

TECHNICAL INFORMATION

MULTIGRADE IV FB FIBER

PREMIUM QUALITY VARIABLE CONTRAST PAPER ON A FIBER BASE

ILFORD

MULTIGRADE IV FB FIBER Fiber Base Black & White Paper

1 DESCRIPTION AND USE

ILFORD MULTIGRADE IV FB Fiber is a premium quality variable contrast paper on a fiber base. Compared with MULTIGRADE FB, it has been improved to give better tonal rendition throughout the contrast range, especially in the highlights. It also has a slightly heavier double weight base (255g/m²).

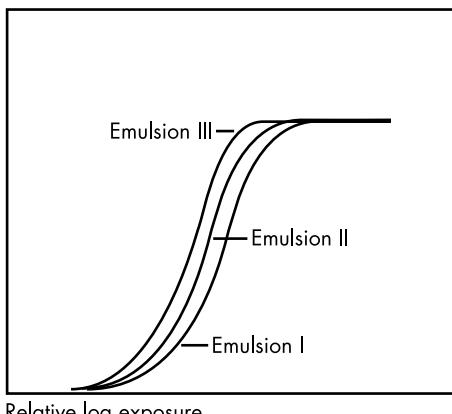
MULTIGRADE IV FB Fiber gives prints with deep, rich blacks. These are achieved by the careful choice and positioning of optical brighteners in the paper. These same optical brighteners also ensure that the base tint is very clean and bright and remains so, even with prolonged washing. Different contrast levels are achieved with MULTIGRADE IV FB Fiber paper in the same way as with ILFORD MULTIGRADE RC papers.

MULTIGRADE IV FB Fiber is part of the ILFORD MULTIGRADE system and is fully compatible with all existing MULTIGRADE filters and equipment. It is equally suitable for printing from conventional negatives and from XP2 negatives.

MULTIGRADE IV FB Fiber is available in double weight (MGF.1K) glossy surface and (MGF.5K) matt surface.

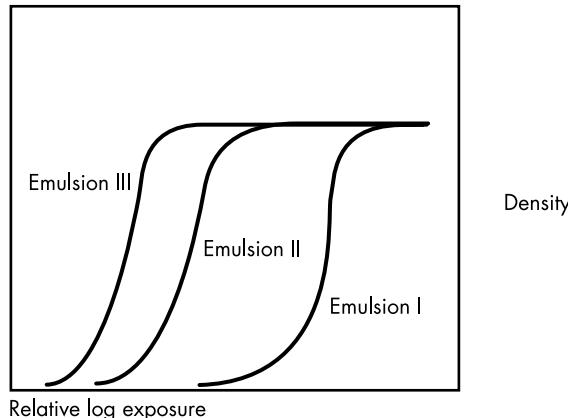
ILFORD variable contrast papers are a blend of emulsion components of differing spectral sensitization. In a typical system, each emulsion in the blend provides similar contrast and speed to blue light.

Figure 1. Sensitometric curves of the components to blue light.



By varying the levels and types of sensitizing dyes, the spectral characteristic of the individual components provide low, medium and high blue/green sensitivity which produces marked speed differences.

Figure 2. Combined sensitometric curve to blue-green light.



By varying the color of the exposing light, the total sensitometric response of the blend is modified to provide a range of contrasts.

Figure 3. Combined sensitometric curve to blue light.

