# eco•pro

## Fixing & Washing Technical Instructions

**eco•pro Neutral Fixer** is a virtually odorless, non-hardening rapid fixer ideal for use with b&w film and paper. This all-purpose fixer is designed to expedite fixing and washing speed, whilst maximizing image quality and permanence. Fiber based prints can be washed to the highest standard with less washing time than other fixers, significantly reducing water wastage. pH is buffered at about 7 when mixed fresh, and is designed to resist acid stop solution carryover. Suitable for use with all b&w materials, including pyro and staining-type developers. eco•pro Neutral Fixer is an all-purpose high performance fixer recommended for all b&w materials processed in tray, small inversion tanks, deep tanks, rotary processors, and slot processors. The chart below provides an overview of the benefits of eco•pro Neutral Fixer when compared to other alkaline and rapid acid fixers.

| Fixer Comparison Chart | | | |
|---|---|---|---|
| | **eco•pro Neutral Fixer** | **Alkaline Fixers** | **Other Acid Fixers** |
| [1] Non-corrosive | √ | √ | |
| [2] ECO-friendly | √ | | |
| [3] Stop bath compatible | √ | | √ |
| [4] Clean-working | √ | | √ |
| [5] Economy dilution | √ | | √ |
| [6] Fastest washing time | √ | √ | |
| [7] Most effective dye removal | √ | | |
| [8] Longest possible shelf life | √ | √ | |

1. Contains no acetic acid and does not burn skin.
2. Contains no substances toxic to plants, such as borates.
3. eco•pro Neutral Fixer may be used with water rinse or acid stop bath, at the user's choice; fixer can instantly neutralize any acid carried over from the stop bath due to its advanced buffering system. Alkaline fixers require a water rinse before fixer since the fixer cannot tolerate acid carryover from acid stop bath. eco•pro Neutral Fixer offers superior results and maximum flexibility.
4. eco•pro Neutral Fixer is a clear liquid concentrate with none of the solid sediment or precipitate commonly found in alkaline fixers.
5. Can be used at higher dilution for improved economy.
6. Non-acid fixers are more rapidly washed from the film and prints, and this is most significant with fiber-based paper. As a result, there is a great reduction of washing time and water usage while maintaining archival quality.
7. Films often show a magenta, pink or red tint after processing. eco•pro Neutral Fixer is designed to wash out the dyes used in films most effectively.
8. Non-acid fixers have much longer shelf life than acid fixers, which can deteriorate during storage.

**eco•pro Hypo Wash** is a washing aid that expedites the washing process of fiber based prints. It helps the efficient removal of fixer and fixing reaction byproducts, which are detrimental to image permanence if inadequately removed from prints. When eco•pro Neutral Fixer is used, films and RC papers can be washed to an archival standard by thoroughly washing in water for a few minutes; however, eco•pro Hypo Wash can significantly shorten washing time, conserve water and expand the fixer's processing capacity, particularly when fiber based paper is processed. eco•pro Hypo Wash is a neutral pH sulfite washing aid supplied in highly concentrated liquid stock.

Acid hardening fixers are not recommended for modern photographic materials in manual processing. This is because fixing reaction byproducts are tightly attached to the film and paper due to acid and hardener, and such byproducts are washed out

reaction byproducts are tightly attached to the film and paper due to acid and hardener, and such byproducts are washed out only slowly. **eco•pro Hypo Wash** treatment will expedite washing of all films and papers fixed in acid hardening fixers. (Acid hardening fixers may be preferred for machine processing at an elevated temperature, or when prints are ferrotyped.)

**Preparing eco•pro Neutral Fixer**
eco•pro Neutral Fixer is packaged as liquid concentrate, and it is simply diluted with water before use. For optimal processing, one part of eco•pro Neutral Fixer concentrate is mixed with four parts of water (1+4 dilution). For print processing, one part of eco•pro Neutral Fixer may be mixed with seven parts of water (1+7 dilution) when greater economy is desired.

