

EASTMAN
PROFESSIONAL
FILMS

EASTMAN KODAK COMPANY

Rochester, N. Y.



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Eastman Professional Films

Par Speed Portrait, Super Speed Ortho Portrait
Commercial, Commercial Matte
Commercial Ortho, Ortho Press
Portrait Panchromatic
Super Sensitive Panchromatic
Commercial Panchromatic
Safety Panatomic
Panchromatic Process
Process

Eastman Kodak Company
Rochester, N. Y.
1936

EASTMAN PROFESSIONAL FILMS

THE purpose of this booklet is to acquaint the users of Eastman Films with the various brands, the work for which each is best suited, and the most practical formulas and processing methods. The formulas recommended have been found by long experience to produce the most satisfactory results and should be used under all normal conditions. If unusual conditions make it impossible to use the proportions of chemicals recommended in any formula, we shall be glad to advise by correspondence the changes necessary to meet the situation.

**EASTMAN KODAK COMPANY,
ROCHESTER, N. Y.**

1936

EASTMAN FILM

Film is now so widely used in the photographic profession that it is unnecessary to go into great detail concerning its merits. The chief advantages, however, will be briefly enumerated:

Film negatives have a distinctive quality which is not obtainable in any unbacked glass plate—a quality which is due to the thinness of the film support. As to convenience, films have but one-tenth the weight of plates, and occupy about one-sixth the amount of space in storage. They are coated on a support which is very much thinner than the thinnest glass it is possible to use for plates and, hence, film negatives are practically free from halation, which so degrades the quality of negatives made on unbacked glass. Films are unbreakable and yet have sufficient rigidity to make them lie perfectly flat in the special Film Holders or Film Sheaths made for use with them. Another decided advantage of the thin support is that retouching may be done on both the face and the back of the film. Coarse retouching is softened if it is done on the back of the negative.

Films for Every Purpose

Films are available for all purposes which fall within the field of work of the professional photographer. For photographs which do not require excessive speed or sensitiveness to color, the regular Portrait or Commercial films meet every need. For an orthochromatic film of extreme speed, Super Speed Ortho Portrait Film is available, while Process Film serves well the needs of the photo-engraver for a material giving high contrast and sufficient density.

Wherever it is necessary to photograph colored objects in such a way as to give tonal renderings comparable with the brightness differences seen by the eye, where it is required to make separation negatives for color work, and particularly where it is convenient to use incandescent tungsten lighting, panchromatic films are available.

The new Safety Panatomic Film is especially adapted to many forms of illustrative, commercial, and press photography, where brilliancy and fine grain are desirable. It is particularly well suited for enlargements from small portions of negatives and for the making of photo murals. Where halation problems are serious, use Safety Panatomic Film, Anti-halation.

The Super Sensitive Panchromatic and Portrait Panchromatic Films have opened up new possibilities for the alert photographer. He can now give shorter exposures than would have been considered

possible but a few years ago. Moreover, he can reduce the amount of his light considerably. These advantages are readily appreciated in home portraiture, in the many forms of commercial work, and in the photography of children. Any reduction in the amount of electric current consumed by lighting equipment naturally has a distinct appeal to the commercial photographer, while the possibility of increasing the speed with which exposures may be made insures a greater number of successful negatives, especially of children. The shorter exposure makes it easier to secure the flash of natural expression so essential in depicting character in a portrait, or to arrest the action by which the success of a news, sports, or illustration photograph stands or falls. Highly successful pictures, taken under normal conditions of interior lighting in but a fraction of a second of such subjects as sports events, testify to the extreme speed of Eastman Super Sensitive Panchromatic Film.

The Super Sensitive Panchromatic and Portrait Panchromatic Films present these great advantages of speed coupled with a high exposure latitude or scale of gradation, and without the sacrifice of fineness of grain.

Films for Commercial Use

There are many classes of commercial work requiring emulsions of different characteristics. All the demands can be satisfactorily met by proper selection of one of the following films manufactured by the Eastman Kodak Company:

Eastman Commercial, Commercial Matte, Commercial Ortho, Safety Ortho Press, Par Speed Portrait, Super Speed Ortho Portrait, Safety Panatomic, Commercial Panchromatic, Portrait Panchromatic, Super Sensitive Panchromatic, Panchromatic Process, and Process Films.

Non-Color-Sensitive Materials

Eastman Commercial Film, which has an emulsion of medium speed, is, as its name implies, especially suitable for commercial work and copying where color correction is not necessary but where a fairly high degree of contrast is desirable. Commercial Matte is the same film with a matte emulsion and permits the use of a pencil for blocking out or retouching without the use of a retouching medium.

Eastman Process Film gives an extremely high degree of contrast and is equally suitable for negatives or positive transparencies. It will be found useful for the reproduction of line drawings and tracings, and for all purposes where strong contrast is needed.

Orthochromatic Film

Par Speed Portrait and Super Speed Ortho Portrait Films have been used extensively for many kinds of commercial work. They are, of course, most used for portraiture where daylight, arc, or mercury light is available, but they are of great value in all cases where an orthochromatic film having speed, soft gradation, and wide latitude is required. Eastman Super Speed Ortho Portrait Film, also supplied on Safety base with Anti-halation backing, is considerably faster and appreciably more green-sensitive than the regular Portrait Film. For commercial flashlight work, using either flash powder or Photo-flash Lamps, Portrait Film is recommended for best results.

