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Film Speed (Zone I) Test Exposure Procedure for Sheet Film

1. Determine starting exposure. Use the highest probable E.I. (usually the rated film speed or a little faster); meter the test target and set shutter and aperture combination. Use a rather slow shutter speed, they are more accurate. Make sure you have a rather small aperture setting, since all the following steps involve opening.
2. Pull the dark slide completely, then re-insert it 1/5 of the way (covering 1/5 of the sheet) and make the initial exposure. It helps to have the darkslide marked in fifths for this.
3. For +1/3-stop increments; descending film speed:
 - 3.1: Close down **2 stops**, insert the dark slide another 1/5, and make the second exposure
 - 3.2: Open 1/3-stop, insert the dark slide another 1/5 and make the third exposure. Repeat this procedure for the fourth exposure for a total of five strips: one unexposed, four exposed.
 - 3.3: Continue on another sheet of film. Give a second "initial exposure" at 1 1/3 stops more than the first "initial exposure." Expose the entire sheet.
 - 3.4: Continue with steps 3.1 and 3.2 above.

You should now have two sheets of film with 10 differently exposed stripes: one at no exposure (FB+Fog) and nine stripes exposed in descending 1/3-stop intervals.

Example: (5 exposures per sheet) I might use this E.I. spread for an ISO 125 film.

1. Initial exposure with darkslide in 1/5	ISO 200
2. Dark slide in 2/5; close 2 stops; expose.	ISO 160
3. Dark slide in 3/5; open 1/3 stop; expose.	ISO 125
4. Dark slide in 4/5; open 1/3 stop; expose.	ISO 100
5. Dark slide in; remove holder; reverse and re-insert; pull slide completely.	
6. Open 2 1/3 stop (= initial exposure plus 1 1/3 stops) and expose sheet.	ISO 80
7. Dark slide in 1/5; close 2 stops; expose.	ISO 64
8. Dark slide in 2/5; open 1/3 stop; expose.	ISO 50
9. Dark slide in 3/5; open 1/3 stop; expose.	ISO 40
10. Dark slide in 4/5; open 1/3 stop; expose.	ISO 32
11. Dark slide in; remove holder.	

ISO Numbers: 16.20.25.32.40.50.64.80.100.125.160.200.250.320.400.500.640.800.1000.etc.
(Exposure units times the cube root of 2 = 1/3 stop increase. Cube root of 2 = approx. 1.259920)

To Determine Film Speed:

Develop your film at a time about 15% less than the manufacturer's recommended time, or at a time close to what you estimate your final time to be. You can then read the differently exposed stripes with a densitometer and compare the densities to the first unexposed (FB+Fog) stripe to determine Zone I and film speed. Alternately (and my preference) you can use the following procedure that requires no densitometer.

Determining Film Speed Without a Densitometer:

This method is paper-based and requires you to first determine a "proper proofing time" for your film/developer/developing time/ combination. Use the unexposed stripe on the first negative and make a test contact print. The object is to find the minimum time it takes to print maximum paper black (Dmax) from the FB+Fog. Make different test exposures and compare the **dried** prints them under normal viewing light. Err on the side of overexposure if there is difficulty determining the exact exposure time for maximum paper black. Once you have determined this time, contact print the two negatives using the same enlarging time, lens, aperture and enlarger head height you used to determine the "proper proofing time."

Develop and dry the contact print of the two negatives and find the first stripe that shows a marked difference from maximum black (i.e., the first stripe). This will be Zone I and determine your E.I. Again, err on the side of overexposure if in doubt; one-third of a stop slower is not that much to sacrifice for shadow detail! The E.I. assigned to the stripe you choose as Zone I is what you should use as the basis for the following Zone Ruler tests, which will determine developing times for N, N+1, N-1, etc.

