Black And White Film Development

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5th January 2004

Abstract

This is the procedure I use to develop black and white films. It's rather strict so it should be quite reproducable. The table for development times is still work in progress, more films will be added as time goes by.

1 Film Development

All chemicals are prepared and put into bottles that goes into a water bath of 20°C/ 68°F for 30 minutes to get them to the proper temperature. I use wide-mouth juice bottles with a capacity of one litre each. It is important that all fluids that come in contact with the film is of the same temperature.

This is what goes into the different bottles:

- One bottle with tap water for a pre-wet, mainly to get the temperature of the development tank to the proper level and to prevent air bubbles sticking to the film.
- One bottle with developer diluted with deionized or distilled water to get repeatable development times. The developer is discarded after use. If you want you can use regular tap water but the results depend on your local water quality.
- One bottle with tap water for the stop bath. I use tap water because it does not cost anything and with a real stop bath you need an extra container if you want to reuse it.
- One bottle with fixer. The fixer is reused but is stored in a separate bottle from the paper fix. If you use the same fix for paper and film you will get lots of particles in the development tank because the paper fix is more open to contamination since it's in an open tray while you use it.

1.1 Development Steps

Pre-wet

1. Pour pre-wet into tank
2. Agitate three cycles
3. Tap tank against table three times to dislodge air bubbles.
4. Repeat steps 2 and 3 four times.
5. Empty tank into sink.

Developer

1. Pour developer in tank.
2. Start timer.
3. Tap tank against table three times to dislodge air bubbles.
4. For the appropriate time, agitate for 10 seconds (3 agitation cycles) at the beginning of each minute. Tap tank against table three times to dislodge air bubbles before putting it to rest after agitation. Keep the tank in the water bath when not agitating.
5. Empty tank into sink.

Stop

1. Pour stop bath in tank.
2. Agitate continuously for 30 seconds.
3. Empty tank into sink.

Fixer

1. Pour fixer into tank.
2. Agitate continously for 30 seconds to avoid fixer bleed, then for the rest of the time[1], agitate for 10 seconds (3 agitation cycles) at the beginning of each minute. Tap tank against table three times to dislodge air bubbles before putting it to rest after agitation. Keep the tank in the water bath when not agitating.
3. Empty tank into fixer bottle for reuse.

Rinse

Use the Ilford method of rinsing the film, it saves you time. It goes like this. Fill the tank with water, agitate for 5 cycles, empty the tank. Repeat again but with 10 cycles. Repeat again but with 20 cycles. Repeat again with 10 cycles for paranoia (not specified by Ilford). Finished.

Wetting Agent

The wetting agent is the final step before drying the film and is to avoid drying marks on the film. Mix the wetting agent beforehand. Use 2 ml of Ilford Ilfotol to 1 litre of deionized water. Ilford recommends a dilution of 1+200, but that leaves traces of wetting agent on the negatives when they are dry. To use, pour enough solution into the development tank to just cover the negative reel. Don't shake the tank as this will make bubbles, just twist the reel some, remember, no bubbles! Let it sit for a minute or so.

[1] Fix time depends on film and fixer dilution. Put an unexposed piece of film into the fixer, use double the clearing time as the fix time.

Drying

The film is ready to be hang up and dry. Take the reel from the tank and shake it vigorously to remove as much water as possible from the film. Some use a squeegee to remove excess water but I have had scratches that way. Remove the film from the reel and hang it to dry in a dust free environment.

Clean Equipment

It's important that the equipment is cleaned after use so no chemicals are left, for example fixer traces in the development tank could affect the developing of your next film.

1.2 Agitation Method

I agitate for 3 cycles every minute, those cycles together with tapping the tank to the bench to dislodge air-bubbles should take about 10 seconds.

1.3 Development Times

These times should be correct if using the procedure outlined above. Note: Times in italic are not yet tested.

Film	Developer	ISO	Time	Temp	Comment
Agfa APX 100	D76 1+1	100	9:00	20	To be tested
Agfa APX 100	Rodinal 1+50	100	13:00	20	To be tested
Kodak Tri-X (new)	D76 1+1	320,400	9:45	20	
Kodak Tri-X (new)	D76 1+1	320,400	7:45	24	
Kodak Plus-X (old)	D76 1+1	100,125	7:00	20	Upswept curve
Kodak Plus-X (old)	Rodinal 1+24	160	5:00	20	Dramatic gritty look, straight line
Ilford PanF Plus	D76 1+1	50	8:30	20	Low highlight contrast
Ilford Delta 100	D76 1+1	100	9:30	20	
Ilford Delta 400	D76 1+1	400	11:00	20	
Ilford HP5 Plus	D76 1+1	400	9:30	20	
Ilford FP4 Plus	Acutol 1+9	100,125	5:30	20	6:00 too long
Ilford FP4 Plus	D76 1+1	100,125	9:00	20	
Ilford FP4 Plus	Rodinal 1+50	100,125	?	20	To be tested
Efke KB50	Acutol 1+14	50	6:00	20	Good shadow detail outdoors
Efke KB50	D76 1+1	50	?	20	To be tested
Efke KB50	Rodinal 1+50	50	?	20	To be tested