Eastman Commercial Ortho Film has a high degree of sensitiveness to yellow-green light, in addition to its sensitiveness to blue and violet. It gives good color rendering for all kinds of commercial work not requiring a red-sensitive film. When used with a yellow filter, it reproduces yellows and greens very satisfactorily. With a Wratten K1 or K2 filter, it is extremely desirable for the reproduction of oak, unfinished mahogany furniture, and all subjects where the correct rendering of yellows is necessary. Eastman Commercial Ortho Film has great latitude, allowing for considerable variation in exposure.

Eastman Safety Ortho Press Film is fast, orthochromatic, and especially sensitive to green. It produces clean, brilliant negatives so desirable in press photography. It also has excellent non-halation properties, due to a backing which absorbs reflected light.

Panchromatic Films

Panchromatic films are sensitive to all colors. They are, therefore, essential when it is desired to photograph colored objects so as to record the different colors in the same relative brightness values visible to the eye. To accomplish this exactly it is necessary to use a yellow or pale green filter over the lens, but without this filter the rendering is much more nearly correct than is obtainable on a non-color-sensitive or even on an orthochromatic material.

Super Sensitive Panchromatic and Portrait Panchromatic Films are among the most sensitive photographic materials available. They are nearly twice as fast as the older Portrait Panchromatic Film, with incandescent tungsten illumination. They are of low contrast, have a long scale of gradation, and will give beautifully soft yet brilliant negatives of finest printing quality.

The chief difference between the Super Sensitive and Portrait Panchromatic Films lies in their color sensitiveness. The Super Sensitive Panchromatic Film has been specially made to have extreme

sensitiveness to yellow, orange, and red light. It is, therefore, eminently suitable for use with incandescent tungsten lamps and the carbon arc, where it is desirable to make negatives with the shortest possible exposures.

The color sensitiveness of Portrait Panchromatic Film differs from that of the Super Sensitive material in being somewhat lower in the red but relatively higher in the green region of the spectrum. Its sensitivity corresponds approximately to the color sensitiveness of the eye.

The selection of Portrait Panchromatic or of Super Sensitive Panchromatic Films for portrait work in the studio will depend somewhat on the lighting and the personal likes of the photographer for the work at hand. It may happen in certain instances that Super Sensitive Panchromatic Film used with tungsten lighting tends to give slight over-correction of red objects, such as lips, and may falsify slightly the correct rendering of blue eyes and blonde hair. If this is found to be the case, then Portrait Panchromatic Film should be used, or the lighting should be changed to be somewhat less red in color, as by substituting some blue-bulb tungsten lamps, white flame arcs, or daylight. Both Super Sensitive Panchromatic and Portrait Panchromatic films are now available on Safety base with an Anti-halation backing.

Eastman Safety Panatomic Film is a very fine grained, long scale panchromatic emulsion especially recommended for commercial and press photography. In color sensitivity, it resembles Eastman Super Sensitive Panchromatic Film but it has slightly less speed, develops more rapidly, and produces negatives of greater contrast and brilliancy. Because of its fine grain, it is an ideal emulsion for enlargements of more than average size. Its maximum effective speed and finest grain are obtained by the use of the D-76 or DK-76 Developer.

Commercial Panchromatic Film is a negative medium of good speed and considerably higher contrast than the panchromatic materials discussed.

Panchromatic Process Film is completely color-sensitive and produces negatives of extremely high contrast. It is especially suited for such work as copying maps or drawings in color, or for photographing faded legal documents.

Use of Filters

All panchromatic materials have their maximum sensitiveness to blue and violet light. The eye, on the other hand, is most sensitive to the green region of the spectrum. If, therefore, it is desired to photograph colored objects so that in the black-and-white result

the tones are in the same brightness ratio as seen by the eye, it is necessary to use a filter over the camera lens which will remove much of the blue and violet light. Such a filter is yellow in color.

With modern panchromatic materials having an extremely high sensitiveness to red light, it may be necessary to remove some red light in addition to the blue and violet to give correct rendering. In this case, the filter should be pale green in color.

Filters are unnecessary in portraiture with the extremely fast Panchromatic Films.

The choice of filter will depend on the type of photographic material and the nature of the source of light. For instance, to obtain correct tone rendering with Portrait Panchromatic Film in daylight, the Wratten K2 filter should be used, while for tungsten lighting, the pale green X1 filter is correct. On the other hand, with Super Sensitive Panchromatic Film, the X1 filter should be used with daylight and the somewhat darker green X2 filter with tungsten illumination.

As all filters absorb some light, it is necessary to give increased exposures when using them. The number of times the exposure *without* a filter must be multiplied to give correct exposure *with* a filter is called the "filter factor" of that filter. A card giving filter factors for some of the commonly used light sources is enclosed with each box of Eastman Panchromatic Film. These values are based on a careful test of each separate batch of emulsion.

Since the quality of light used in practice may vary somewhat from that under which the filter factors were measured in the laboratory, the actual factors may be slightly different from those on the cards. They will, however, provide a satisfactory guide.

Approximate filter factors are given below for sunlight, white flame arc, Photoflood and incandescent tungsten lamps (clear bulb), for several orthochromatic and panchromatic materials.

Approximate Filter Factors

Light Source	Films	Filters			
		K1	K2	X1	X2
Sunlight or White Flame Arc	Commercial Ortho and Ortho Press	3	5	—	—
	Super Speed Ortho Portrait	3	5	—	—
	Portrait Panchromatic	1.5	2	—	—
Photoflood	Super Sensitive Panchromatic	1.5	2	5	—
	Safety Panatomic	1.5	2	5	—
	Commercial Panchromatic	2.5	3	—	—
Incandescent Tungsten	Commercial Ortho and Ortho Press	2.5	4	—	—
	Super Speed Ortho Portrait	2.5	4	—	—
	Portrait Panchromatic	1.5	1.5	4	—
	Super Sensitive Panchromatic	1.5	1.5	—	5
	Safety Panatomic	1.5	1.5	—	5
	Commercial Panchromatic	1.5	2.5	—	—

In addition to using filters to give true rendering of colors in black and white, it is often necessary in commercial work to vary the tonal contrast in a subject to a value best suited to that particular subject. For instance, in photographing furniture, it might be desirable to emphasize the grain of the wood. For purposes such as this, contrast filters are used. Those most likely to be of value are the Wratten filters A, B, C5, F, and G, which are, respectively, red, green, blue, red, and deep yellow. Filter factors for these filters are given on the cards enclosed in the boxes of films.

