Black & White Film Developing

Note: Download the Ilford article on developing a film as it gives more details but prescribes Ilford products**.**

http://www.ilfordphoto.com/applications/page.asp?n=16

The eqivalent from Kodak is also OK

http://www.kodak.com/global/en/professional/support/techPubs/aj3/aj3.pdf

Discussion about film photography can be found at

www.apug.org – leading analog online forum

The Basic Process

The sequence of steps in developing a film are as follows:

1. **Load film into Tank**
   Must be done in total darkness.

2. **Developer** (time depends on film and developer)

   Pour premixed developer (at 20 ^{0}C) into tank and replace filler lid, start timer and and tap the tank on a hard surface a couple of times. Give four gentle inversions at the start, and at start of each following minute for development time specified for the film. 10 sec before the end of development time remove the press on lid and start to pour developer down drain. The timer should end as you finish pouring the developer out.

3. **Stop bath** (30 sec) or **water rinse** (2 changes)
   When the developer has been removed add required amount of stop bath. Agitate by turning the tank upside down twice. After 10-15 seconds, repeat, after another 10-15 sec pour it stop bath out into container, it can be reused. The time in the stop bath is not critical although it must be at least 20-30 seconds.

4. **Fixer** (3 min typically)
   Add the pre-mixed fixer and agitate as per development, fixing only takes 3 minute using a typical rapid fixer. But check the information from the manufacturer. Pour fixer back into container for re-use.

5. Water rinse (2 changes)
6. Hypo clearing agent to reduce wash times

7. **Final Wash**
   The final wash removes all residual chemicals remaining in the emulsion.
   Fill the spiral tank with water at the same temperature, +/– 5 ^{0}C of the processing solutions and invert it five times. Drain the water away and refill. Invert the tank ten times. Once more drain the water away and refill. Finally, invert the tank twenty times and drain the water away.

8. **Wetting agent**
   Either add the wetting agent to final rinse (above) or make a new wash with the wetting agent and gently swirl film in the developing tank for 30 seconds. Too much agitation can cause froth.

9. **Dry Film**
   Hang film to dry in a dust free environment. To remove excess water you can

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gently pull the film between two wet fingers. The darkroom has a drying cabinet. Drying can be speeded up with a hair dryer but if there is dust in the air it will be forced onto the wet surface. All forced drying should be done on the non-emulsion side of the film.

The essential steps are shown in **bold**. The other steps are optional.

Chemicals

Mixing Ratios for chemicals

1:4 or 1+4 generally means 1 part fixer/developer to 4 parts water.

Eg. 300ml of developer mixed at 1:100 is

3ml stock developer + 300ml of water (actually 303ml for the obessives).

Make sure that you have correctly prepared all chemicals before beginning the process of developing your film. This includes diluting them for one-shot processing.

Developers

There are many different film developers available to choose from. Newcomers to film processing are advised to use one of the standard developers (three are suggested below) until they are clear on where they are going.

Kodak D76 and Ilford ID11
These are very similar standard developers, which gives normal speed and contrast with fine-grain results. Mainly used as a stock solution, they can be diluted 1:1 or 1:3 for single shot use, to give harder and sharper grain.

Agfa Rodinal
This is a high acutance developer that provides "edge" effects, increasing grain sharpness while maintaining film-contrast latitude. A one-shot developer normally diluted 1:25 or typically 1:50.

Always mix developers and use development times as per instructions that come with the developer.

Stock liquid developer such as D76 and ID11 with keep longer if bottled into smaller 500ml/300ml bottle and sealed with the air removed. If air in allowed to remain in the bottle the developer will oxidize and reduce effectiveness. Tetenal recommends ‘sealing off’ chemicals by topping up the container with propane gas (and they sell a product for this - Protectan). Any propane gas will do. If you take a cylinder of cigarette lighter gas, you can use the filler heads as nozzles to direct the gas into your chemical bottles.

Stop Baths

An indicator stop bath is mixed for use at 16ml per litre of water, but check the manufacturer’s instructions. This can be reused until exhausted, at which time it starts to discolour to purple.

Alternatively you can use ordinary household vinegar – if the smell doesn’t bother you. Dilute about 1:4 with water. It is cheap enough to discard after each developing session.

Another alternative is **running water** as a stop bath.

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Fixers

Any Fixer will be OK for processing your film. Fixers tend to have a limited life when mixed to instruction. They also have a limited volume of film they can process. Rapid Fixer has a capacity of approximately 20 rolls per litre of stock solution after mixing at 1+4 from concentrate.. One "roll" is defined as 80 square inches of film and is equivalent to a roll of 135/36, a roll of 120, 4 sheets of 4x5" or 1 sheet of 8x10".