**Preparing eco•pro Hypo Wash**
eco•pro Hypo Wash is packaged as liquid concentrate, and it is simply diluted with water before use. One part of eco•pro Hypo Wash concentrate is mixed with 19 parts of water (1+19 dilution).

**Film processing**
Exposed films are developed in a film developer according to the instruction of the film developer. Developed films are rinsed in fresh tap water with continuous agitation for 30-60 seconds, or immersed in acid stop bath for 15-30 seconds. The temperature of the rinse water or acid stop bath should be within 5°C or 10°F of the processing temperature.

After draining the processing tank, the film is immersed in eco•pro Neutral Fixer working solution (1+4 dilution) with continuous or frequent agitation. Films should be fixed for a minimum of twice the clearing time, or 2 to 5 minutes depending on the film and freshness of the fixer. When the film is sufficiently fixed, the fixer is drained and the film should be washed in fresh tap water for minimum of 3 minutes.

The temperature of the rinse water, stop bath, fixer, and wash water should be higher than 18°C (65°F) and within 5°C (10°F) of the developer temperature.

Fresh fixer may completely fix slow conventional films in less than 2 minutes, while fast tabular grain films may take as long as 5 minutes. Longer fixing time may be necessary when fixing temperature is low, agitation is insufficient, and when the fixer becomes exhausted. When uncertain, take a piece of unprocessed film and immerse it in the fixer solution. Time necessary to clear the film is called *clearing time*; use twice the clearing time to fix the film to ensure complete fixation.

With modern films, it is common to see a pinkish tint on the processed films. This is because of a small amount of sensitizing dye remaining in the film, and has no detrimental effect on image quality or archival properties. However, some photographers prefer to remove this tint so that the negatives are easier to inspect on a light box, and high quality prints are obtained with the shortest possible printing exposure. **eco•pro Hypo Wash** may be effectively used in the film processing sequence to remove residual dyestuff.

For thorough removal of residual dyestuff, fixed film may be washed in tap water for 1 minute, immersed in eco•pro Hypo Wash working solution (1+19 dilution) for a minimum of 3 minutes with continuous or frequent agitation, and washed in water for minimum of 3 minutes. By increasing the time in eco•pro Hypo Wash and extending the washing time complete removal of the pinkish tint can be achieved.

In eco•pro Neutral Fixer, films may be safely overfixed with no adverse effects. Films may also be washed longer than necessary.

**RC paper processing**
Exposed resin coated (RC) papers are developed in a print developer according to the instructions of the print developer. In the case of eco•pro Paper Developer, the exposed print should be developed for 60 to 90 seconds in a 1+9 dilution at approximately 20°C (68°F). Developed prints are rinsed in fresh tap water with continuous agitation for 30-60 seconds, or immersed in an acid stop bath for 10-30 seconds.

After draining the print, it should be immersed in eco•pro Neutral Fixer working solution (1+4 dilution) for 1 minute with continuous or frequent agitation. Alternatively, RC prints may be fixed in eco•pro Neutral Fixer working solution (1+7) dilution for 1.5 to 2 minutes with continuous or frequent agitation. Fixed prints should be washed in fresh tap water for a minimum of 2 minutes. The temperature of the rinse water, stop bath and fixer should be higher than 18°C (65°F) and within 5°C (10°F) of the developer temperature. The temperature of the washing water should be above 10°C (50°F) and no higher than the highest processing temperature specified by the paper manufacturer. Most modern papers can withstand 25°C (77°F), and often higher.

In eco•pro Neutral Fixer, RC papers may be safely overfixed with no ill effect, although it is generally best to minimize the total wet time. Excessive washing time is not recommended.

**FB paper processing**
Exposed fiber based (FB) papers are developed in a print developer according to the instruction of the print developer. In the

Exposed fiber based (FB) papers are developed in a print developer according to the instruction of the print developer. In the case of eco•pro Paper Developer, the exposed print should be developed for 90 to 120 seconds in a 1+9 dilution at approximately 20°C (68°F). Developed prints are rinsed in fresh tap water with continuous agitation for 30-60 seconds, or immersed in acid stop bath for 15-30 seconds.