For a fuller discussion of the properties of color-sensitive materials and the uses of filters, the reader should consult "The Photography of Colored Objects" published by the Eastman Kodak Company (Price \$1, postpaid).

Film Speeds

The speed numbers of the various brands of Eastman Professional Films are shown in the following table. The figures given were obtained according to the standard system of speed evaluation employed in the Kodak Research Laboratories. They are for light of sunlight quality and are not valid when the materials are exposed to light of different quality, such as incandescent tungsten.

Panchromatic Materials

(Sensitive to All Colors)

	Sunlight
Eastman Super Sensitive Panchromatic Film	200
Eastman Portrait Panchromatic Film	200
Eastman Safety Panatomic Film	150*
Eastman Commercial Panchromatic Film	120
Eastman Panchromatic Process Film	16

Orthochromatic Materials

(Sensitive to Blue and Green)

Eastman Super Speed Ortho Portrait Film	200
Eastman Safety Ortho Press Film	160
Eastman Par Speed Portrait Film	120
Eastman Commercial Ortho Film	100

Non-Color-Sensitive Materials

Eastman Commercial Film	40
Eastman Commercial Matte Film	40
Eastman Process Film	12

*With development in D-76 or DK-76.

Safelights

Because they are so sensitive to red as well as to all of the other colors of the spectrum, Panchromatic Films *cannot* be handled in the usual red light of the darkroom. Particular care must be taken in the case of Super Sensitive Panchromatic and Portrait Panchromatic Films. These should be handled in total darkness, or by the light of a Series 3 Safelight in conjunction with a 10-watt bulb (15-watt bulb if used in the overhead Indirect Light Box). The other Panchromatic Films can be handled either in total darkness, or by the light from a Series 3 Safelight, provided with a 25-watt bulb, if used in the indirect safelights, such as the Wratten and Kodak Safelight Lamps. A 10-watt bulb should be used in the direct safelights, such as the Eastman and Brownie Safelight Lamps.

For ceiling illumination the use of one 10 by 12-inch Eastman Indirect Light Box, fitted with a Series 3 Wratten Safelight and a 15-watt, 120-volt bulb, is recommended for every 80 square feet of floor space.

THE PROCESSING OF FILM

Tank Development

The development of film is very simple with either the tray or tank method. For convenience, economy, and *quality of negatives*, we recommend tank development.

We supply Eastman Film Developing Boxes, Film Developing Hangers, and the Film Developing Hanger Racks, so that a number of 5 by 7-inch or 8 by 10-inch films can be developed at the same time and with greater uniformity in the quality of the negatives that will be produced.

The use of the Film Developing Hanger Rack is strongly urged, especially where handling a batch of six or more film hangers. Its use insures greatest uniformity of agitation.

Films may be developed, fixed, washed, and dried without removing them from the film hangers.

Film Developing Hangers should be agitated slightly when first placed in any solution and at intervals of two or three minutes while remaining in the solution. Placing the hangers too close together, and agitating them constantly, may cause streaks and uneven development.

Tray Development

In tray development it is best to use trays that are large enough to permit handling the films in two piles. Use sufficient developer to submerge films completely during the time of development. Slide the first film under the developer, breaking any air bells that may form on its surface. When it is thoroughly saturated, proceed in the same way with the other films until a pile is made. Take them one at a time from the top of the pile and place them in another pile at the other end of the tray. When fully developed, place them in the hardening bath before fixing.

Development

Formulas DK-50 and D-61a are specially recommended. They contain elon and hydroquinone as the developing agents. These developers are capable of giving excellent negatives free of stain or fog and have the advantage over pyro in that it is possible to duplicate results readily, whereas with a pyro developer the degree

of stain and hence the printing contrast tends to vary from batch to batch of negatives.

For development to low contrast which favors minimum graininess, Formulas D-76 and DK-76 are recommended. Formulas DK-50 and DK-76 contain the new Eastman alkali, *Kodalk*, which has the advantage over carbonate that no gas is liberated when the developer is brought into contact with the acid hardening bath or acid fixing bath. Trouble from blisters, therefore, is eliminated with developers containing Kodalk. The activity of the developer may also be controlled more precisely by varying the quantity of Kodalk in Formulas DK-50 or DK-76. The activity of D-76 may also be increased by using more borax, but maximum activity is obtainable with DK-76 with increased Kodalk content. Kodalk is not recommended for use with pyro developers.

Those who prefer pyro developers will find that very satisfactory results can be obtained with Formulas D-1 and D-7. Both of these developers, however, have much poorer keeping qualities than any of the elon-hydroquinone formulas.

For press work where rapid development and fairly high contrast are often desired, Formula D-72 is recommended. Negatives of extreme density as required for line work may be obtained with Formulas D-8 and D-9. Formula D-8 has somewhat better keeping properties than D-9 and is especially recommended for line and half-tone screen negatives intended for printing directly on metal. Formula D-11 is recommended for general commercial work and for half-tone screen negatives from which positive transparencies are to be made for dot etching.

