KEEPING PACE

A Monthly Newsletter devoted to the art of Darkroom Photography

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Another Approach to Obtaining the Correct Exposure in Printing.

The most exasperating step in any color print process is how to determine the correct exposure level.
If you are using a camera, you have many options and techniques at your disposal.
Today's camera's have built-in exposure meters that are sometimes center loaded and often edge loaded. The manufacturers are trying the best they can to make life easier for the average person who doesn't want to be bogged down with learning the methods of exposure.
With today's camera equipment, all you have to do is aim the camera and press the button.
This eliminates the opportunity to be creative with the exposure.
More often than not, a change in the exposure will allow for a more interesting image and thereby become more valuable. Especially, if you are a professional.
Kodak pioneered the method of using a grey card when exposing Ektacolor film so that the color balance and density of the print could more easily be obtained, without the hassle of trial and error printing.
Is it possible to achieve the same accurate results when printing any color paper or film?
Of course it is.
There are a few methods that I want to expand on.
If you have the money to purchase a top of the line easel meter such as the Speedmaster SM-1400, you will find that this meter is capable of monitoring and memorizing 8 different colors and densities.
This means, that if you made a print by trial and error, and finally have a satisfactory print, you can place the probe of the easel meter on any specific area of color or density and program the meter. You can do this all over the entire print. Program the whites, greys, flesh tones, skies, green grass, or whatever you feel is a color that you can probably use when you are printing from different originals.
If the originals are color negatives, you are at a slight disadvantage. You

will be forced to assume that any flesh tone you read will be the flesh tone that you want. Remember, there are variations in flesh tones and this may cause incorrect conclusions.

If the photographer was thoughtful enough of the printer, he would have included a grey card exposure in the roll of film. However, in my experience, this is a rarity.
In any event, the grey card on the roll of film may not have been shot in the same light or color values as the rest of the roll.

The point that I am getting at is this.
The grey card plays an important role in determining the correct color balance and level of density.
This simple method of determining the essentials of an exposure can be used to make prints from transparencies.
The current method used by most labs today, is to read the highlight area of the transparency, on the easel, record the reading, and proceed to make a print by trial and error.
Once the correct exposure and color balance have been arrived at, most labs will use the last color balance and light level as the opening test exposure for the next new print.
This is not a "bad" idea, however it falls short of being an exact science.

Here is a method for determining the correct exposure that can be used with any positive color process.
The first step is to produce a "grey card" on film.

Here is how this is done.

All that is needed is to expose a sheet of film to room light and process it in a relatively soft developer until you get an even tone across the entire sheet. A reading between .60 and 1.0 would be fine.
Then, cut this sheet into hundreds of little pieces of film and store them in a box.
Place one of these little pieces of film along side the edge of the transparency. Try to isolate the transparency so no light escapes from the sides of the film, except for the grey piece of film. This procedure may require some mounting.

Try to use a transparency that you regard as "normal," as far as density is concerned.
Then proceed to make the first print by trial and error.
When you have made the final print, and are satisfied with the density and color balance, then simply read the grey piece of film with an easel meter and record the information.

The next time you place a transparency in the enlarger, regardless of it's size, read the new grey piece of film, adjust the f stop until it matches the original reading, and the exposure level will have been found.

If you have a sophisticated color easel meter, you can also find the correct color balance. If you are using the same batch of paper and chemistry, this color balance will change for only one reason. **Subject failure.**
If you are printing a transparency that has an overwhelming saturation of color, it will affect every other color in the print.

Your eyes play a very important role when using this procedure. You must look at the original transparency and compare it to a "normal" transparency. If you feel that the brightness and contrast of the new transparency look satisfactory to your eyes, then proceed to make the print.
If you feel that the transparency is possibly too light or too dark, then you must interpret that difference. Use increments such as 1/8th or 1/4 of an f stop.
This could easily be mathematically worked so that 1/4th of an f stop is the equivilant of +25% or - 12.5%.

If you are contemplating making Cibachrome prints and have to make major changes in sizes between different originals, then this procedure will allow you to keep the correct level of exposure intact for every transparency you plan to print.

What happens when you make a contrast mask and add it back to the original?
The fact that a mask is added to the original does nothing to the procsdure. Just place the

probe of your meter on the projected image of the grey sheet of film, and adjust the lens f stop until the reading matches the original reading.

If, for some reason, the readings are not able to be matched, then use your scientific calculator's log function to determine the new exposure.
You must have some sort of meter to accomplish this task. The meter need not be expensive. There are plenty of meters on the market that are able to determine the difference in density numbers.

When there is a difference in density, you must make exposure corrections.
To find the new exposures, a calculator or slide rule should be used.