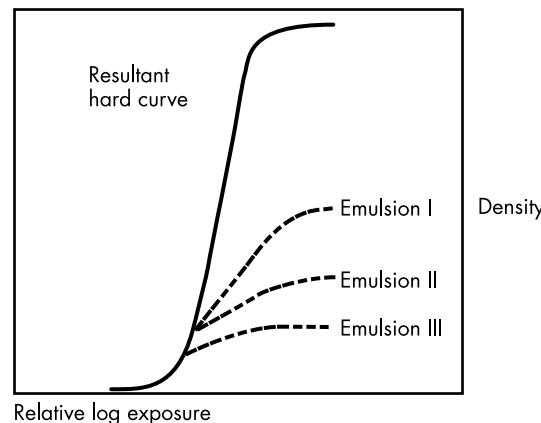
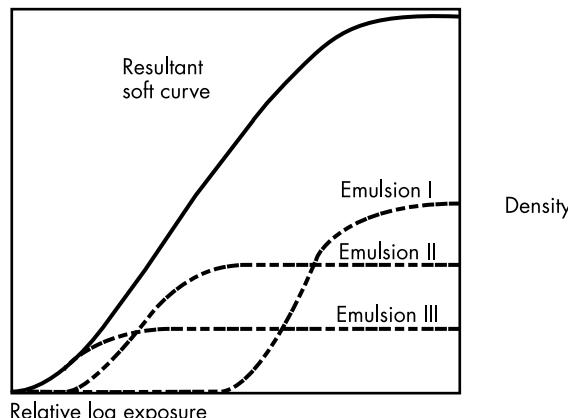


Figure 4. Combined sensitometric curve to blue-green light.



The limitation in most variable contrast systems is that the contrast at the foot of the curve (the highlight region of the print) is determined by a somewhat high contrast component. ILFORD MULTIGRADE IV FB Fiber incorporates an entirely new component which actually is itself a variable contrast emulsion. This, coupled with improved sensitizing technology, gives highlights whose contrast changes across the entire filter range without compromising maximum contrast.

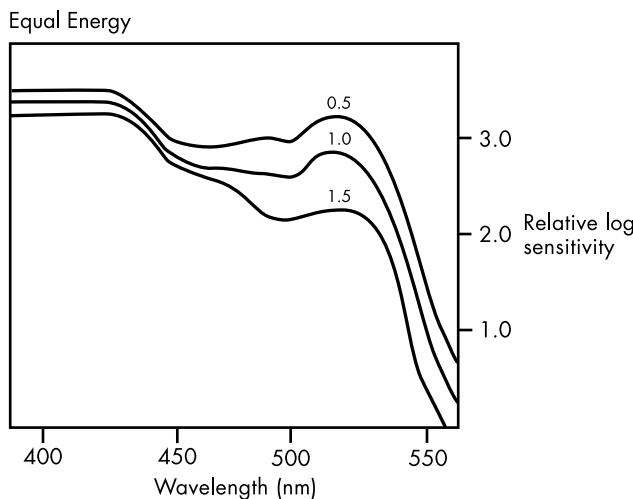
2 EXPOSURE

2.1 SAFELIGHT RECOMMENDATIONS

Use an ILFORD 902, Kodak OC safelight filter, or equivalent, in a darkroom lamp fitted with a 15 watt bulb. For direct lighting, the distance between the paper and the safelight should not be less than three feet and exposure should not exceed 4 minutes.

2.2 SPECTRAL SENSITIVITY

MULTIGRADE IV FB Fiber was tested unfiltered to produce the following curves at density 0.5, 1.0 and 1.5.



2.3 CONTRAST RANGE

Seven full grades of contrast are available with MULTIGRADE IV FB Fiber paper when used with MULTIGRADE filters or the ILFORD MULTIGRADE 500 Exposure System. Both of these systems allow half grades in addition to full grades. 12 contrast steps from 00–5 are obtainable using MULTIGRADE filters.

The chart gives the ISO range figures (ISO standard 6846–1983) for MULTIGRADE IV FB Fiber. These figures give a guide to selecting the appropriate grade of paper for a given effective negative density range.

MULTIGRADE IV FB Fiber unfiltered has an ISO range of R100.

ISO Range

MULTIGRADE IV FB Fiber Paper and MULTIGRADE Filters

Filter	00	0	1	2	3	4	5
Range (R)	170	150	130	100	80	60	40

These values are representative of those obtained when tray processing the paper to ILFORD recommendations.

ISO range figures may be helpful to printers who have some means of measuring the effective density range of the image as projected on the enlarger baseboard—such as with a photometer.