1. Processing using **eco•pro Hypo Wash** (RECOMMENDED)
After the print is drained, it is immersed in eco•pro Neutral Fixer working solution (1+4) for 1 minute with continuous agitation. It is important that the fixing time is accurately timed, and within the range of 60 to 75 seconds. Fixed prints should be rinsed in tap water for 1 minute with continuous agitation, immersed in eco•pro Hypo Wash working solution (1+19) for a minimum of 5 minutes with continuous or frequent agitation, and washed in fresh tap water for 10 minutes.

2. Processing without **eco•pro Hypo Wash**
After draining the print, the print is immersed in eco•pro Neutral Fixer working solution (1+4) for 1 minute with continuous agitation. It is important that the fixing time is within the range of 60 to 75 seconds. Fixed prints should be washed in fresh tap water for a minimum of 20 minutes (double weight paper).

Note that the processing capacity of fixer is considerably lower if fiber prints are processed without using a washing aid. The use of eco•pro Hypo Wash allows you to continue using the fixer for a longer period as it increases the efficient removal of fixer byproducts from the paper, thereby allowing you to continue using partially exhausted fixer for a longer period.

3. Processing using **1+7 dilution of eco•pro Neutral Fixer**
After the print is drained, it is immersed in eco•pro Neutral Fixer working solution (1+7) for 2 minutes with continuous agitation. Fixed prints should be rinsed in tap water for 1 minute with continuous agitation, immersed in eco•pro Hypo Wash working solution (1+19) for a minimum of 10 minutes with frequent agitation, and washed in fresh tap water for 10 minutes.

When using eco•pro Neutral Fixer, overfixing does not degrade the image quality, but overfixed FB papers will require a significantly longer washing time to meet an archival standard.

To aid the flattening of prints, it is recommended to use the shortest total wet time when processing RC and FB paper. With RC prints, excessive wet time tends to cause the paper to absorb chemicals and water from the edges, resulting in wavy prints when dried. With FB prints, excessive wet time allows the paper base to absorb more chemicals and water, also leading to curly or wavy prints when dried. eco•pro Neutral Fixer and eco•pro Hypo Wash are designed to achieve the highest image quality in the shortest total wet time.

**Optional processing sequences**

Each film, paper, and chemical manufacturer often recommends different processing techniques. Darkroom manuals and technical guides add more processing variants. Some important optional processing systems are described below.

The Ilford Archival Processing Sequence is described in several Ilford publications, such as the Ilfobrom Multigrade IV FB and Galerie FB information sheets, and is sometimes called the Ilford Optimal Permanence Sequence. It can be summarized as follows:

Fix in Ilford Universal Rapid fixer (1+3) for 60 seconds. Wash in good supply of fresh running water for 5 minutes. Treat in Universal wash aid (1+4) for 10 minutes. Wash in good supply of fresh running water for 5 minutes.

The key in the Ilford Archival Processing Sequence is to use a non-hardening rapid fixer at film strength. The same sequence may be very effectively used with eco•pro Neutral Fixer (1+4) and eco•pro Hypo Wash (1+19) in place of Ilford's fixer and washing aid.

Ilford also recommends a **fill-and-dump washing sequence** for film processing in small tanks. The fill-and-dump washing sequence is efficient in minimizing the amount of water required for archival washing of films, and is specified as follows:

Process the film in a small tank. Fix the film in Ilford Hypam or Universal Rapid fixer (1+3). After fixing, fill the tank with water at the same temperature, and invert the tank five times.
Drain the water and refill. Invert the tank ten times.
Drain and refill a third time, and invert the tank twenty times. Drain again.

The key in the fill-and-dump sequence is to use a non-hardening rapid fixer. The same sequence may be very effectively used with eco•pro Neutral Fixer (1+4).