Elon-Hydroquinone Developer [Formula D-61a]

For Tray or Tank Use

Stock Solution	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	16 ounces	500.0 grams
Elon	45 grains	3.1 grams
Sodium Sulphite, desiccated (E. K. Co.)	3 ounces	90.0 grams
Sodium Bisulphite (E. K. Co.)	30 grains	2.1 grams
Hydroquinone	85 grains	5.9 grams
*Sodium Carbonate, desiccated (E. K. Co.)	165 grains	11.5 grams
Potassium Bromide	24 grains	1.7 grams
Cold water to make	32 ounces	1.0 liter

Dissolve the chemicals in the order given.

*If monohydrated sodium carbonate is used, the quantity given above must be increased to 195 grains (13.5 grams).

For tray use, take 1 part of stock solution to 1 part of water. Develop about 7 minutes at 65° F. (18° C.).

For tank use, take 1 part of stock solution to 3 parts of water. (This dilution gives a tank developer equivalent to Formula D-61 previously published.)

At a temperature of 65° F. (18° C.), the development time is about 14 minutes. While Formula D-61a does not produce negatives of warm tone, they have good printing density and quality and the developer has excellent keeping properties. It is one of the most satisfactory developers for continued use and, when kept up to normal strength, will give excellent results over a period of several weeks.

As with all tank developers, when not in use it should be covered with a floating lid or thin Kodaloid, cut to the exact size of the tank and floated on the solution. The surface of the developer should be skimmed each morning with the aid of a blotter.

If the developer in the tank is of normal strength, but the volume of solution has been reduced, add a sufficient amount of the surplus stock solution (diluted 1:3) to fill the tank.

If the strength of the solution, as well as the volume, has been reduced, add a sufficient quantity of the following replenisher solution:

[Formula
D-61R]

Replenisher Solution

For Use with the Tank Dilution of Formula D-61a

Stock Solution A

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	96 ounces	3.0 liters
Elon	85 grains	5.9 grams
Sodium Sulphite, desiccated (E. K. Co.)	6 ounces	180.0 grams
Sodium Bisulphite (E. K. Co.)	55 grains	3.8 grams
Hydroquinone	170 grains	11.9 grams
Potassium Bromide	45 grains	3.1 grams
Cold water to make	1½ gallons	6.0 liters

Stock Solution B

*Sodium Carbonate, desiccated (E. K. Co.)	8 ounces	240.0 grams
Water to make	64 ounces	2.0 liters

Dissolve the chemicals in the order given.

*If monohydrated sodium carbonate is used, the quantity given above must be increased to 9 ounces 160 grains (280 grams).

For use, take 3 parts of Solution A and 1 part of Solution B and add to the tank of developer as needed. Do not mix these solutions until ready to use.

[Formula
DK-50]

Kodalk Developer

For Normal Contrast on Professional Films

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	64 ounces	2.0 liters
Elon	145 grains	10.0 grams
Sodium Sulphite, desiccated (E. K. Co.)	4 ounces	120.0 grams
Hydroquinone	145 grains	10.0 grams
Kodalk	1 oz. 145 grains	40.0 grams
Potassium Bromide	29 grains	2.0 grams
Cold water to make	1 gallon	4.0 liters

Dissolve the chemicals in the order given.

For tank use, develop 4 to 7 minutes at 65° F. (18° C.) in the fresh developer according to the contrast desired. For tray use, decrease the time about 20 per cent.

By increasing or decreasing the quantity of Kodalk in the formula, it is possible (a) to increase or decrease the contrast obtained in a given time of development, or (b) to decrease or increase the time of development without affecting the contrast.

Replenisher Solution

[Formula
DK-50R]

For Use with Formula DK-50

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	96 ounces	3.0 liters
Elon	290 grains	20.0 grams
Sodium Sulphite, desiccated (E. K. Co.)	4 ounces	120.0 grams
Hydroquinone	145 grains	40.0 grams
Kodalk	5¼ ounces	160.0 grams
Cold water to make	1 gallon	4.0 liters

Dissolve the chemicals in the order given.

Add to the tank as needed to maintain the level of the solution.

Elon-Hydroquinone-Borax Developer

[Formula
D-76]

For Greatest Shadow Detail on Panatomic Films

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	96 ounces	3.0 liters
Elon	116 grains	8.0 grams
Sodium Sulphite, desiccated (E. K. Co.)	13¼ ounces	400.0 grams
Hydroquinone	290 grains	20.0 grams
Borax (pure granular)	116 grains	8.0 grams
Cold water to make	1 gallon	4.0 liters

Dissolve the chemicals in the order given.

Use without dilution.

For tank use, develop 10 to 25 minutes at 65° F. (18° C.) in the fresh developer according to the contrast desired. For tray use, decrease the time about 20 per cent.

A faster working developer can be obtained by increasing the quantity of borax. By increasing the borax about 10 times, from 116 grains to 2 oz. 290 grains (from 8 grams to 80 grams), the development time will be about one-half that of the regular D-76. If a more active developer is required, use DK-76 with 10 times the Kodalk concentration.

With use, this developer becomes slightly muddy, due to the formation of a suspension of colloidal silver, and the tank usually becomes coated with a thin deposit of silver. Both these effects are harmless, however, and may be ignored.

Replenisher Solution

[Formula
D-76R]

For Use with Formula D-76

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	96 ounces	3.0 liters
Elon	175 grains	12.0 grams
Sodium Sulphite, desiccated (E. K. Co.)	13¼ ounces	400.0 grams
Hydroquinone	1 ounce	30.0 grams
Borax (pure granular)	2 oz. 290 grains	80.0 grams
Cold water to make	1 gallon	4.0 liters

Dissolve the chemicals in the order given.

