

Measuring Photography for offset reproduction

JOB DATE: JUNE 19, '87

CLIENT: SINAR, SWITZERLAND

PROMOTION TITLE: _____

SUBJECT: GIRLS FACE
(4 STOPS)

ACCESSORIES: FLOWERS

DRESS

MODELS: CORINNE

PHOTOGRAPHER: DENNIS SAVINI

CAMERA: SINAR P 4X5"

HEIGHT: 1M

FILM: EPR 64

FLASH EXPOSURE: 1/60 (11 1/2 / 22)

FILTERS: 05G, 05B

OTHER: DIGITAL SHUTTER, MODULE 2, SINARSIX DIGITAL, REFLEX VIEWER

FLASH GENERATOR: 3 X 404

WATT/SECONDS: 3/1 QUADREFLEX 100/100CM, 1 WAB1, 1 REKTANTE 49/100

SPECIAL EFFECTS: _____

LENS: SINAR 300DB DISTANCE: 1.5 M

INCLINATION: _____ SWING/TILT: _____

EMULSION: 834 DEVELOPMENT: PPL

AVAILABLE LIGHT EXPOSURE: 1/30 SEC

MASKS: _____

BACKGROUND: BROWN SEAMLESS

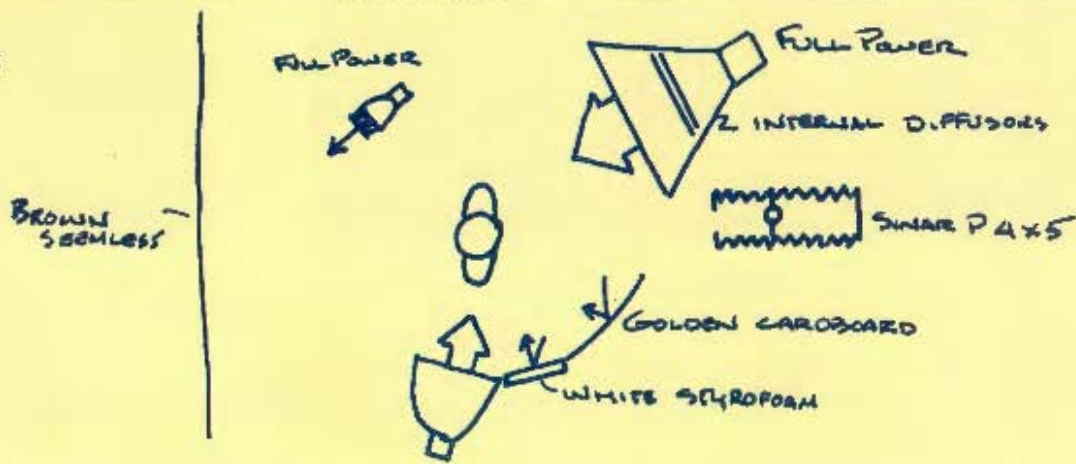
LOCATION: STUDIO

TIME NEEDED: _____ OVERHEAD COST: _____ TOTAL COST: _____

REMARKS: _____ OUTSIDE COST: _____

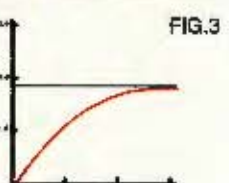
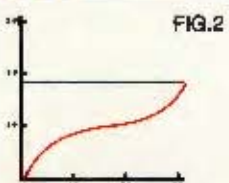
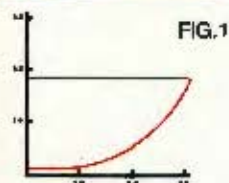


SITUATION:



BAD REPRO

Until recently, there has not been a general understanding between the photographer and the separator. And because of this, there has been no accurate way for an art director or production manager to specify photography for reproduction. This is due, primarily, to the fact that the photographer and separator rarely spoke with each other. When they did, they weren't speaking the same language. A communication gap has developed that leaves the art directors and production managers in the middle shaking their heads and asking "Why can't we do better than this?" We can. All we need is higher quality communication and a little common sense.



