MAKING LINE- AND CONTACT-FILM TEST EXPOSURES

Test negatives are used to determine the proper exposure time for high-contrast film reproduction of line originals. There are three types of tests you will need to make:

- Camera-negative tests using the opaque Stauffer Scale.
- Camera-negative tests using density-numbered scales.
- Contact- or duplicate-film tests using the transparent Stauffer Scale and the UGRA Scale.

Camera-negatives using the Stauffer Scale:

1. Prepare the darkroom and the Argyle process camera. Be sure to have an opaque Stauffer Scale and camera-film available.
   a. Clean the copyboard glass inside and out with window cleaner and paper towels.
   b. Place the Stauffer Scale in the center of the copyboard.
   c. Set the lens-board and vacuum back to 100%.
   d. Set the aperture to 100% on f: _____ .
2. Set the timer to _____ seconds by pressing the buttons under each digit of the readout until the desired reading is achieved.
3. Shut off the white lights and make sure the darkroom door is closed and locked.
4. Check the image for correct focus by turning the timer to "focus" and examining the image on the ground glass (you'll need to open the access door to see the ground glass). Then close the access door.
5. Hinge open the vacuum back.
6. Open the box of film and remove one sheet by touching the edges of the film only. Cut the sheet to about 6 X 10 inches (roughly 1/2 the original size). Keep one piece and place the other back into the box. **Close the box of film securely!** Find the emulsion side (light side) of the film. Place the film, centered and emulsion up, on the vacuum back. **Remember to touch only the edges of the film because fingerprints elsewhere will ruin the film.**
7. Turn the vacuum pump on using the appropriate switch on the timer.
8. Close the vacuum back.
9. Press the "start" button on the timer. The film will now be exposed for the preset time.
10. When the lights shut off, hinge the vacuum back open.
11. Turn off the vacuum pump using the switch on the timer.
12. Lift the film off the vacuum back by touching the edges only.
13. Carry the film to the processor. Place the film emulsion up on the feed table under the arrow (the arrow indicates the film sensor: if this sensor is not

"tripped," the processor will not work properly) and gently nudge the film into the processor until the feed rollers engage it.

14. When the film emerges from the processor, remove the film from the basket so that it can be evaluated.
15. **Make sure the film boxes are all closed,** then turn on the viewing screen or light table.
16. Place the film on the viewing screen and find the **last *solid black* step.**
17. For normal originals, the last solid step should normally be #3.
18. If the last solid step is #3, the test exposure is the correct time to adequately expose good originals. If the last solid step is not #3, the exposure time needs to be altered. Go on to step 19.
19. Calculate the correct number of seconds to make the last solid step move to #3 (the longer the exposure, the higher number the last solid step will have).
    a. Use this procedure:

	Desired location of last-solid step:	step 3
-	Location of last-solid step on test:	- (example) step 4
	Number of steps to be moved	- 1

    b. If the "sign" of the answer is positive (+), then the exposure must be increased. If the sign is negative (-), then the exposure must be decreased.
    c. Use the following chart to determine the "exposure adjustment factor" needed to calculate the proper exposure:

*To **increase** the Stauffer Scale Reading:*

	1 step	2 steps	3 steps	4 steps
The exposure adjustment factor is:	1.4	2.0	2.8	4.0

*To **decrease** the Stauffer Scale Reading:*

	1 step	2 steps	3 steps	4 steps
The exposure adjustment factor is:	0.7	0.5	0.36	0.25

    d. Multiply the original test exposure time by the exposure adjustment factor to determine the correct exposure time for good originals. See examples below:

Example 1: If the original test was exposed for 90 seconds and the last solid step was step 5, what should the correct exposure time be to make a "last-solid" step 3?

	Desired location of last-solid step:	step 3
-	Location of last-solid step on test:	- step 5
	Number of steps to be moved	- 2

The "sign" of the answer is negative, so the exposure time must be decreased. The exposure adjustment factor (from the chart) for 2 steps down is .50.

Multiply the original exposure time (90 seconds) by the exposure adjustment factor (.50) to arrive at the correct exposure time (45 seconds).

Example 2: If the original test was exposed for 5 seconds and the last solid step was step 1, what should the correct exposure time be to make a "last-solid" step 3?

	Desired location of last-solid step:	step 3
-	Location of last-solid step on test:	- step 1
	Number of steps to be moved	+ 2

The "sign" of the answer is positive, so the exposure time must be increased. The exposure adjustment factor (from the chart) for 2 steps up is 2.00.

Multiply the original exposure time (5 seconds) by the exposure adjustment factor (2.00) to arrive at the correct exposure time (10 seconds).