Use the replenisher without dilution and add to the tank to maintain the level of the solution.

Elon-Hydroquinone-Kodalk Developer

[Formula
DK-76]

For Greatest Shadow Detail on Panatomic Films

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	96 ounces	3.0 liters
Elon	116 grains	8.0 grams
Sodium Sulphite, desiccated (E. K. Co.)	13¼ ounces	400.0 grams
Hydroquinone	290 grains	20.0 grams
Kodalk	116 grains	8.0 grams
Cold water to make	1 gallon	4.0 liters

Dissolve the chemicals in the order given.

For tank use, develop 10 to 25 minutes at 65° F. (18° C.) in the fresh developer according to the contrast desired. For tray use, decrease the time about 20 per cent.

By increasing or decreasing the quantity of Kodalk in the formula, it is possible (a) to increase or decrease the contrast obtained in a given time of development,

or (b) to decrease or increase the time of development without affecting the contrast. For example, by increasing the Kodalk in DK-76 to 2 ounces 290 grains per gallon (80 grams per 4 liters), satisfactory contrast is obtained in about 4 minutes at 65° F. (18° C.) compared with 16 minutes in the regular formula.

[Formula
DK-76R]

Replenisher Solution

For Use with Formula DK-76

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	96 ounces	3.0 liters
Elon	175 grains	12.0 grams
Sodium Sulphite, desiccated (E. K. Co.)	13¼ ounces	400.0 grams
Hydroquinone	1 ounce	30.0 grams
Kodalk	1 ounce	30.0 grams
Cold water to make	1 gallon	4.0 liters

Dissolve the chemicals in the order given.

Use the replenisher without dilution and add to the tank to maintain the level of the solution.

[Formula
D-72]

Elon-Hydroquinone Developer

For Press Photography

Stock Solution	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	16 ounces	500.0 cc.
Elon	45 grains	3.1 grams
Sodium Sulphite, desiccated (E. K. Co.)	1½ ounces	45.0 grams
Hydroquinone	175 grains	12.0 grams
*Sodium Carbonate, desiccated (E. K. Co.)	2¼ ounces	67.5 grams
Potassium Bromide	27 grains	1.9 grams
Water to make	32 ounces	1.0 liter

Dissolve the chemicals in the order given.

For general use, take 1 part stock solution to 2 parts water. Develop 3 to 6 minutes at 65° F. (18° C.). For greater contrast, dilute 1:1 or use without dilution.

*If monohydrated sodium carbonate is used, the quantity given above must be increased to 2 ounces 275 grains (79 grams).

[Formula
D-82]

Maximum Energy Developer

For Use with Underexposed Negatives

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	24 ounces	750.0 cc.
Wood Alcohol	1½ ounces	48.0 cc.
Elon	200 grains	14.0 grams
Sodium Sulphite, desiccated (E. K. Co.)	1¾ ounces	52.5 grams
Hydroquinone	200 grains	14.0 grams
Sodium Hydroxide (Caustic Soda)	125 grains	8.8 grams
Potassium Bromide	125 grains	8.8 grams
Cold water to make	32 ounces	1.0 liter

Dissolve the chemicals in the order given.

Develop about 4 to 5 minutes at 65° F. (18° C.).

The prepared developer does not keep more than a few days. If wood alcohol is not added and the developer is diluted, the solution is not as active as in the concentrated form. This developer gives the greatest possible shadow density with negatives having a minimum exposure.

[Formula
D-7]

Elon-Pyro Developer

For Tank or Tray Use

Stock Solution A	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	16 ounces	500.0 cc.
Sodium Bisulphite (E. K. Co.)	¼ ounce	7.5 grams
Elon	¼ ounce	7.5 grams
Pyro	1 ounce	30.0 grams
Potassium Bromide	60 grains	4.2 grams
Water to make	32 ounces	1.0 liter
Stock Solution B		
Water	32 ounces	1.0 liter
Sodium Sulphite, desiccated (E. K. Co.)	5 ounces	150.0 grams
Stock Solution C		
Water	32 ounces	1.0 liter
*Sodium Carbonate, desiccated (E. K. Co.)	2½ ounces	75.0 grams

Dissolve the chemicals in the order given.

*If monohydrated sodium carbonate is used, the quantity given above must be increased to 3 ounces (90 grams).

For tank development, take 8 ounces (250 cc.) each of A, B, and C and add water to make 1 gallon (4 liters). At a temperature of 65° F. (18° C.), development time is from 9 to 12 minutes. This developer can be used repeatedly for two or three weeks if kept up to its normal volume by adding fresh developer in the proportion of 2 ounces (64 cc.) each of A, B, and C to 8 ounces (250 cc.) of water although it is usually necessary to increase the development time as the developer ages.

All tank developers must be kept covered with a floating lid or a piece of thin Kodaloid floated on the solution. This prevents oxidation. After removing the floating lid, the surface of the developer should be skimmed with a blotter.

For tray development, take 2 ounces (64 cc.) each of the A, B, and C solutions to 16 ounces (500 cc.) of water. Develop about 7 to 9 minutes at 65° F. (18° C.).

Three-Solution Pyro Developer [Formula D-1]

For Warm Tones Using Tank or Tray

Stock Solution A

	Avoirdupois	Metric
Sodium Bisulphite (E. K. Co.).....	140 grains	9.8 grams
Pyro.....	2 ounces	60.0 grams
Potassium Bromide.....	16 grains	1.1 grams
Water to make.....	32 ounces	1.0 liter

Stock Solution B

Water.....	32 ounces	1.0 liter
Sodium Sulphite, desiccated (E. K. Co.).....	3½ ounces	105.0 grams

Stock Solution C

Water.....	32 ounces	1.0 liter
*Sodium Carbonate, desiccated (E. K. Co.)...	2½ ounces	75.0 grams

Dissolve the chemicals in the order given.