Ilford also recommends **speed washing of RC prints**, which is an efficient method of minimizing the washing time. This technique should be used only with RC papers. Prints fixed in non-hardening rapid fixer are vigorously washed for 30 seconds in water at 20C (68F). The key in this technique is to use non-hardening rapid fixer, and use running water with vigorous

agitation at 20C temperature. eco•pro Neutral Fixer (1+4 or 1+7) may be effectively used with this technique, to provide a very high standard of washing. RC prints processed with eco•pro Neutral Fixer using this speed washing technique will meet archival standards for residual chemical levels.

Eastman Kodak and other manufacturers often recommend a **two-stage fixation process**. Film and paper are successively fixed in two fixing baths. Two baths are prepared identically, and the material is fixed in each bath for one half of the total fixing time. Most of the fixing is carried out in the first fixing bath, and the second fixing bath ensures complete fixation of the material. When the first fixer is exhausted, it is discarded, and the second fixer is then moved up to replace the first fixer. A fresh fixer solution is prepared to act as the new second fixer. The advantage of two-stage fixation is that the processing capacity of the fixing bath can be significantly extended, although at the expense of an extra processing step. This method also functions as a double security measure for complete fixation of the material by creating an extra fixing stage to guard against possible exhaustion of the first solution.

When eco•pro Neutral Fixer and eco•pro Hypo Wash are used together, the processing capacity of the fixer is already increased; however, when preferred, a two-stage fixing process may be used.

**SUMMARY OF RECOMMENDED FIX-WASH TIME**

The following table summarizes processing sequences: one sequence for film, three sequences for RC paper and four sequences for FB paper. Each row indicates a sequence; follow the fixer dilution, fix time, rinse time, wash aid treatment time, and washing time from the same row. Processing capacity limit for the fixer is also indicated for the particular sequence.

| **Fixing & Washing Chart** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Processing Sequences** | | | | | | **Fixer Capacity†** | |
| **Material** | **Dilution** | **eco•pro Neutral Fixer** | **Rinse** | **eco•pro Hypo Wash** | **Wash** | **Archival** | **Commercial** |
| Film* | 1+4 | 2-5min | --- | --- | 4 min | 25 | 25 |
| Film* | 1+4 | 2-5min | 1 min | 3 min | 3 min | 30 | 30 |
| RC paper* | 1+4 | 1 min | --- | --- | 2 min | 30 | 80 |
| RC paper* | 1+7 | 1.5-2 min | --- | --- | 2 min | 30 | 80 |
| RC paper | 1+4 | 1 min | 1 min | 3 min | 2 min | 80 | 80 |
| FB paper | 1+4 | 1 min | --- | --- | 20 min | 15 | 40 |
| FB paper* | 1+4 | 1 min | 1 min | 5 min | 10 min | 50 | 60 |
| FB paper* | 1+4 | 1 min | 5 min | 10 min | 5 min | 40** | 60** |
| FB paper | 1+7 | 2 min | 1 min | 10 min | 10 min | 40 | 60 |

*Recommended processing sequences.
**Ilford sequence.
† Fixer capacity is indicated for the maximum archival processing standard. When processing materials for less permanent applications, the processing capacity may be increased to the specified commercial level. The fixer capacity is indicated as number of 80 square inch materials in each liter of working strength fixer. 35mm 36exp film, 120 film and 8x10 film are approximately 80 square inches. 8x10 paper is 80 square inches.

Some films and papers require a longer time to fix. As a general guide, fast tabular grain films tend to require a longer fixing time than conventional grain films. Also, bromide paper emulsions tend to require longer fixing time than more common chlorobromide papers. When using these products, fixing time should be extended. Although we have not investigated all photographic products, some of known products are described below.

Kodak Kodabromide paper (discontinued) may require as much as 2 minutes fixing time in eco•pro Neutral Fixer (1+4) and 5 minutes in eco•pro Neutral Fixer (1+7). Kodak recommends 5 minutes fixing time in Kodak Rapid Fixer (1+7) and 10 minutes in Kodak Fixer.

Ilford Delta 400 film tends to require significantly longer fixing time than most other films in all fixers we tested. Give 5-8 minutes fixing time with continuous or frequent intermittent agitation in eco•pro Neutral Fixer (1+4).