Slide rules are as scarce as hens teeth. Purchase a simple instrument such as a Texas Instruments TI-30. The cost is about $14.
If you don't know how to use the log scale function of a calculator, here is an example:

To find a higher number,

1. Insert the difference in density.
2. Press the button "INV."
3. Press the button "LOG."
4. Press the button "X."
5. Insert the original exposure.
6. Press the button "=" to find the new exposure.

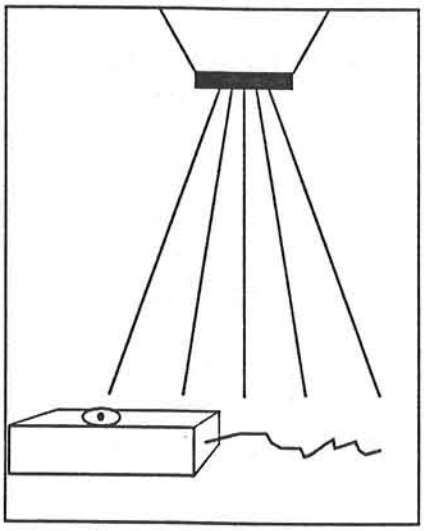
To find a lower number,

1. Insert the difference in density.
2. Press the button "INV."
3. Press the button "LOG."
4. Press the button: 1"X."."
5. Press the button "X."
6. Insert the original exposure.
7. Press the button "=" to find the new exposure.

This is a simplistic approach to a complex problem, but it works. Match the projected image of the grey piece of film and make your

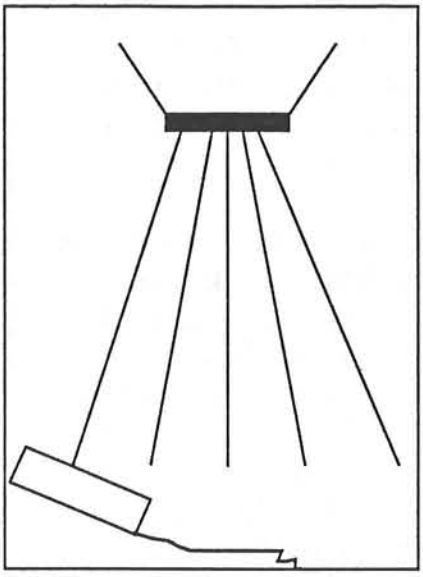
exposure.

If nothing else, it will at least put you in the "ball park."
The only problem with any easel reading is the problem of "cosine error."
One of my back issues dealt with this problem. The easel meter must be tilted in such a way so that the angle of acceptance for the image on the probe is straight.
The diagram will explain this problem better than words.



This is the wrong position for the probe.

You could pull the enlarger carrier out far enough so that the grey piece of film could be located right beneath the lens, however, the escaping light would ruin the accuracy of your readings.
Will this system of exposure accuracy work with all positive processes? Yes.



This is the correct angle of the probe.

If you are planning to make Cibachrome prints, this system will save you lots of time in establishing the first exposure.
This is not a fool-proof system that guarantees you a perfect print on the first exposure, but just a great way to get close to a final print without wasting paper.

It will also work with the Dye Transfer process.

When I was in business and was specializing in the Dye Transfer process, this procedure was used by me, and my associates, for many years.
We used the original Speedmaster easel meter that had the ability to program thousands of colors and densities.
The procedure used then, was about the same as I would handle it now.
I purposely made a small test print so that I was **forced** to make a decision about color correction or density changes. No matter how good the image may have looked. I wanted to make it even better.

However, it worked so well that my workers were tempted to make the final large sized matrices without making test prints. I would insist on this procedure of making small tests first, being followed.
But, if I had to leave the lab for a delivery or to pick up a job, I would tell my men to please, make a small test print.

When I returned from my trip, I found that they would sometimes go right to finals without making the tests. This annoyed me. But the results were close enough so that "good" prints from these large matrices were easily accomplished.
They felt that they were

saving time by making the finals.
Perhaps they were right.
This procedure allowed us to make prints for over two years without ever making a set of matrices over. This kept our material expenses to a minimum. Even our accountant was happy.

This procedure will even work when making dupe transparencies.

The major problem with making dupes is one of subject failure. If there is a tendency for a specific transparency to be "one sided" in color, then the reading of the grey piece will immediately tell you that you have a problem.
The kind of enlarger you use will have something to do with this phenomenon. A diffusion enlarger will allow for more subject failure than will a diffusion enlarger.
This system will allow you to use an inexpensive easel meter. The main function that should concern you is whether or not the light level is correct for the specific transparency.