*If monohydrated sodium carbonate is used, the quantity given above must be increased to 3 ounces (90 grams).

Prepare fresh developer for each batch of films.

For tank development, take 9 ounces each (285 cc.) of A, B, and C and add water to make 1 gallon (4 liters). For the 3½-gallon tank, take 32 ounces each of A, B, and C and add water to make 3½ gallons. Develop for about 12 minutes at a temperature of 65° F. (18° C.). Any scum that may form on the surface of the developer *must be removed by means of a sheet of blotting paper before developing films.*

For tray development, take 1 ounce (30 cc.) each of A, B, and C and add 7 ounces (210 cc.) of water. Develop about 5 to 7 minutes at 65° F. (18° C.).

An instruction card packed in each box of Panchromatic Film gives the times of development, for average density, at varying temperatures, for that particular emulsion. The values given are not rigid, and it may be necessary to develop slightly less or more according to individual conditions. They will, however, serve as a guide.

Process Film Developers

The following Hydroquinone-Caustic Process Developers D-8 and D-9 will give very high density and will be found best for line work. They should be used at a temperature of 65° F. (18° C.), not warmer, and should never be used colder than 55° F. (13° C.). It is important to wash all negatives very thoroughly before fixing, or stains and dichroic fog will result. Fix in an acid-hardening fixing bath.

[Formula D-8] **Single Solution Hydroquinone-Caustic Developer**

For High Contrast on Process Films

Stock Solution	Avoirdupois	Metric
Water	96 ounces	3.0 liters
Sodium Sulphite, desiccated (E. K. Co.)	12 ounces	360.0 grams
Hydroquinone	6 ounces	180.0 grams
Sodium Hydroxide (Caustic Soda)	5 ounces	150.0 grams
Potassium Bromide	4 ounces	120.0 grams
Water to make	1 gallon	4.0 liters

Dissolve the chemicals in the order given.

For use, take 2 parts of Stock Solution D-8 and 1 part of water. Develop about 2 minutes at 65° F. (18° C.). This formula is especially recommended for making line and halftone screen negatives intended for printing directly on metal.

A formula which is slightly less alkaline and gives almost as much density can be obtained by using 3¾ ounces of sodium hydroxide per gallon of stock solution (112 grams per 4 liters) instead of the quantity given in the formula.

[Formula D-9] **Hydroquinone-Caustic Process Developer**

For Tray Use

Stock Solution A	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	16 ounces	500.0 cc.
Sodium Bisulphite (E. K. Co.)	¾ ounce	22.5 grams
Hydroquinone	¾ ounce	22.5 grams
Potassium Bromide	¾ ounce	22.5 grams
Water to make	32 ounces	1.0 liter

Stock Solution B	Avoirdupois	Metric
*Cold water	32 ounces	1.0 liter
Sodium Hydroxide (Caustic Soda)	1¾ ounces	52.5 grams

Dissolve the chemicals in the order given.

Use equal parts of A and B. Shake bottles well before using. Develop about 2 minutes at 65° F. (18° C.). This developer will not keep when mixed and therefore is not suitable for tank development.

*Cold water should always be used when dissolving sodium hydroxide (caustic soda) because considerable heat is evolved. If hot water is used, the solution will boil with violence and may cause serious burns if the alkali spatters on the hands or face.

A developer which gives almost as much density, keeps well, and can be used for tank or tray developing, is given below:

[Formula D-11] **Elon-Hydroquinone Developer**

For Tank or Tray Use

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	16 ounces	500.0 cc.
Elon	15 grains	1.0 gram
Sodium Sulphite, desiccated (E. K. Co.)	2½ ounces	75.0 grams
Hydroquinone	130 grains	9.0 grams
*Sodium Carbonate, desiccated (E. K. Co.)	365 grains	25.0 grams
Potassium Bromide	73 grains	5.0 grams
Water to make	32 ounces	1.0 liter

Dissolve the chemicals in the order given.

*If monohydrated sodium carbonate is used, the quantity given above must be increased to 1 ounce (30 grams).

Use full strength. Develop 5 minutes at 65° F. (18° C.).

This formula is useful for general commercial photography and for making halftone screen negatives from which positive transparencies are to be made for dot etching.

When great contrast is not desired, dilute the mixed developer with an equal volume of water.

Tropical Development

For best results it is advisable to have the temperature of the solutions as near 65° F. (18° C.) as possible. There are times, however, when it is impossible to do this owing to unusual conditions. This is especially true in tropical countries where the temperatures are high and where it is difficult to obtain fresh, cool water.

To develop films at temperatures up to 90° F. (32° C.) Kodak Developer, Formula DK-15, is especially recommended. This formula has the following advantages: (1) It is non-blistering because no gas is formed when the developer is added to the acid hardening bath or the acid fixing bath. (2) The development rate changes slowly with time so that on slight overdevelopment the negatives will not be too dense. (3) It has a minimum scumming tendency in conjunction with the average acid fixing bath.

Kodak Tropical Developer [Formula DK-15]

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	24 ounces	750.0 cc.
Elon	82 grains	5.7 grams
Sodium Sulphite, desiccated (E. K. Co.)	3 ounces	90.0 grams
Kodak	3/4 ounce	22.5 grams
Potassium Bromide	27 grains	1.9 grams
*Sodium Sulphate, desiccated	1 1/2 ounces	45.0 grams
Cold water to make	32 ounces	1.0 liter

Dissolve the chemicals in the order given.