TWO DIFFERENT MEDIUMS

Have you ever taken a close look at one of the unsatisfactory four-color pages and said, "It just doesn't look right — something's missing"? Well, you're right. Something is missing — about 30% to 40% of the density information that was in the transparency.

Photographic reproduction and offset printing reproduction are two very different mediums. A color transparency can reproduce as much as twice the amount of density the offset press can put on paper. It's obvious if we give the separator a transparency with more information than the press can reproduce, we'll be disappointed with the results. However, if we give the separator a transparency with just the right amount of information, and label it clearly, we're assured of optimal results.

So how do we know before the photograph is taken whether the offset printing press will be able to reproduce a pleasing image of our shot? Simple — we measure our image at the film plane and match the tonal range of the subject to the range that the press can reproduce. In other words, we have to fit our transparency through the press window.

¹ For the sake of simplicity in this text, we will assume that shutter speed will remain consistent.

TIME OUT FOR MEASUREMENT

Like anything else, light intensity can be measured. Photographers use a unit of measure called an f/stop or EV-value. An f/stop¹ is no different from a degree or ounce or centimeter in the way in which it meters light. Photographers using a through the lens (TTL) light meter can measure the range of light striking a subject (from brightest highlight to darkest shadow). In a typical photo, the difference between a highlight and shadow might be 5 f/stops. This photo then would reflect a 5 stop range.

From the range measured in the film plane, there is a conversion step to the range in the developed transparency. The range is multiplied by the development factor Gamma (γ), which is, for example, 1.7 for Ektachrome with standard processing.

Separators and printers measure light in a different way. They measure the amount of light that can pass through a transparency or the amount of light that will reflect off the printed page. They also use a different unit of measure — density units. Density units refer to the amount of dye (or pigment) either in the transparency or on the printed page. In a transparency where there is low density, the dye present subtracts only small amounts of light, allowing bright colors to show through. A typical low-density area might measure 0.25 units of density. In a high density area of a transparency, the large amounts of dye present prevent nearly all light from passing through. Such an area might measure 2.80 units of density. The same is true for a printed page, except that the light bounces off the white paper and back to our eye. Depositing ink onto the paper reduces the amount of light that can reflect back. An area of very dense ink coverage would measure a maximum of 1.80 units of density.

From f-stops to density units, there is the simple conversion: 1 f-stop equals 0.3 density difference. So, 1.8 density equals 6 f-stops measured in the transparency or 6 + by 1.7 (γ)

PHOTOGRAPHY	
CONTRAST RANGE	
Film plane in EV-values (F/stops)	IN TRANSPARENCY
	In EV-values (stops)
4 x 1.7*	6.8 x .3**
5 x 1.7*	8.5 x .3**
6 x 1.7*	10.2 x .3**

* CONVERSION FACTOR GAMMA γ FILM
** CONVERSION FACTOR F/STOP TO DENSITY

3.5 f-stops measured in the film plane.

All right, now we have an idea of different ways that we can measure light in an image. Let's talk some more about the lousy looking piece of four-color we've all seen.

THE PRESS WINDOW

In web offset printing, there is only so much information (or image) that can be reproduced on paper. That image is generally measured in units of density. Paper white (with no image) measures zero; while the most information that can be laid onto that paper, or the highest possible density, would measure around 1.80. (Some presses may vary slightly; consult your printer.) For example, on a printed four-color image of a silver teapot from the lightest spectral highlight (no halftone image) to the deepest shadow, the entire density range would be 1.80. However, if you measure the amount of information or the density in the transparency, you would likely find a range of 2.80, (or slightly more than 5 f/stops if measured at the film plane as suggested earlier).

Are the numbers boring you yet? Hold on; it's almost over.

Let's take the transparency measurement of 2.80 and subtract the printed image measurement of 1.80. The result is 1.0. What happened to this one whole unit of density?

Measure photography which by in the printed reproduction.