The end of a great film

We have been notified by Kodak about the demise of Kodalith Pan Film.
The EPA has notified Kodak that the by-products produced when the film was developed was detrimental to society.
Kodak has halted any further production of Kodalith Pan film.
Some of my colleagues have gathered as much Kodalith Pan film as they could find.
What does this do to our Dye Transfer techniques?
It forces us to use a new material.

At this writing, I still haven't heard about a new substitute film by Kodak for making highlight masks with a panchromatic litho film.

In my early years with Evans and Peterson Labs in New York, we used **Kodak Process Pan Film.**
The film curve and response is longer then Kodalith Pan, but we used it very successfully for many years.
It needs more washing than the Kodalith Pan film. It also is only available in 7 mil thickness, but has excellent color response.

Agfa makes a panchromatic litho film.. It is called P 911.
It's characteristics are similar to Kodalith Pan.
Some of my friends in the Dye Transfer field have been using it ever since Kodak lowered the boom.
In order to make highlight masks for the dye transfer process or as color correction pre-masks, panchromatic film is a necessity.

In order to find the correct exposures for making tricolor highlight masks, tests must be made.
For making these tests, use a contact frame, or platen.
The light source can be located above the work table or below it. The choice is yours.

The light source must have some arrangement for lowering it's brilliance.

This can be accomplished by either making the light dimmer by adjusting the voltage or by using F stops (Waterhouse F stops work well.)

If you use a transformer to make the light dimmer, buy the kind of transformer that clicks into position for a specific voltage, rather than a totally variable one.

The click system will assure you of a repeatable voltage every time. The Color balance will change with each change of voltage, so when the appropriate voltage is chosen, use it.
This system will allow you to use any kind of bulb you wish.
The majority of the professional labs use a point source system with a 100 watt G.E. bulb and a 20 volt variable transformer. However, any kind of incandescent bulb will work.

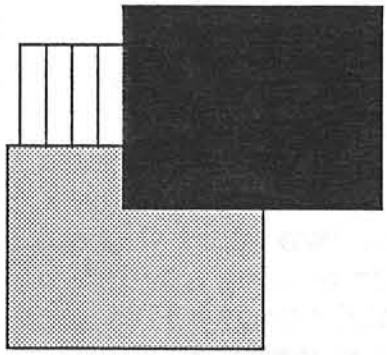
I used to use a 75 watt, 120 volt small opal lamp in a system built by Condit. It worked great. This system used a fixed light source and a wheel with various sized holes that allowed the light to pass through the holes in different percentages. (This is the Waterhouse system)

This is where the idea for F stops came from.

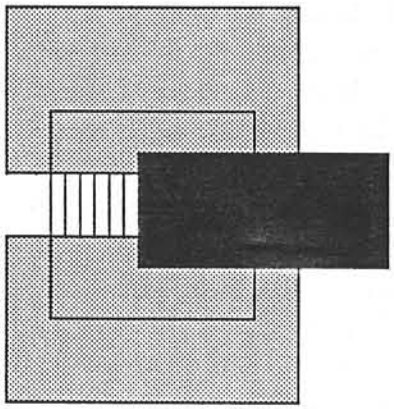
The enlarger can also be used for making contact highlight masks. Here is where the F stop control works great. You can choose the light level and not be concerned with the intensity changing the color balance of the lamp.
Not much light is needed for making highlight masks.

The method that I recommend for finding the correct exposure times is as follows:
Place a sheet of flash exposed and processed film that has a density of about .50. on the platen (A few sheets of diffusion material could also be used.) Then place a sheet of unexposed panchromatic litho film on the platen with the emulsion facing the filtered light source. Lower the light level by whatever means you plan to use, either F stops, or voltage control.

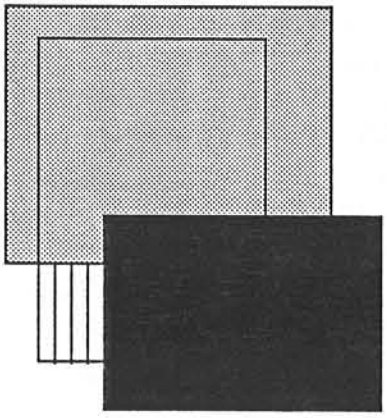
Between the light source and the unexposed film, place an opaque sheet, and only allow the top third of the film to be exposed.
Using a step and repeat procedure, make a series of exposures across the top third of film through the red 29 separation filter.



When that is done, cover that portion of the litho film and open the middle third of the film so that it can also be exposed. This time, use the green 61 filter.