*If it is desired to use sodium sulphate crystals instead of desiccated sulphate, use 3 1/2 ounces per 32 ounces of developer (105 grams per liter).

At normal temperatures of 65° F. to 75° F. (18° C. to 24° C.), development will be more rapid if the sodium sulphate is omitted, but it should always be used when working above 75° F. (24° C.).

Average time for tank development *without* the sulphate is 5 to 7 minutes and *with* the sulphate 9 to 12 minutes at 65° F. (18° C.) in the fresh developer according to the contrast desired. Develop about 20% less for tray use.

By increasing or decreasing the quantity of Kodak in the formula, it is possible (a) to increase or decrease the contrast obtained in a given time of development or (b) to decrease or increase the time of development without affecting the contrast. Prolonging the development time, however, is very undesirable, as excessive swelling and softening of the gelatin will occur.

Approximate times of development at 80° F. to 90° F. (26.5° C. to 32° C.) are from 5 minutes at 80° F. (26.5° C.) to 2 1/2 minutes at 90° F. (32° C.).

After development, rinse the films not more than 1 second in water (omit water rinse above 85° F.) (29.5° C.), and immerse directly in the following Tropical Hardener (Formula SB-4) for 3 minutes. Then fix in Formula F-5, page 18, for at least 10 minutes and wash for 10 to 15 minutes in water not over 95° F. (35° C.).

Further details on handling films under high temperature conditions are included in our booklet "Tropical Development," obtainable on request.

Tropical Hardening Bath [Formula SB-4]

For Use at 75° F. to 90° F. (24° C. to 32° C.)

	Avoirdupois	Metric
Water	32 ounces	1.0 liter
Potassium Chrome Alum	1 ounce	30.0 grams
*Sodium Sulphate, desiccated	2 ounces	60.0 grams

*If it is desired to use sodium sulphate crystals instead of the desiccated sulphate, then 4 ounces per 32 ounces of hardener (120 grams per liter) should be used.

Immerse the films for 3 minutes in the bath. Agitate them when first immersed and at intervals during treatment to avoid streaking. After about twenty 8 x 10-inch films per gallon have been processed, the bath should be replaced. If overworked, scum markings will be produced.

Rinsing and Fixing

After the development has been completed, the films should be rinsed for at least 5 seconds in water and then placed in a clear acid hardening fixing bath such as F-5.

Freedom from stain formation will be assured, especially under hot weather conditions, by using the following hardening bath after the water rinse. The use of the chrome alum bath also extends the life of the fixing bath.

[Formula SB-3] **Chrome Alum Hardening Bath**

	Avoirdupois	Metric
Water	32 ounces	1.0 liter
Potassium Chrome Alum	1 ounce	30.0 grams

When developed, rinse the films for about 5 seconds in water and place for 3 minutes in the hardening bath, then place immediately in the fixing bath.

Agitate the negatives for a few seconds when first immersed in the hardener, otherwise a chromium scum, which is very difficult to remove, may form on the film. If negatives have been rinsed, the potassium chrome alum is sufficiently acid to neutralize any alkali carried over from the developer. The chrome alum hardening bath should be renewed frequently, and if any scum tends to form, it should be removed before the bath is used.

[Formula F-5] **Acid Hardening Fixing Bath**

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	80 ounces	2.5 liters
Hypo	2 pounds	960.0 grams
Sodium Sulphite, desiccated (E. K. Co.)	2 ounces	60.0 grams
*Acetic Acid (28% pure) (E. K. Co.)	6 ozs. (fl.)	190.0 cc.
**Boric Acid, crystals	1 ounce	30.0 grams
Potassium Alum (E. K. Co.)	2 ounces	60.0 grams
Cold water to make	1 gallon	4.0 liters

Dissolve the chemicals in the order given.

*To make 28% acetic acid from glacial acetic acid, dilute 3 parts of glacial acid with 8 parts of water.

**Crystalline boric acid should be used as specified. Powdered boric acid dissolves only with great difficulty and its use should be avoided.

If films are fixed in a tank, they should be left in the developing hangers. They should be fixed properly in 10 minutes if a freshly prepared fixing bath has been used. Leaving them in the solution a few minutes longer than the time specified will not do any harm, but prolonged immersion, especially in warm weather, may tend to bleach the image.

When the total fixing time (twice the time to clear) exceeds 20 minutes, the F-5 bath should be discarded. This will occur usually after eighty to one hundred 8 by 10-inch films (or their equivalent in other sizes) have been fixed per gallon (4 liters).

[Formula F-5a] **Stock Hardener Solution**

For Use with Formula F-5

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	80 ounces	2.5 liters
Sodium Sulphite, desiccated (E. K. Co.)	10 ounces	300.0 grams
*Acetic Acid (28% pure) (E. K. Co.)	30 oz. (fl.)	940.0 cc.
**Boric Acid, crystals	5 ounces	150.0 grams
Potassium Alum (E. K. Co.)	10 ounces	300.0 grams
Cold water to make	1 gallon	4.0 liters

Dissolve the chemicals in the order given.

*To make 28% acetic acid from glacial acetic acid, dilute 3 parts of glacial acid with 8 parts of water.

**Crystalline boric acid should be used as specified. Powdered boric acid dissolves only with great difficulty and its use should be avoided.

A fixing bath is made by adding 1 part of cool stock hardener solution to 4 parts of cool 30% hypo solution (2½ lbs. hypo per gallon of water) while stirring the hypo rapidly.