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Zone Rulers (1-stop increments) Test Exposure Procedure for Sheet Film

Determine exposure. Use E.I. for the development to be tested as already determined. Make sure that the aperture/shutter speed combinations allow for the necessary 8-zone spread. (Choosing surface and reflectance may be difficult) **Place subject in Zone I as indicated by the meter.**

Exposure number:

1. (Zone I on the meter and on the film.) **Place subject in Zone I as indicated by the meter.** Insert the dark slide **1/5** of the way and make the initial exposure. (It helps to have a dark slide that is marked in 1/5 sheet increments.) Note that the first stripe is covered during the exposure, therefore unexposed FB+Fog, i.e., Zone 0.)
2. (Zone I on the meter, Zone II on the film.) Insert the dark slide another 1/5 (2/5 total); make the second exposure with the **same aperture/shutter speed combination**.
3. (Zone II on the meter, Zone III on the film.) Insert the dark slide another 1/5 (3/5 total), **open one stop** and make the third exposure.
4. (Zone III on the meter, Zone IV on the film.) Insert the dark slide 1/5 (4/5 total), **open one stop** and make the fourth exposure.
5. (Zone V on the film.) Insert dark slide completely, pull the film holder, turn, insert into the camera and pull the dark slide **completely**. Make the fifth exposure **placing the subject in Zone V as indicated by the meter**.
6. (Zone V on the meter, Zone VI on the film.) Insert the dark slide 1/5 and make the sixth exposure with the **same aperture/shutter speed combination**.
7. (Zone VI on the meter, Zone VII on the film.) Insert the dark slide 1/5 (2/5 total), **open one stop** and make the seventh exposure.
8. (Zone VII on the meter, Zone VIII on the film.) Insert the dark slide 1/5 (3/5 total), **open one stop** and make the eighth exposure.
9. (Zone VIII on the meter, Zone IX on the film.) Insert the dark slide 1/5 (4/5 total), **open one stop** and make the ninth exposure.

Insert the dark slide completely and pull the holder. A third sheet of film can be used starting with Zone X and following the same procedure for N- zone rulers.

Example:

No exposure	Exp. units	Exp. units	Zone	Exp. 5	Exp. units	Exp. units	Zone
	0	0	0	(Zone V, meter)	16	16	V
Exp. 1				Exp. 6			
(Zone I, meter)	1	1	I	(Zone V, meter)	16+16=	32	VI
Exp. 2				Exp. 7			
(Zone I, meter)	1+1=	2	II	(Zone VI, meter)	16+16+32=	64	VII
Exp. 3				Exp. 8			
(Zone II, meter)	1+1+2=	4	III	(Zone VII meter)	16+16+32+64=	128	VIII
Exp. 4				Exp. 9			
(Zone III, meter)	1+1+2+4=	8	IV	(Zone VIII meter)	16+16+32+64+128=	256	IX
(sheet 1)				(sheet 2)			

The shaded portion of table above is a graphic representation of the actual sheet of film and the Zone Values and Exposure Units for each stripe. The text on the left is a summary of the directions given above.

For determining developing times for N, N+1, etc., I find it useful to make five or six sets of these negative pairs.

Develop the first pair at an estimated Normal developing time and then contact print these films at the “proper proofing time” determined above. If your developing time is correct for Normal, then Zone VIII should be a shade of grey just slightly darker than pure paper white (Zone IX). If not, then repeat the procedure developing the next film pair slightly more or less as needed (more if your initial Zone VIII was too dark, less if it was too light).

After you zero in on N development time, you can use the remaining film pairs to determine N+ and N- developments. Adjust developing time to place desired exposure zones at Zone VIII density (e.g. Zone VII → Zone VIII for N+1; IX → VIII for N-1 etc.).

Fine tune film speed and developing time for each different development time by repeating the film speed test and the Zone Ruler test for N+ and N- development times.

If more Zones are necessary, for example when testing extreme contractions, continue the above procedure on a third sheet starting with a Zone X exposure. The next stripe should also get a Zone X exposure to place it on Zone XI. Continue the process, adding one stop each time if more Zones are required.

To get a better idea of just how your film/developer combination renders the intermediate zones for each determined development time, make Zone Rulers for each of your film/development/paper combinations by printing the appropriate film pairs on one piece of paper at the proper proofing time, and trimming the print to make a “ruler” with all the different Zones. Zone Rulers developed to N- times will have longer scales while Zone Rulers developed to N+ times will have shorter scales. These rulers can be a useful visualization aid in the field.

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