PRINTING INPUT REQUIREMENTS

DENSITY	OFFSET PRINT	SEPARATION	
		NECESSARY COMPRESSION	
In density (1 EV = 0.3d) 1 F/Stop	Density behavior: Highlight and shadow in printed page	In density values	In % of contrast or density on transparency
2.04	1.8	0.24	12.7%
2.55	1.8	0.75	28.4%
3.08	1.8	1.26	41%

FIG. 4 THE FILM PLANE READING TO THE TRANSPARENCY DENSITY

Good question. Answer: It wouldn't fit through the printing window of 1.80, so it was compressed. Ever hear of squeezing 10 pounds of sugar into a 5-pound sack? That's exactly what happens when you give your separator a beautiful transparency that contains more information than can be reproduced on press. Today, 1.80 on press is the limit, and that's what we have to live with, folks.

DATA COMPRESSION

All right, enough with the sacks of sugar. What happened to the one unit of density? Well, the separator knew when he set up his scanner for your transparency that no web press in the world would print 2.80 units of density. So he decided to compress the information in one of three ways:

1. Compress the highlight (see Figure 1).
2. Compress the midtone (see Figure 2).
3. Compress the shadow (see Figure 3).

By the way, there are literally thousands of ways these compression curves can be altered slightly here or there. But all variations probably fall into one of these three categories. After all, if there were only three ways to separate a transparency, all separators would be great separators.

4 F/Stops

After closely studying Figures 1 through 3, you will see where the one full unit of density went. It's still there — just greatly compressed. When you compress that much information from a transparency into a printed image, you will end up with results similar to those shown on Figures 6 and 7. And you'll say things like, "Who the hell printed this? Get the production manager on the phone!" And the production manager is stuck in the middle, watching fingers being pointed between the photographer and separator.

How do we avoid this? (Here's where common sense comes in.) Obviously, we have to control density in the transparency. The only way to do this accurately is by metering highlight and shadow at the film plane; judiciously placing light sources, diffusers and fill cards; and lighting the subject to fall within the 1.80 density range.

Of course, light meters don't measure in units of density. So we've provided this handy conversion table, (Figure 4). Note the dramatic compression in transparencies shot to a 5 or 6 stop brightness range. We can come to within 13% of fitting the press window by limiting the brightness to 4 f/stops. **NOTE:** It is important here to clarify that the 4 stop range should apply only to the highlight areas that should have detail and the shadow areas that should have detail. These areas should be

communicated by the photographer, for he is the only one who knows the aim points. As demonstrated on the cover, the areas metered on the film plane should be identified clearly to the separator. This is the key to opening a channel of communication that both photographer and separator can understand. In Figures 5, 6 and 7, notice that these transparencies were shot to a 4, 5 and 6 stop range respectively.

Also notice that the images in

Figure 5 were compressed least, while those in Figure 7 were compressed most. In other words, regardless of what brightness range you meter, the printing press can reproduce only approximately a 4 stop range as measured at the film plane. Therefore, even though you're working in a medium, like color transparency capable of reproducing a very large density range, common sense tells you to record only information that can be reproduced on press.

SUMMATION

In order to get a separated image to resemble the original transparency as closely as possible, you should control that original subject matter's brightness range to within 4 f/stops. To do this accurately, you should meter at the film plane. This is extremely important, because metering at the subject can introduce an error factor as large as 1½ f/stops (25% to 30%). See Figure 4A.

The additional benefit the photographer gets by restricting himself to the 4 stop range is exposure latitude (clearly demonstrated by comparing the ± ⅔ of a stop over and underexposed objects of Figures 5 to 7). By observing 4 f-stops, the exposure latitude is ± 1 stop, and makes bracketing redundant! All image informa-

tion is contained, even in the 1 stop under or overexposed transparency.

Selective spot metering in the film plane has been widely accepted as the standard of advanced 35mm photography.

TTL meters for selective reading in the film plane for large format cameras have been pioneered by SINAR® Switzerland. The most advanced equipment is SINAR's DIGITAL shutter/Module/SINARSIX-digital electronic system, which fits all SINAR large format cameras. Metering probes which adapt to handmeters and which fit any large format view camera are available for GOSSEN® and MINOLTA® meters.