Camera-negatives using density numbered scales:

1. Prepare the darkroom and the Argyle process camera. Be sure to have an opaque density numbered scale and camera-film available.
   a. Clean the copyboard glass inside and out with window cleaner and paper towels.
   b. Place a density numbered scale in the center of the copyboard.
   c. Set the lens-board and vacuum back to 100%.
   d. Set the aperture to 100% on f: _____ .
2. Set the timer to _____ seconds by pressing the buttons under each digit of the readout until the desired reading is achieved.
3. Shut off the white lights and make sure the darkroom door is closed and locked.
4. Check the image for correct focus by turning the timer to "focus" and examining the image on the ground glass (you'll need to open the access door to see the ground glass). Then close the access door.
5. Hinge open the vacuum back.
6. Open the box of film and remove one sheet by touching the edges of the film only. Cut the sheet to about 6 X 10 inches (roughly 1/2 the original size). Keep one piece and place the other back into the box. **Close the box of film securely!** Find the emulsion side (light side) of the film. Place the film, centered and emulsion up, on the vacuum back. **Remember to touch only the edges of the film because fingerprints elsewhere will ruin the film.**
7. Turn the vacuum pump on using the appropriate switch on the timer.
8. Close the vacuum back.
9. Press the "start" button on the timer. The film will now be exposed for the preset time.
10. When the lights shut off, hinge the vacuum back open.
11. Turn off the vacuum pump using the switch on the timer.
12. Lift the film off the vacuum back by touching the edges only.
13. Carry the film to the processor. Place the film emulsion up on the feed table under the arrow (the arrow indicates the film sensor: if this sensor is not "tripped," the processor will not work properly) and gently nudge the film into the processor until the feed rollers engage it.
14. When the film emerges from the processor, remove the film from the basket so that it can be evaluated.
15. **Make sure the film boxes are all closed,** then turn on the viewing screen or light table.
16. Place the film on the viewing screen and find the **last *solid black* step.**
17. For normal originals, the last solid step should normally be .35.
18. If the last solid step is .35, the test exposure is the correct time to adequately expose good originals. If the last solid step is not .35, the exposure time needs

to be altered. Go on to step 19.

19. Calculate the correct number of seconds to make the last solid step move to .35 (the longer the exposure, the higher number the last solid step will have).

a. Use this procedure:

	Desired location of last-solid step:	.35
-	Location of last-solid step on test:	- (example) .50
	Number of steps to be moved	- .15

b. If the "sign" of the answer is positive (+), then the exposure must be increased. If the sign is negative (-), then the exposure must be decreased.

c. Use the following chart to determine the "exposure adjustment factor" needed to calculate the proper exposure:

To move the density	*up*	*down*
0.01	1.02	0.98
0.02	1.05	0.95
0.03	1.07	0.93
0.04	1.10	0.91
0.05	1.12	0.89
0.06	1.15	0.87
0.07	1.17	0.85
0.08	1.20	0.83
0.09	1.23	0.81
0.10	1.26	0.79
0.11	1.29	0.78
0.12	1.32	0.76
0.13	1.35	0.74
0.14	1.38	0.72
0.15	1.41	0.71
0.16	1.45	0.69
0.17	1.48	0.68
0.18	1.51	0.66
0.19	1.55	0.65
0.20	1.58	0.63
0.21	1.62	0.62
0.22	1.66	0.60
0.23	1.70	0.59
0.24	1.74	0.58
0.25	1.78	0.56
0.26	1.82	0.55
0.27	1.86	0.54
0.28	1.91	0.52
0.29	1.95	0.51

To move the density	*up*	*down*
0.30	2.00	0.50
0.31	2.04	0.49
0.32	2.09	0.48
0.33	2.14	0.47
0.34	2.19	0.46
0.35	2.24	0.45
0.36	2.29	0.44
0.37	2.34	0.43
0.38	2.40	0.42
0.39	2.45	0.41
0.40	2.51	0.40
0.41	2.57	0.39
0.42	2.63	0.38
0.43	2.69	0.37
0.44	2.75	0.36
0.45	2.82	0.35
0.46	2.88	0.35
0.47	2.95	0.34
0.48	3.02	0.33
0.49	3.09	0.32
0.50	3.16	0.32
0.51	3.24	0.31
0.52	3.31	0.30
0.53	3.39	0.30
0.54	3.47	0.29
0.55	3.55	0.28
0.56	3.63	0.28
0.57	3.72	0.27
0.58	3.80	0.26
0.59	3.89	0.26
0.60	3.98	0.25

d. Multiply the original test exposure time by the exposure adjustment factor to determine the correct exposure time for good originals. See examples below:

Example 1: If the original test was exposed for 50 seconds and the last solid step was .60, what should the correct exposure time be to make a "last-solid" .35?

