lack of any better information, I follow the instructions that come with the film and/or developer.

EVALUATING THE EXPOSURE

All of the “experts” will tell you that it’s important to set your light meter to a film speed that will result in a Zone I exposure that is 0.10 density units above film base plus fog. However, since we exhibit prints, not negatives, what we really need to do is give the film sufficient exposure to produce sufficient density changes in the shadow areas so that we can print shadow detail, if desired, down in the Zone II (or maybe even lower) region. While my procedure typically results in slightly more Zone I exposure (usually 1/3 to 1/2 stop more), what I’m really interested in is getting good printable densities in the shadows, which I can later choose to “print through” if I don’t want them.

I evaluate my exposure index test visually – I look at the negative (see Figure 2). Can I see density changes right down to and including Zone zero (step 21)? Does Zone zero look “pretty close” to film base plus fog? If I can answer yes to both of these questions, I’ve got the right speed set on the meter. Fred Picker probably just rolled over in his grave!

If Zone zero (step 21) looks significantly denser than the film base plus fog area, then the film is probably



receiving more exposure than it needs. In this case I would back off on exposure (set the light meter to a higher film speed index), and repeat the test. With experience, I'm usually able to guess within a half a stop, but if in doubt I'll back off more than I think is necessary before repeating the test.

If Zone zero shows no difference in density from the step(s) just above it, then the film has received insufficient exposure. In this case, it is easy to judge how much additional exposure is needed: count the steps until you can see good density changes on the negative. Each step is another half stop of exposure. Where you begin to see density changes, that step is Zone zero. Since each step represents a half-stop change in exposure, it's possible to calculate how to change the exposure index. For example, if I set my light meter to ISO 400, and significant density changes are seen only down through the 3rd from last step (step 19), then that's actually receiving the Zone zero exposure, and the film speed on the light meter needs to be set at 200 to give one stop more exposure to the film. I then repeat the test to double check my assumptions. The film speed I've chosen at this point will be the one I'll use for this film.

What I'm after here is getting my entire image – the entire range of necessary densities – onto the straight line portion of the film's density curve.

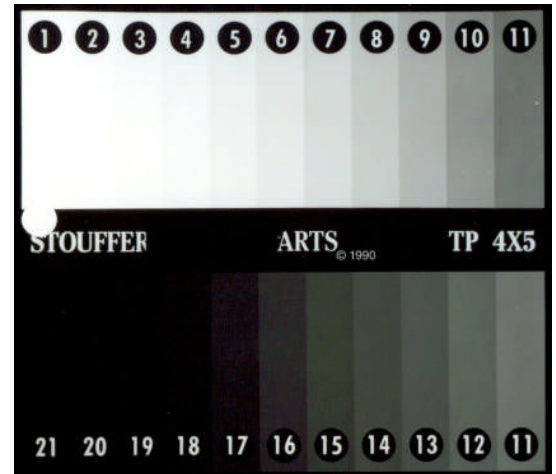
Determining Development Times

To evaluate my development time, I make a "minimum time for maximum black" contact print of the test negative – what Fred Picker used to call a "proper proof."

To make this contact print, start with a piece of unexposed film which is developed, fixed, washed, and dried it as usual. Set the enlarger to what you consider to be your "grade 2" setting. For example, a color head would typically be set to no filtration (yellow and magenta both set to zero). If you use contrast filters, use the one labeled "grade 2." If you have a cold-light VC head, set the yellow (soft) and magenta (hard) light sources to equal intensity. Or, if you're a purist and use real graded paper, get out the box labeled "grade 2." Using the unexposed "negative," contact print a test strip with increasing times, and develop in your usual paper developer for your typical time. Look at this test print under a subdued light source – I use a 25 watt bulb at about 4 feet. Look for the first band of exposure that looks completely black (you can

see no further darkening with increased print times). This is your “proper proof” time. Write down EVERYTHING: the enlarger height, printing time, f/stop on the enlarging lens, paper type, etc.