Additional information may be obtained from SINAR LTD SCHAFFHAUSEN, Switzerland, and its distributors.

SYSTEM TOLERANCES IN LARGE FORMAT PHOTOGRAPHY

Type of Tolerance	Source of Tolerance	Approx. Tolerance in EV Value (stops)	
		with handmeter	with selective TTL Meter automatic system
Photoelectronic	light reading incident reflected integral selective	± 1½	± ½
Optical	bellows extension filter factors light transmission array light sunshade	± ⅓	± 0
Mechanical	f-stop setting shutter speed	± ⅓ ± ⅓	± 0 ± ⅓
Chemical	film speed development	± ⅓ ± ⅓	± ⅓ ± ⅓
Total maximum Tolerance		± 3	± ⅓
Total average Tolerance*		± 1½	± ⅓

* PROBABILITY OF TOTAL TOLERANCE IS ½ OF TOTAL MAXIMUM FIG. 4A TOLERANCE

GOALS OF THIS DEMONSTRATION

1. Find a standard between the disciplines of photography and offset reproduction (through color separation) that will allow for optimal results at a minimum cost.
2. Provide the photographer with a method to predict, with a high degree of certainty, the density values of both the processed transparency and, in turn, the four-color separated image, before he ever makes an exposure with his own camera. This would increase the photographer's ability to impact the quality of the color separation.
3. To open a channel of precise high-quality communication between the photographer and the separator.

THE PROCESS

In order to demonstrate the value of knowing how to control

the tonal range of a transparency and also how to communicate those tonal values to the separator, Swiss photographer Dennis Savini was commissioned to do the portrait "Corinne." Using his large-format SINAR P 4"X 5" camera equipped with the SINAR digital shutter, module 2, and selective light meter SINARSIX - digital Savini made nine exposures. With these nine exposures, Savini recorded three different image-contrast situations with a $+2/3$ f/stop exposure and a $-2/3$ f/stop exposure bracket.

With the selective reading in the film plane, Savini controlled the different flash light sources and reflectors for fill-in light on up to eight important spots of the image. Thereby, the reflected light intensity of each portion of the image could be placed on the available scale in a controlled way. (See figures of black and white photos with the spots that indicate EV-values or f/stops. The area metered as 0 means

0.7 density or medium brightness, plus values mean the number of stops above the medium brightness, and minus values mean the number of stops below the medium brightness.) In the highlight area in which to show first discernible detail, white flowers were selected. As a shadow area in which to show last discernible detail, the deep blue in the feather hat was selected. The skin tones were determined to be always constant at $+1 2/3$ EV-values (f/stops) above average brightness in exposure. The graduation of the background was determined to be from -1 EV-value on the upper left, to 0 (equals average brightness or 0.7 density) in the center, to +1 stop at the right lower edge.

ILLUMINATION AND FILL-IN LIGHT

The hazylight was used as a main light source and was left in the same position for

all exposure alternatives. For the lower-contrast images, additional diffusers inside the hazylight softened the illumination. This measure alone reduced the resulting contrast by $1/3$ EV-value. The reduction of contrast from 6 stops to 5 stops was obtained with a golden cardboard as a fill-in reflector for the skin tones and with white styrofoam surfaces at the side and from the top. The 4 stops contrast result was achieved by moving the fill-in reflectors closer to the subject, and by replacing the styrofoam board on the side with an additional fill-in light source reduced in its power to such an extent that it only had a diffusion effect and not a lighting effect visible in the image. The 6 stops subject was exposed without any fill-in light and with only the hazylight as a main light source.