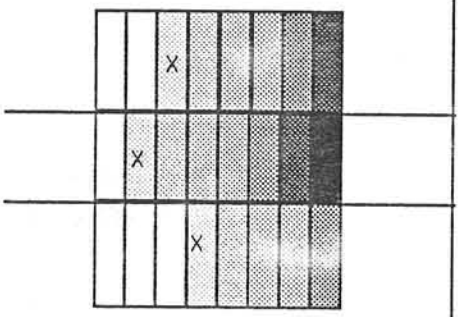


When this is done, cover all of the film except for the last third and expose that part through a blue 47b filter.



Process this one sheet in Kodak D11 or HC-110 (30 cc per liter of H20) for 2:30 min. at 68° F.

Examine this processed sheet.
The trick is to pick out which strip in each of the colors reads .35.
For this procedure you will need a densitometer.



When you have found the exposures in each of the color strips that read .35, record the exposures that produced them.
Make a chart that looks like this.
The next step is to use the log portion of your scientific calculator and produce all of the numbers needed for the different densities of highlight areas in your original transparency.

The original sheet of flashed film or diffusion sheets represent the highlight area of an imaginary transparency.

Log Calculations

Increasing Density ↑

step		step	
1	Density Diff.	1	Density Diff
2	INV	2	INV
3	LOG	3	LOG
4	X	4	1x
5	OLD EXP	5	X
6	= Answer	6	OLD EXP
		7	= Answer

↓ Decreasing Density

By using the calculator in the increasing mode or decreasing mode, you should be able to fill in all of the other exposure times that are situated next to their densities.

the exposures. This procedure only takes a few minutes and will allow you to make accurate highlight masks for the duration of the film's emulsion.

Highlight Mask Chart

Transp. Highlight Density	Exposure in seconds Red	Green	Blue
.20			
.25			
.30			
.35			
.40			
.45			
.50	10	12	15
.55			
.60			

An example:
If you found that the transparency's highlight density of .50 required exposures of 10 sec., 12 sec. and 15 sec. to produce .35 highlight masks. Use the chart at the top of the page to determine the rest of

.05 increments in the increasing or decreasing modes will fill the chart with the correct densities for each color filter. Try this excercise. It will sharpen your ability to make the right choice each time.

For Those of You who like to work from 4x5 originals.

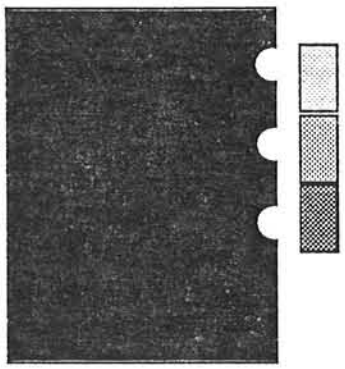
There are times when it is important to include all of the necessary items that should accompany the transparency through it travels as you make masks or separation negatives. This means that grey scales, or grey patches of film, and color patches should be included as part of the information that must travel from the early stages of masking to it's final conclusion, the print.
I would make this suggestion. Purchase a 5x7 contact frame or vacuum platen. Use a blank sheet of 5x7 film to mount the 4x5 original transparency or color negative.
Make the contrast masks, using 5x7 Kodak Pan Masking film, or any other kind of film that you deem necessary.
By allowing these items to be mounted along with the original, you will be able to keep an accurate record of the contrast level and any color correction system you may use.
I would always suggest to my students that they use a three step grey scale, and the accompanying color patches. These items will enable you to measure the masks and separation negatives to make sure that they have met the standards you have set for them.
The next obvious choice then would be the enlarger.
Some choices are found in "Shutterbug Magazine"
and other periodicals, and used photographic equipment dealers, such as "Lens & Repro" in New York City, and "Industrial Photo Supply", in Los Angeles, which cater to the needs of photographers as well as darkroom enthusiasts. You will find ads for Elwood, Durst and other enlargers.
This 5x7 choice will allow for placing all of the measuring devices that are needed to keep track of, and to control the final results.

But, what do you do if you already have a 4x5 enlarger?

The answer is simple.
Use a hole punch in such a way as to make 1/2 moon shapes in the black edge of the film

Then tape the grey scales and color patches on the bottom side of the contact glass, so that edge of the grey scale can be seen along the edge of the film, so that the the information will be included in the mask.

When you are ready to use the enlarger, attach the grey scale to the underside of the carrier glass so that it's position matches that of the image in the mask.
In this way, you can use the information I mentioned at the beginning of this newsletter.



I still have a few items to offer to you.
My Video and book on the Dye Transfer process is available at $200 plus $12 for S&H.
So are the Newsletters, at $60 per year, and the Book,"The Art of Photo Composition." $50.
Thank you,

Bob Pace