As an example, for a negative with an effective density range of 1.32 log exposure units, multiply this figure by 100 and choose the nearest ISO range figure from the table—in this case 130. Try printing this negative with MULTIGRADE filter 1 on MULTIGRADE IV FB Fiber paper.

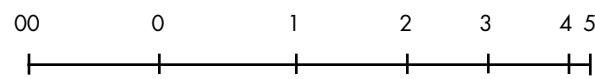
2.4 ENLARGER LIGHT SOURCES

MULTIGRADE IV FB Fiber is designed for use with most enlargers and printers, that is, those fitted with either a tungsten or tungsten halogen light source. It is also suitable for use with cold cathode (cold light) light sources designed for variable contrast papers. Other cold cathode (cold light) and pulsed xenon light sources may give a reduced contrast range.

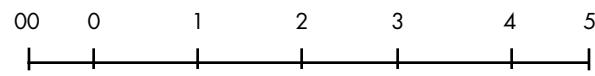
Enlargers with a cold cathode or cold light head may be used, but the contrast range will vary, and is dependent on the spectral characteristics of the light source used. The only way to determine the contrast range available with each model of enlarger is to carry out a practical test. Some additional yellow filtration, up to 70Y, may be helpful in these circumstances.

The following chart gives a guide to the contrast range of MULTIGRADE papers when exposed using MULTIGRADE filters with a conventional tungsten enlarger head and with an Aristo head fitted with an Aristo W45 cold cathode lamp. With the Aristo W45 lamp, extra yellow filtration was also added—CC40Y—as recommended by Aristo. It can be seen that a full contrast range can be achieved, but the grade intervals are bunched towards the high contrast end.

Aristo W45 cold cathode lamp + 40Y with MULTIGRADE filters



Conventional tungsten enlarger head with MULTIGRADE filters



2.5 MULTIGRADE FILTERS

MULTIGRADE filters are suitable for use with MULTIGRADE IV FB Fiber or MULTIGRADE RC paper. The twelve MULTIGRADE filters are numbered 00–5 in $\frac{1}{2}$ steps. They have been specifically designed for use with ILFORD variable contrast paper. With MULTIGRADE IV FB Fiber paper, they give a wide contrast range equivalent to grades 0–4 on graded paper: The lowest filter number corresponds to the softest grade of paper.

The sets comprise twelve filters, solvent coated on a polyester base. They are available in sets of $3\frac{1}{2} \times 3\frac{1}{2}$ inches and 6x6 inches, and individually in 12x12 inches. They may be used above or below the lens and may be cut to fit the filter drawer of a particular enlarger.

Filters are also available mounted, and supplied as a kit with a filter holder and a filter holder adaptor. The filter holder may be fitted to the enlarger in two ways. If the enlarger has a non-recessed lens and the filter holder can be attached without obscuring the aperture ring, mount it on the lens barrel. Alternatively, if the enlarger lens is either recessed or has too large an outside diameter, the filter holder may be fitted to the post supporting the red filter on the enlarger. A suitable adaptor is supplied with the kit.

MULTIGRADE filters are very easy to use: No complicated calculations are needed when changing from one filter to another. The exposure time for filters 00–3½ is the same; that for filters 4–5 is double.

For example, if a print made with filter 3 requires an exposure of 10 seconds at f5.6, a print of similar overall density made from the same negative with filter 4 would require 20 seconds at f5.6.

The effective speed of a variable contrast paper is dependent on the transmission characteristics of any filter through which it is exposed. The International Organization for Standardization (ISO) measures photographic paper speed at a density of 0.6 above base and fog, and expresses it using an arithmetic scale (in the same way as ASA film speed). For example, paper with a speed of ISO P200 is one having twice the speed of one with ISO P100. The American National Standards Institute (ANSI) has an identical system of speed rating.

ISO Speed

The speed of MULTIGRADE IV FB Fiber depends on the filtration used during exposure. MULTIGRADE IV FB Fiber unfiltered, has a paper speed of ISO P500.