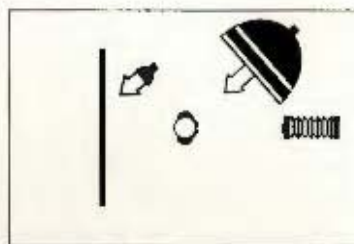
Photographer Savini states that if fill-in light should be applied, one has to be careful not to change the light character in the

FIG.7

6 stops



POINTS METERED IN FILM PLANE



LIGHTING SITUATION

FIG.6

5 stops



POINTS METERED IN FILM PLANE



colors of the subject. This can best be prevented if the fill-in light is similar to the subject colors (with a brighter tone value). Therefore, the golden cardboards were used for skin tones.

THE TRANSPARENCIES

Nine exposures were made: the 4 EV-value contrast subject with correct exposure, $\frac{2}{3}$ stops over and $\frac{2}{3}$ stops under (Figure 5); the 5 EV-value contrast subject with correct exposure, $\frac{2}{3}$ stops over and $\frac{2}{3}$ stops under (Figure 6); the 6 EV-value contrast subject with correct exposure, $\frac{2}{3}$ stops over and $\frac{2}{3}$ stops under (Figure 7).

The contrast measured in the film plane is not identical to the contrast measured on the transparency. The development process of color transparency material increases this contrast by a factor of approximately 1.7" (γ). The different results

show very clearly that on the lower-contrast range, an allowable exposure deviation made correct exposure rather uncritical, whereas on the higher-contrast range, correct exposure was a necessity. With the highly precise and simple-to-use electronic exposure system, all exposures obtained were right on according to what was measured before the exposure.

CONCLUSIONS

In order to realize these positive findings in practice, it is necessary to control the illumination of the subjects before the exposure is made. Selective light reading in the film plane (and not outside of the camera) is the only exact way to control this.

Experience with fill-in light and reflectors of different sizes, shapes and hues is required. Outside the studio, polarizing and other filters are helpful. The

additional benefit of low-contrast photography is the exposure latitude available, thereby doing away completely with the necessity of bracketing and wasting film material, developing costs and photographer's time (even sometimes reshooting).

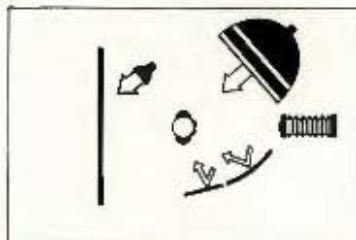
An overlay or polaroid showing the different tonal values as measured in the film plane is critical to this process. It should accompany the transparency to the separator. The notations on this overlay or polaroid should include the location of the highlighted area of the image (where the first discernible detail should occur). Also on the polaroid should be the location of the shadow area of the image (where last discernible detail should occur). For optimal results, these two points should be 4 EVs (f /stops) apart. There should also be up to six intermediate points identified on the polaroid. All these points should be labeled with spot

meter readings from a TTL meter. Even if your highlight and shadow areas are more than 4 or 5 EVs (f /stops) apart, it is critical that you communicate these points clearly and accurately to your separator.

What the photographer gains in so labeling his transparencies is confidence in knowing that the separator is going to separate his transparency with a knowledge of what (in the image) is critical, and what (in the image) can be, if necessary, compromised (compressed).

What the separator gains in participating in this practice is knowing exactly what the customer wants and how to get there from here in less time with fewer corrections. This, of course, means the capacity for greater volume.

ops



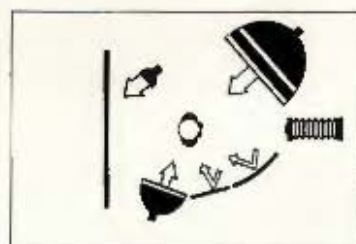
LIGHTING SITUATION

FIG.5



POINTS METERED IN FILM PLANE

4 stops



LIGHTING SITUATION



+7/8 STOPS



NORMAL



N



-2/3 STOPS



-2/

Measuring Photograph

STOPS

+2/3 STOPS



NORMAL

NORMAL



STOPS

-2/3 STOPS

y for offset reproduction

PHOTO CREDITS

Gerhard Muhlebach,
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(Figs. 1,2,3). Dennis Savini,
Zurich, Switzerland (Portrait of
Corinne, Figs. 5,6,7).

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