	Desired location of last-solid step:	.35
-	Location of last-solid step on test:	- .60
	Number of steps to be moved	- .25

The "sign" of the answer is negative, so the exposure time must be decreased. The exposure adjustment factor (from the chart) for .25 down is .56.

Multiply the original exposure time (50 seconds) by the exposure adjustment factor (.56) to arrive at the correct exposure time (28 seconds).

Example 2: If the original test was exposed for 10 seconds and the last solid step was step .20, what should the correct exposure time be to make a "last-solid" .35?

	Desired location of last-solid step:	.35
-	Location of last-solid step on test:	- .20
	Number of steps to be moved	+ .15

The "sign" of the answer is positive, so the exposure time must be increased. The exposure adjustment factor (from the chart) for .15 up is 1.41.

Multiply the original exposure time (10 seconds) by the exposure adjustment factor (1.41) to arrive at the correct exposure time (14.1 seconds). *You will need to convert the last digit of the display to 1/10ths by pressing the appropriate button on the timer.*

Contact/Dupe films using the transparent Stauffer and UGRA Scales:

Determining proper exposure for contact and duplicating films using the Stauffer Scale is essentially the same as when using camera films except a contact frame is used rather than a process camera. And, when using duplicating film, the appropriate target is the last *clear* step rather than the last *solid* step.

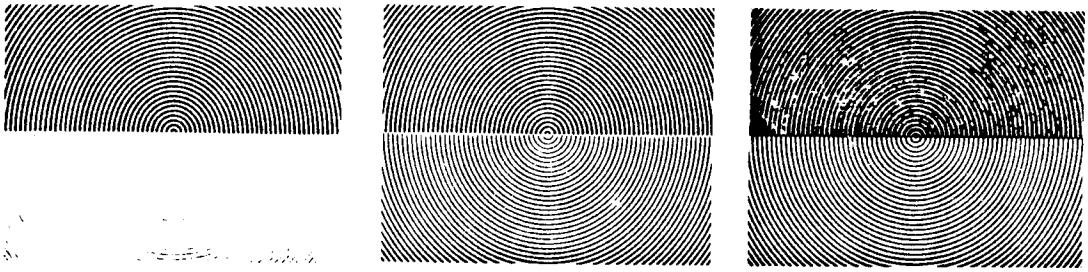
1. Prepare the darkroom and the OVAC Exposure Station. Be sure to have a transparent Stauffer Scale, an UGRA scale and contact- duplicating-film available (depending upon which type of film you wish to test/use).
   a. Clean the vacuum frame glass with window cleaner and paper towels.
   b. Set the exposure unit to memory _____. It should be set to _____ intensity, _____ vacuum, _____ units/seconds and accessory _____.
2. Be sure to work under the appropriate safelights for the film you are using.

Make sure the darkroom door is closed and locked.

3. Hinge open the vacuum frame.
4. Place the Stauffer and UGRA Scales in the center of the vacuum frame glass *emulsion up (toward you)*.
5. Open the box of film and remove one sheet by touching the edges of the film only. Cut the sheet to about 6 X 10 inches (roughly 1/2 the original size). Keep one piece and place the other back into the box. **Close the box of film securely!** Find the emulsion side (light/dull side) of the film. Place the film, centered and emulsion down (facing the emulsion of the scales), on top of the Stauffer and UGRA scales on the vacuum-frame glass. **Remember to touch only the edges of the film because fingerprints elsewhere will ruin the film.** ***Also remember that the scales and fresh film must touch with emulsion-to-emulsion orientation.***
6. Gently and slowly close the vacuum back. When the frame is completely closed, the vacuum pump will engage automatically, followed, after the appropriate "draw-down time," by the lamp.
7. When the lights shut off, hinge the vacuum frame open.
8. Lift the film off the glass by touching the edges only.
9. Carry the film to the processor. Place the film emulsion up on the feed table under the arrow (the arrow indicates the film sensor: if this sensor is not "tripped," the processor will not work properly) and gently nudge the film into the processor until the feed rollers engage the film.
10. When the film emerges from the processor, remove the film from the basket so that it can be evaluated.
11. **Make sure the film boxes are all closed,** then turn on the viewing screen or light table.
12. *For contact films:* place the film on the viewing screen and find the **last *solid black* step.** *For duplicating films:* place the film on the viewing screen and find the **last *completely clear* step**.
13. Generally, the last solid (or clear) step should be #3.
14. If the last solid (or clear) step is #3, the test exposure is close to the correct time to adequately expose good originals, so go to step 16. If the last solid (or clear) step is not #3, proceed to step 15.
15. Calculate the correct number of units/seconds to make the last solid (or clear) step move to #3 (the longer the exposure, the higher number the last solid (or clear) step will have). Use the charts and procedure on page 5 of this handout.
16. After calculating the new test exposure, make a second test at the new time. Process it normally.
17. When the film emerges from the processor, remove the film from the basket so that it can be evaluated.
18. **Make sure the film boxes are all closed** then turn on the viewing screen or

light table.