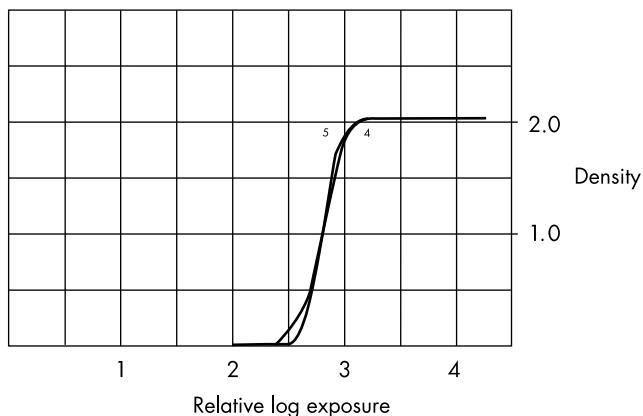
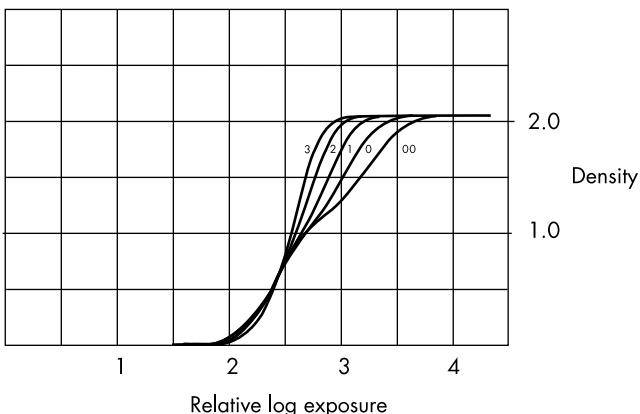
ISO Paper Speed

MULTIGRADE IV FB Fiber Paper and MULTIGRADE Filters

Filter	00	0	1	2	3	4	5
Speed (P)	200	200			100	100

The above values are representative of those obtained when tray processing the paper to ILFORD recommendations.

2.7 CHARACTERISTIC CURVES



MULTIGRADE IV FB Fiber glossy paper exposed through filters 00, 0, 1, 2, 3, 4 and 5. Developer: MULTIGRADE, diluted 1+9. Development: 2 minutes at 68°F.

2.8 ILFORD XP2 400 NEGATIVES

Equal contrast spacing and the same wide contrast range can be achieved when printing ILFORD XP2 400 negatives on MULTIGRADE IV FB Fiber paper. In some cases of extreme over exposure (plus 3–4 stops) of XP2 400, the equal speeds between the highest contrast steps may not apply. Longer printing times may then be needed. For this reason, exposure must be reassessed by practical trial when changing filters.

2.9 MULTIGRADE 500 EQUIPMENT

MULTIGRADE IV FB Fiber paper is fully compatible with the ILFORD MULTIGRADE 500 enlarger head and control system. Full details on this equipment are available separately from ILFORD PHOTO.

2.10 USE OF COLOR HEADS

By adjusting the yellow and magenta filtration, it is possible to obtain a wide contrast range with MULTIGRADE IV FB Fiber paper. There are differences, however, between the characteristics of the filters used in different manufacturers' color heads. Also, as the yellow and magenta filters have not been arranged to equalize exposures, new exposure times will have to be calculated when the contrast is changed. For these reasons, it is not possible to accurately predict the settings that will be required to produce specific print contrasts. The following table may be used as a rough starting point.

The majority of enlarger manufacturers use Durst or Kodak filtration values. The tables are a guide to making prints with MULTIGRADE IV FB Fiber paper when using a color enlarger.

From the table below, select the type of filtration needed according to the enlarger type.

Durst	Kodak
Dunco	Beseler
Durst	Chromega
Kaiser	De Vere
Kienzle	Fujimoto
Leitz	IFF
Lupo	Jobo
	LPL
	Omega
	Paterson
	Simmard
	Vivitar

From the tables below, read off the approximate filtration needed for each contrast step. Dual filtration values usually need longer exposure times than single filtration values, but may need less adjustment to exposure times when changing contrast.