Now using all these same settings, contact print the test negative that was correctly exposed as described above, and look at the print (see Figure 3). Remember that the steps represent half-zone increments in film exposure. Step 1 received Zone X exposure, step 3 received IX, etcetera down through step 21, which received zone zero. Most photographers want to tailor their film development time so that “normal” development will yield Zone VIII print densities (step 5) that are just about paper base white in this test, with higher zones printing pure white.



So look at your contact print. What do you see? Are there significant non-white steps above Zone VIII (for example, steps 1 through 4)? In this case the film development time needs to be longer to be considered “normal.” On the other hand, what if you see paper base white through steps 6, 7, and maybe beyond? In that case, you will want to back off on the development time for “normal” development. Adjust your development time up or down by about 20% for each stop (pair of steps) that you’re off, and try the test again.

When you get everything working correctly, here’s what you should see. For a correctly exposed and “normally” developed negative, you should get a contact print that resembles Figure 3. While magazine reproduction may not do this justice, your print should begin to show shadow detail around Zone II (step 17), and should show increasingly lighter shades of gray up to Zone VIII (step 5), above which there should be no discernable density changes. If you’re viewing a wet print, be sure to use a dim light to avoid thinking you’ve got more shadow detail than will actually be seen in a dry print under normal room light.

Don’t get too hung up on trying to be too precise with all these visual inspections. If you’re in the right ballpark, you’re doing fine.

When I get a test negative that has the correct exposure and “normal” development time, I save it, and carefully mark it “benchmark.” For my equipment: film type, film developer, light meter, shutter, enlarger type, paper type, and paper developer, [this](#)

is what a correctly exposed and developed negative should look like.

This test can also be used to find “plus” and “minus” development times. Increase or decrease your development times and repeat the contact print procedure. If the contact print shows densities up through Zone IX (step 3), that’s your “normal -1” development time. On the other hand, if the contact print shows densities only up through Zone VII (step 7), then you’ve found your “normal +1” time. By developing a set of identically exposed test negatives for, say, 5, 6, 8, 10, 12, and 15 minutes, and looking at the corresponding contact prints, I can usually get a pretty good idea of what all of my development times will be from $n-2$ through $n+3$. I may not hit each time exactly, but I can make a pretty accurate guess by interpolating the results.

One final comment about the Zone System: while this (and other) testing procedures tune your negative development times to give Zone VIII print densities that are just about paper base white in a straight print, please don’t think that this limits your fine print to densities between Zone II and Zone VIII. There is plenty of well-separated density above Zone VIII, which, with printing controls, can be brought out in an expressive print.

Conclusions

The more you know about your tools and materials, the more you’ll be able to make photographs that convey your artistic intent. I’ve presented an approach to tuning up your Zone System controls by looking at the end product of photography: actual prints. This approach should lead you to negatives with good printable densities in the shadows, should you need them, and highlights that are manageable in your prints. I hope the ideas I’ve presented help you to take better control of your craft.

Paul Wainwright holds a PhD in physics from Yale, and has been making black & white images for more than 40 years. In 2001 he retired from a long career in research at Bell Labs to pursue large format fine-art image making full time. His interests include details of landscapes and architecture, and applying his research background to make the more technical aspects of photography simple to understand. Paul lives and works in Atkinson, New Hampshire, and teaches advanced workshops at the New Hampshire Institute of Art. He can be reached at paul@wainwright.mv.com.

FIGURE CAPTIONS

Figure 1. Exposing the film for the film speed and development time test. In the dark, a sheet of film is loaded into the film holder along with a step tablet. This is then given a Zone X exposure, as described in the text. I have covered a small area in the center of the step tablet with black tape to shield the film completely, giving me a place to determine the film base plus fog (FB+F) of the film. I have also punched a small hole in the step tablet to allow unobstructed exposure of the film at that spot.

Figure 2. The resulting negative, if exposed correctly, will have a series of densities ranging from Zone zero (step 21) to Zone X (step 1) in half zone increments.

Figure 3. A contact print of the test negative, printed on Ilford Multigrade Fiber, on a Saunders dichroic enlarger with no filtration.