For other products, refer to the information sheet for the film or paper to check whether a particular product requires a longer fixing time.

**Using ecopro products with other manufacturers' products**

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If another manufacturer's fixer is used with eco•pro Hypo Wash, prepare eco•pro Hypo Wash 1+19 working solution and follow the fixer's instruction for the fixing and washing time.

If Kodak Hypo Clearing Agent, Ilford Washaid, Fuji QW or Heico Permawash is used with eco•pro Neutral Fixer, the washing aid working solution should be mixed from powder or concentrate according to the manufacturer's instructions. Then follow the eco•pro Neutral Fixer instructions in this document for fixing and washing times.

A solution consisting of 15g sodium sulfite, 5g sodium metabisulfite in a liter of water may be used as a washing aid, in place of eco•pro Hypo Wash 1+19 working solution. However, such a solution must be prepared shortly before use and should not be stored for repeated use.

Other washing aid products have not been tested with eco•pro Neutral Fixer or processing sequences described in this document.

**Vertical slot processing**
eco•pro Neutral Fixer working solution should be prepared at 1+4 (for RC and FB) or 1+7 (RC only) dilution with the processing time according to the table above. For further details, follow the processor's instruction.

**Toning prints**
Although prints that are adequately fixed and washed enjoy long life in perfect storage conditions, the silver image may degrade much sooner in real life storage and display conditions. This is due to oxidative attacks from environmental pollutants. In order to ensure maximum permanence of the image, it is highly recommended to treat important prints in sulfiding toners.

The recommended toner is Kodak Brown Toner. Other recommended toners, although they are discontinued or difficult to obtain, include: AGFA Viradon, Kodak Poly Toner and IPI Silverlock. A practical brown toner may be prepared by dissolving 20g liver of sulfur, a crude form containing potassium polysulfide, in 1 liter of water (working strength). Such a solution should work very similarly to Kodak Brown Toner working solution (1+9 dilution). These brown toners are most thoroughly researched by conservation scientists worldwide for their strong image protecting properties. When the brown black tone given by sulfiding toners is undesirable, Kodak Rapid Selenium Toner (1+3, 1+4 or 1+9 dilution) may be used.

Prints may be toned at the end of each printing session. The toning step should be inserted after the fix and before the washing aid. Prints should be fixed according to the recommendation above. Fixed prints should be rinsed for 1 min (RC) or 3-5 min (FB) in tap water. Rinsed prints should be treated in toning solution according to the toner's instructions. Toned prints should be rinsed in tap water prior to resuming the recommended sequence, i.e., eco•pro Hypo Wash treatment and final wash.

Alternatively, prints may be fixed, washed and dried completely, and they may be toned at a later time. In such case, prints should be toned, rinsed in water for 1-5 minutes, treated in eco•pro Hypo Wash for 5 minutes and washed for 10 minutes.

When Kodak Rapid Selenium Toner (KRST) is used, some authors recommend to mix KRST with the washing aid. However, when eco•pro Neutral Fixer is used, this is unnecessary; prepare KRST working solution by diluting KRST concentrate with water.

**Note on image permanence**
In order to ensure very long life expectancy of the image, attention should be paid to complete fixing, toning and washing, as well as good storage conditions. Some key points are as follows:

- give adequate fixing time and agitation
- do not exceed archival processing capacity
- ensure print surfaces are in contact with washing water with good agitation (i.e., prints should not be tightly stacked in a washing tray.)
- important prints should be toned in sulfiding toner
- prints should be stored in low humidity conditions
- avoid non-archival storage containers

In addition, 35mm and roll films should be occasionally allowed to breathe in dry, clean, fresh air to prevent degradation of cellulose triacetate base.

For more details on image permanence and archival practice, please consult additional sources on b&w silver image conservation standards.