Filter Settings		SINGLE FILTER METHOD		
ILFORD MULTIGRADE Filters	Durst (Max. 130M)	Durst (Max. 170M)	Kodak	Exposure Factor For Heads
00	120Y	150Y	199Y	2.5
0	70Y	90Y	90Y	2.3
½	50Y	70Y	70Y	2.1
1	40Y	55Y	50Y	1.7
1½	25Y	30Y	30Y	1.4
2	0	0	0	0
2½	10M	20M	5M	1.2
3	30M	45M	25M	1.3
3½	50M	65M	50M	1.6
4	75M	100M	80M	2.0
4½	120M	140M	140M	2.4
5	130M	170M*	199M	2.6

*Some enlargers in this group have a maximum magenta setting higher or lower than 170M. For these enlargers, set the highest possible magenta value as an approximate equivalent to filter 5.

Filter Settings		DUAL FILTER METHOD			
MULTIGRADE Filters	Durst (Max. 130M)	Durst (Max. 170M)	Kodak		
00	120Y	0M	115Y	0M	162Y 0M
0	88Y	6M	100Y	5M	90Y 0M
½	78Y	8M	88Y	7M	78Y 5M
1	64Y	12M	75Y	10M	68Y 10M
1½	53Y	17M	65Y	15M	49Y 23M
2	45Y	24M	52Y	20M	41Y 32M
2½	35Y	31M	42Y	28M	32Y 42M
3	24Y	42M	34Y	45M	23Y 56M
3½	17Y	53M	27Y	60M	15Y 75M
4	10Y	69M	17Y	76M	6Y 102M
4½	6Y	89M	10Y	105M	0Y 150M
5	0Y	130M	0Y	170M*	— —

3 PROCESSING

3.1 DEVELOPING

MULTIGRADE IV FB Fiber is processed in the same way as other fiber base papers.

ILFORD UNIVERSAL Paper Developer or ILFORD MULTIGRADE Developer are recommended for use with MULTIGRADE IV

FB Fiber paper. Dilute either developer 1+9 with water and develop at 68°F (20°C) for 1½–3 minutes. On correctly exposed prints, the image will begin to appear after 35 seconds. Development may be extended to 6 minutes without any noticeable change in contrast or fog. Alternatively, any normal bromide paper developer can be used.

For greater development control and added economy, MULTIGRADE Developer can also be diluted at 1+14 with development of 2–5 minutes at 68°F (20°C). Diluted MULTIGRADE Developer will stay in good condition in an open tray for two working days, at dilution 1+9 and for one working day, at dilution 1+14.

3.2 STOP BATH

After development, rinse prints in an acid stop bath. ILFORD IN-1 Stop Bath is recommended, diluted 1+31. The use of a stop bath terminates development immediately and helps to maintain the fixer bath in good condition. Where a stop bath is not available, a plain water rinse may be used, provided care is taken to change it completely at regular intervals.

3.3 FIXING

Fix prints made on MULTIGRADE IV FB Fiber in ILFORD MULTIGRADE Fixer (1+4) for 60 seconds at 68°F (20°C). Alternatively, use MULTIGRADE Fixer (1+9) for 2 minutes at 68°F (20°C).

Two bath fixing can also be used. Fix prints for half the recommended fixing time in the first bath, then transfer them to the second bath for the remainder of the time. When the capacity of the first bath is reached, discard it and replace it with the second bath.

Make up a fresh second bath. This cycle can be repeated four times. If two bath fixing is not used, then the fixing and washing sequence using ILFORD UNIVERSAL Wash Aid described in section 4 is recommended.

The use of a hardening fixer is not recommended as it impairs the efficiency of the wash. A hardener CAN NOT be used with ILFORD MULTIGRADE Fixer. For optimum permanence, see section 4.

Checking Paper For Adequate Fix

It is easy to test for residual silver salts in the paper and thus check whether the paper is adequately fixed.