19. Inspect the UGRA scale and Stauffer Scale. The UGRA scale microlines should be the same in both halves of the target in the 6 micron step. Use the chart below to evaluate the microlines:



Underexposed Contact
Overexposed Dupe

Correct Exposure

Overexposed Contact
Underexposed Dupe

20. Make exposure changes as necessary to obtain the result shown in the center diagram above.

Altering Camera Exposures for Special Circumstances:

There are occasions when the original copy is not of "good" quality. "Good" quality copy is defined as "dense black image on bright white paper." Exposure times must be adjusted to compensate for the special characteristics of "poor" copy. Several possibilities exist:

- The image on the copy is good, but the background is grey.
- The copy's background is good and white, but the image is grey.
- The image is not black, but another color.
- The background is not white, but another color.

Good Image with Grey Background:

In this case, it is important to remember that the background exposes the film, not the image. The grey background absorbs some of the light that strikes it. The absorbed light is not reflected back to expose the film. Thus, copy with grey background will result in an underexposed negative. To solve this problem, you need to increase the exposure time. Generally, a one step increase (multiply normal exposure by 1.4) on the Stauffer Scale is sufficient. You can get more technical by measuring the density of the grey background with a densitometer and increasing the exposure time by the background's density using the charts on pages 5 and 6 of this handout.

Good Background with Grey Image:

In this case, the background is exposing the film properly. Unfortunately, the grey type does not absorb all the light that it should. The light that it does not absorb is reflected back through the lens and partially exposes the film. This causes the image to be speckled with black rather than completely clear. To solve this problem, you need to decrease the exposure time. Generally, a one step decrease (multiply exposure by .7) on the Stauffer Scale is sufficient. You can get more technical by measuring the densities of the poor image and a good image with a densitometer and decreasing the exposure time by the difference between the two densities. Use the charts on pages 5 and 6 of this handout.

Colored Image:

If the image is not black, you must first consider the light-sensitivity of the emulsion of the film you are using. If you are using orthochromatic film, you may safely photograph originals that contain either black or red images. If you are using panchromatic film, only black images can be photographed.

When reproducing colored images, you must "trick" the film into "thinking" that the image is black. This is done through the use of colored filters. This "trick" is called "holding a color" and results in a colored image reproduced as clear on the negative.

To "hold" a color, you must choose a filter that is the opposite (complement) of the color you wish to hold. For example, if you wish to hold blue, you must use a yellow filter (yellow and blue are complementary colors). Use the following chart:

Color to Hold	*Orthochromatic*	*Panchromatic*
violet-blue	yellow	yellow
cyan	*cannot be done*	red
green	magenta or blue	magenta
yellow	blue	blue
orange-red	blue	blue
red	*none needed*	cyan
magenta	green	green

Note that cyan images cannot be held using orthochromatic film. This would require the use of a red filter. Because all the light reflecting from the original must pass through the filter, and because red light does not expose orthochromatic film, use of a red filter with orthochromatic film would always result in completely clear film. The inability to photograph cyan images is burdensome because cyan is a popular color often used on printed jobs that must later be reproduced.

When placing a filter in the path of the light reflecting from an original, the

filter absorbs a great deal of the light. For this reason, exposure times must be increased when using filters. The normal exposure is multiplied by the *filter factor* for the particular filter to be used. The *filter factor* depends upon the filter itself, the light sensitivity of the particular film being used, and the lights used on the process camera. For this reason, filter factors vary from darkroom to darkroom and from film to film. However, there are some basic guidelines that are printed in the technical data sheets shipped with film.

Colored Background:

If the copy has a colored background, that background absorbs some light, which results in underexposed negatives. The exposure must be increased to compensate for this underexposure. Merely increasing exposure time may adversely affect the quality of the image. Therefore, a filter is used to compensate.

When a color is reproduced as if it were white, resulting in a black area on the negative, it is called "dropping" the color. To "drop" a color, use the same color filter as the color you wish to drop. The exposure time must be increased by the *filter factor*.

When using orthochromatic film, cyan (light blue) images always automatically drop. This is why artists use cyan pens or pencils to draw guidelines on paste-ups. These lines do not reproduce on the film: i.e. they turn the film black.

You may also use this same technique to drop out colors other than the background. For example, if you have an original with a white background, but a yellow image you wish to drop, use a yellow filter. The yellow filter will "trick" the film into seeing the background and yellow image as the same. The result will be a black area on the negative where the yellow image appears on the copy.