The depletion level of the fixer can be tested with a fixer testing product. It can also be tested by using a piece of exposed film that has not been developed. Drop the film into the fixer. If the film fails to clear within 2 minutes then discard the fixer.

Wetting agent

Mix at 16ml per litre. The wetting agent breaks the surface tension of the water which allows the water to drain and film to dry mark free.

Notes:

Fixing time

In order to avoid the risk of insufficient fixing, film should remain in the fixer for twice the time it takes the emulsion to clear. Fixer should be discarded when the clearing time in used fixer exceeds twice the clearing time in fresh fixer. The clearing time of a film and fixer combination can be found by the following method. It can be carried out in normal lighting.

Take a piece of scrap unprocessed film and place a drop of the working strength fixer onto a small part of the emulsion side. Leave it until the emulsion under the drop is a clear spot, this should take around 30 to 60 seconds. Immerse the piece of film in the fixer bath and, using a stop clock, time how long it takes for the rest of the film to clear. Clearing can be judged by comparing the surrounding film area with the clear central spot. The time taken for the rest of the film to clear is the clearing time. The fixing time needed is double the clearing time.

Mixing The Developer

To use a powder developer like D76, mix up the stock solution, according to the directions on the packet, one day before you plan to use it. Store in air tight bottles or wine cask with air removed. Tetenal recommends ‘sealing off’ chemicals by topping up the container with propane gas (and they sell a product for this - Protectan). Any propane/butane gas will do. If you take a cylinder of cigarette lighter gas, you can use the filler heads as nozzles to direct the gas into your chemical bottles.

Do not mix up a partial batch of powder developer by dividing up the powder.

Measure out and dilute the stock (1:1 / 1:3) using your measuring jug just before you plan to use it - the diluted developer has a limited shelf life.

The easiest way to measure out liquid concentrate developers (eg Rodinol) is with a medical syringe (no needle) obtained from a pharmacy or Vet. Squirt the developer into a carefully-measured quantity of water in your measuring jug. Then suck up some of this mixture into the syringe to rinse the developer dregs out of the syringe.

Temperature Control

Developing is generally calculated at 20^0C and you need to be accurate to about half a degree for your developer, within 2-3 ^{0}C for following fixer and wash to avoid thermal

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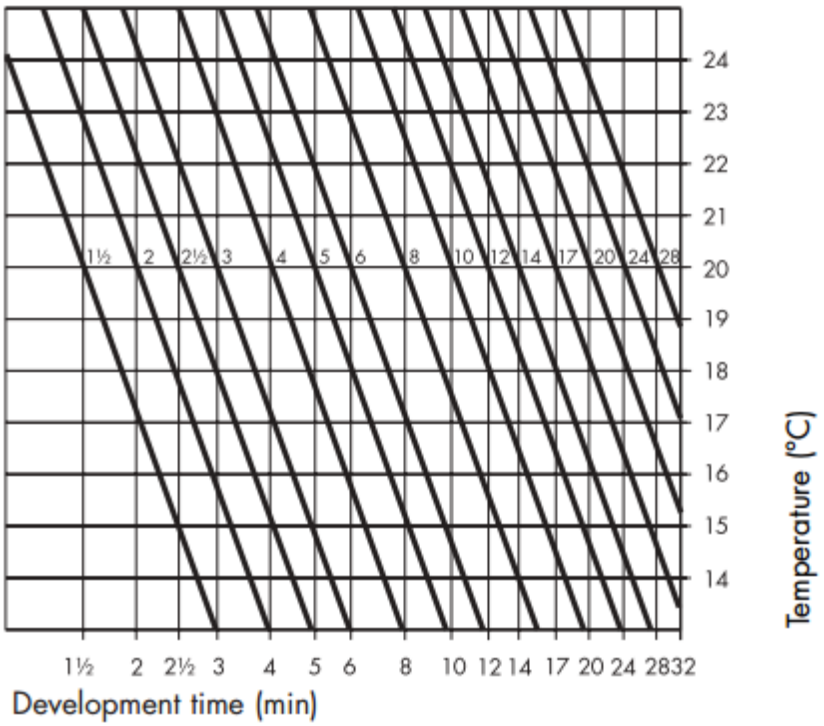
shock to film. Use your thermometer to measure the developer temperature while you heat or cool the developer until it reaches temperature. Cooling is easily done in the fridge, and heating is best done by placing the jug full of developer in a bath of hot water, making sure not to get any extra water in the developer.

Alternatively, you can develop film at temperatures above and below 20^0C within a range of about 4 degrees either way. There are charts that allow you to calculate the correction you have to make to your times for deviations from 20^0C. Ilford's *Processing your first black and white film* provides you with the chart and a description of the process.



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