Make up a stock testing solution by dissolving 2g of sodium sulfide in 125ml of water. Dilute this stock solution 1+9 with water for use. Place a drop of the solution on a white area of a print that is known to be well fixed and washed. Blot any excess solution. The barely visible cream tint that remains is the reference color for a well fixed and washed print.

Soak any prints that show a yellowing of the test spot in fresh water for five minutes, then repeat the recommended fixing and washing sequence using fresh fixer.

A full, tightly capped bottle of stock testing solution will keep in good condition for three months. Once diluted to make working strength solution, it should be used within a week.

3.4 WASHING

Wash MULTIGRADE IV FB Fiber prints in running water for 60 minutes. The bright, clean base tint of MULTIGRADE IV FB Fiber is unaffected by prolonged washing.

4 OPTIMUM PERMANENCE

The biggest cause of premature deterioration of black and white photographs is undoubtedly poor processing technique, notably inadequate fixing and/or washing. In the case of fixing, this can mean times that are too long as well as too short.

Before the fixing and washing method using UNIVERSAL Wash Aid was introduced by ILFORD, it was probably true to say that there had not been a significant change in the way conventional black and white papers had been fixed and washed since the turn of the century. There had been, and still is, a resistance to using shorter fixing and washing times than those established by tradition. Where image quality and permanence are concerned this is understandable.

The traditional fixing and washing method described in section 3 will give excellent print permanence for all commercial needs (up to 10 years). When optimum permanence is needed (up to 100 years), perhaps for archival storage of prints, the ILFORD Archival Processing sequence at 68°F (20°C) is recommended using UNIVERSAL Wash Aid. Be careful not to exceed the capacity of the fixer or to extend the fixing time. Extra time in the fixer increases the absorption of the fixer by the paper base, and reduces the efficiency of the washing stage.

Development	ILFORD MULTIGRADE Developer (1+9)	2 minutes
Stop Bath	ILFORD IN-1 Stop Bath (1+31)	5–10 seconds
Fixing	ILFORD MULTIGRADE Fixer (1+4), constant agitation, hardener is not recommended	60 seconds
First Wash	Good supply of fresh, running water	5 minutes
Wash Aid	ILFORD UNIVERSAL Wash Aid (1+4), intermittent agitation	10 minutes
Final Wash	Good supply of fresh, running water	5 minutes

All processing times are at 68°F (20°C)

Fixer Solution Capacity

The recommended capacity of MULTIGRADE Fixer when following the Archival Process sequence is about 40 sheets of 8x10 inch paper, or equivalent, per liter of working strength solution.

4.1 UNIVERSAL WASH AID

ILFORD UNIVERSAL Wash Aid is specifically formulated to aid the efficient removal of the by-products of fixing. It is supplied as a liquid concentrate and should be diluted 1+4 with water to make a working strength solution. UNIVERSAL Wash Aid has a capacity of 40 sheets of 8x10 inch paper per liter of working strength solution.

5 FINISHING

The fiber base of MULTIGRADE IV FB Fiber ensures that it responds to the majority of established methods of reduction, toning, drying, mounting and retouching.

5.1 CHEMICAL REDUCTION

MULTIGRADE IV FB Fiber can be reduced overall to brighten the highlights or locally with a brush or small cotton pad, using the standard formula.

5.2 TONING

Most toners can be used effectively with MULTIGRADE IV FB Fiber. Apart from creating aesthetic effect, some toners provide additional protection by converting or coating the silver image with compounds that have a greater resistance to damage by external contaminants. Selenium and sulfide (sepia) toning are particularly recommended. The use of a hardening fixer will not only impede fixing and washing, but it will also reduce the amount of color change obtainable with any toner.

CAUTION: Be aware that many of the substances contained in the following formulae, if not used properly, can be hazardous to your health. KEEP OUT OF REACH OF CHILDREN. Before using any chemicals, you should read the manufacturer's label and Material Safety Data Sheets and use appropriate precautions. All chemicals should be disposed of in accordance with all applicable federal, state and local environmental regulations.

Owing to the difficulty and possible hazards involved in preparing the selenium toner from individual chemicals (selenium compounds are extremely toxic substances), it is recommended that a proprietary brand is used.