**Storage and Capacity**

Unopened eco•pro Neutral Fixer and eco•pro Hypo Wash bottles should be kept in cool, dark conditions. The products have a virtually indefinite shelf life. Once opened, the concentrate should be kept in tightly closed glass, PET(PETE) or HDPE containers, and used within twelve months. For best results in small scale darkrooms, a large opened bottle should be divided into several small glass or polyethylene bottles filled to the top to minimize exposure to air.

eco•pro Hypo Wash concentrate may form white crystals if it is stored in contact with air. If a significant amount of crystal forms, discard the solution and replace it with fresh stock. It is inadvisable to use eco•pro Hypo Wash which has crystallized, as the accelerated washing function is impaired even if the crystal is dissolved after dilution.

eco•pro Neutral Fixer and eco•pro Hypo Wash working solution may be stored before and between uses, in a tightly closed glass, PET (PETE) or HDPE containers. Discard eco•pro Neutral Fixer when the processing capacity is reached. The processing capacity of eco•pro Neutral Fixer depends on the processing sequence being used. Processing capacity is indicated in the "Summary of recommended sequences" section for archival standards.

Each liter of eco•pro Hypo Wash working solution (1+19) can process more than 50 8x10 prints. Discard eco•pro Hypo Wash working solution when capacity is reached, or it is stored for more than two weeks, to ensure archival washing quality.

The archival processing capacity of eco•pro Neutral Fixer is much greater when the subsequent washing procedure incorporates treatment in eco•pro Hypo Wash. This is because the archival processing capacity is limited due to more fixing reaction byproducts formed in partially exhausted fixer. The byproducts are more difficult to wash out than the fixer itself, particularly from fiber based papers. The use of eco•pro Hypo Wash promotes the efficient removal of both fixer and fixing reaction byproducts from all photographic materials, thus increasing processing capacity of the fixer.

eco•pro Neutral Fixer (concentrate) is a clear solution free of insoluble sediments. eco•pro Hypo Wash (concentrate) is a clear solution free of insoluble sediments, but it will develop white crystals if the solution is stored in contact with air (oxygen) for a prolonged period of time. When more than a few small crystals are formed, discard the solution.

**Availability**
Both eco•pro Neutral Fixer and eco•pro Hypo Wash are available in bottles of 1 US quart (0.95 liters) and 1 US gallon (3.9 liters).

**Safety Information**
eco•pro Neutral Fixer and eco•pro Hypo Wash are formulated without toxic or harmful chemicals, to minimize the risk in case of accidental exposure or release in the environment. The formula is made with the safest alternative compounds, whenever possible, without compromising the image quality and reliable functionality; however, it is recommended to use all darkroom safety precautions including: wearing an apron, gloves and eye protection. Refer to material safety data sheets for more specific safety information.

eco•pro Neutral Fixer and eco•pro Hypo Wash are free of:

- dihydroxybenzene compounds (commonly used in most photographic developers)
- phosphates
- borates
- alum hardener
- known carcinogens
- known mutagens

eco•pro Neutral Fixer (concentrate) contains about 60% ammonium thiosulfate. Both eco•pro Neutral Fixer and eco•pro Hypo Wash contain significant amounts of sulfites. The pH of concentrate and working solution of both products are in the range of 6.5 to 8.5.

Like other rapid fixer products, eco•pro Neutral Fixer may give off a sharp ammonia odor, which can be irritating to the eyes and respiratory tracts. Use adequate ventilation and avoid significant exposure to ammonia gas. eco•pro Neutral Fixer contains significant amount of ammonium ion, a biologically available nitrogen source, and its discharge to the municipal sewer line may be regulated. Exhausted eco•pro Neutral Fixer working solution contains significant amount of silver, a rather precious resource, in the form of silver-thiosulfate complex.

Most small-scale amateur darkrooms may safely discard solutions to the sewer system with a large amount of water. If a large amount of fixer is used, a silver-recovery system is recommended. Also, whenever readily available, it is recommended to dispose of used solutions through a municipal hazardous waste program. Commercial establishments are subject to additional regulations regarding disposal of photographic chemicals.

It is strongly recommended that the end user of any chemical solution check with federal, state, and local regulatory bodies to conform with special disposal methods for used solutions to remain in accordance with the Clean Air Act, the Clean Water Act,

and the Resource Conservation and Recovery Act.