In general there is a slight increase in print density with selenium toning. It is therefore recommended that prints to be finished in this way are made very slightly lighter than required, and this should be determined by doing a practical test.

To tone MULTIGRADE IV FB Fiber paper during Archival Processing, use the following sequence:

Fixing	ILFORD MULTIGRADE Fixer (1+4)	1 minute
Toner	Kodak Rapid Selenium toner* diluted 1+20 with ILFORD UNIVERSAL Wash Aid (1+4)	5–10 minutes
Wash Aid	ILFORD UNIVERSAL Wash Aid (1+4)	10 minutes
Final Wash	Good supply of fresh, running water	30 minutes

*Tone the print for the appropriate time to achieve the color desired.

5.3 DRYING

A final rinse in ILFORD ILFOTOL, diluted 1+200 with water, will aid even and rapid drying.

After washing, squeegee prints on both sides to remove surplus water. Prints can then be air-dried at room temperature or heat-dried.

There are three ways of drying traditional enlarging papers: Naturally, by the use of photographic blotters and heat drying.

Natural Drying

With natural or air drying, washed prints are squeegeed on both sides and left to dry in a clean area by hanging them on a line with clips or by placing them face down on a clean nylon or plastic mesh screen. Natural drying has the one disadvantage that prints tend to curl while drying and can be difficult to flatten.

Photographic Blotters

The use of photographic blotters is popular since they assist in producing neat, flat prints which are easy to work with for mounting or storage. It is essential that only photographic quality blotters are used. The following procedure has been found to work well in practice.

1. Squeegee a print and place it on a clean blotter.
2. Place a blotter on top of the print and rub the blotter lightly.
3. Squeegee a second print and place it on the second blotter. Continue in this way until all the prints have been placed between blotters.
4. Turn the stack of prints and blotters over and place the top print on three clean blotters. Cover the print with three sheets of blotter.
5. Transfer the second print from the first stack to the new stack. Continue in this way until all the prints have been transferred to the second pile.
6. When all the prints have been placed between sets of three sheets of blotters, place a weight on top of the stack to flatten the prints and leave the prints for about half an hour.
7. Repeat steps 4–6 to form a third stack. Leave the prints until completely dry.

Carefully handled blotters that are free from contamination can be used many times.

Heat Drying

MULTIGRADE IV FB Fiber can be heat dried in all flat bed and rotary dryers. Great care must be taken to ensure that only those prints that have been thoroughly washed are dried on such equipment, otherwise the blanket can easily become contaminated with fixer: It takes only one insufficiently washed print to contaminate others dried subsequently.

5.4 MOUNTING

Prints made on MULTIGRADE IV FB Fiber can be dry or wet mounted.

Dry Mounting

This technique is very convenient, fast, clean to work with and provides a permanent, perfect bond between print and mount.

Wet Mounting

This is generally applied to the mounting of very large prints for display purposes and is not recommended where the highest level of image permanence is required.

5.5 RETOUCHING

MULTIGRADE IV FB Fiber is an ideal paper for all types of retouching (i.e., spotting, knifing and air brushing).

5.6 STORAGE

Unprocessed Paper

Store unused MULTIGRADE IV FB Fiber paper in a cool, dry place in its original packaging. Avoid conditions of high temperature and/or high humidity. MULTIGRADE IV FB Fiber will keep in excellent condition for up to 2 years when stored as recommended.

Prints

MULTIGRADE IV FB Fiber prints which have been processed as recommended in this leaflet will have a more than adequate storage life for most purposes. Print life will be shortened, however, in adverse storage conditions, or if the print is exposed to oxidizing gases.

It is recommended that prints made for display are toned to protect them from the oxidizing gases that are found in many environments. Selenium toner is recommended as it has little effect on the image color of MULTIGRADE IV FB Fiber, but other protection methods can be used including sulfide toning, silver image stabilizers and laminating.

ILFORD may modify its products from time to time and consequently the information given in this publication is subject to change without notice.

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