Chrome Alum Fixing Bath [Formula F-16]

Solution A

	Avoirdupois	Metric
Hypo.....	2 pounds	960.0 grams
Sodium Sulphite, desiccated (E. K. Co.).....	2 ounces	60.0 grams
Water to make.....	96 ounces	3.0 liters

Solution B

Water.....	32 ounces	1.0 liter
Potassium Chrome Alum.....	2 ounces	60.0 grams
Sulphuric Acid, C. P. (E. K. Co.).....	¼ oz. (fl.)	8.0 cc.

Dissolve the chemicals in the order given.

Pour B Solution into A Solution slowly while stirring A rapidly.

Use water at a temperature not higher than 150° F. (66° C.) when dissolving chrome alum. Always rinse films thoroughly before fixing. The above bath is especially recommended for use in hot weather.

A fresh bath should be prepared frequently because the chrome alum fixing bath loses its hardening properties in a few days either with or without use, while with an old bath there is a tendency for scum to form on the surface of the film. Any such scum should be removed by swabbing with cotton before drying. Formula F-5 (page 18) maintains its hardening properties throughout the useful life of the bath and has a minimum sludging tendency.

The Importance of Agitation

When processing films in tanks it is important to agitate the films at intervals during treatment in the various solutions. Agitation during development insures uniform development. The films should also be agitated when first placed in the fixing bath to arrest development and minimize the tendency for streaks and mottle. Move the film hangers up and down in the solution. Rocking the tank will not produce uniform agitation.

The No. 4 Film Developing Hanger Rack (page 28) offers an effective means of agitating six or more films uniformly. After loading the rack with film hangers, lower it into the developer. Then raise each hanger separately about ½-inch and tap it sharply several times on the side of the rack. This dislodges any air bells which may cling to it. After developing for 1 minute, lift the entire Hanger Rack out of the solution and immerse again. Then allow development to go to completion.

Washing

When fixed, the films are removed to the washing tank or tray. The secret of thorough washing is to insure a constant supply of fresh water at the surface of the film and frequent renewal of the water in the washing tank. Fairly complete hypo elimination can be insured by 20 to 30 minutes' washing. For thorough washing, the water in the tank should be replaced at least every 5 minutes.

[Formula
HT-1a]

Hypo Test Solution

	Avoirdupois	Metric
Potassium Permanganate.....	4 grains	0.3 gram
Sodium Hydroxide (Caustic Soda).....	8 grains	0.6 gram
Water (distilled) to make.....	8 ounces	250.0 cc.

To make the test, take 8 ounces (250 cc.) of pure water in a glass and add $\frac{1}{4}$ dram (1 cc.) of the permanganate-caustic soda solution.

Then take an 8 x 10-inch film or its equivalent in other sizes from the wash water and allow the water from it to drip for 30 seconds into the glass of test solution. If a small percentage of hypo is present, the violet color will turn orange in about 30 seconds, and with larger concentration the orange color will change to yellow. In such case, washing should be continued. When further tests produce no change in the violet color, the hypo has been eliminated.

NOTE: Oxidizable organic matter if present in the water reacts with the permanganate solution and changes its color in the same manner as hypo. The water should, therefore, be tested as follows:

Prepare two samples of permanganate test solution, using distilled water. Then add a volume of the tap water to one test sample equal to that of the wash water drained from the film into the other sample. If the sample to which tap water has been added remains a violet color, this indicates the absence of organic matter and it will be unnecessary to make the test in duplicate. If the color is changed slightly by the tap water, however, the presence of hypo in the film will be shown by the relative color change of the two samples. For example, if the tap water sample turned pink and the wash water sample became yellow, it would indicate the presence of hypo; while if both turned the same shade, this would indicate the absence of hypo.

Formalin Hardening

Negatives which normally would be softened considerably by a chemical treatment in the removal of several types of stains or by intensification or reduction should be hardened by treatment with the alkaline formalin solution, Formula SH-1, given below:

[Formula
SH-1]

Formalin Hardener

For All Professional Films

	Avoirdupois	Metric
Formalin (37% Formaldehyde solution).....	2½ drams	10.0 cc.
Sodium Carbonate, desiccated (E. K. Co.)....	70 grains	5.0 grams
Water to make.....	32 ounces	1.0 liter

After hardening for 3 minutes, the films should be rinsed and, if incomplete fixation is suspected, they should be immersed for 5 minutes in a fresh acid fixing bath and washed thoroughly before giving any further chemical treatment.

Intensifying and Reducing

If films need intensification or reduction, it is best to give them such treatment immediately after they have been washed. Much time is saved and the negatives, when dry, are ready for finishing.

Precautions: Stains are sometimes produced during intensification or reduction unless the following precautions are observed: (1) The negative should be fixed and washed thoroughly before treatment and be free of scum or stain. (2) It should be hardened in

the formalin hardener (SH-1) before the intensification or reduction treatment. (3) Only one negative should be handled at a time and it should be agitated thoroughly during the treatment. Following the treatment, the negative should be washed thoroughly and wiped off carefully before drying.

Mercury Intensifier

[Formula
In-1]

	Avoirdupois	Metric
Potassium Bromide.....	¾ ounce	22.5 grams
Mercuric Chloride.....	¾ ounce	22.5 grams
Water to make.....	32 ounces	1.0 liter

Bleach the negative in the above solution until it is white, then wash thoroughly. Blacken it with 10% sodium sulphite solution, a developing solution such as Formula D-61a diluted 1:1 (page 11), or 10% ammonia (1 part conc. 28% ammonia to 9 parts water), these giving progressively greater density in the order listed. To increase contrast greatly, blacken with the following solution:

	Avoirdupois	Metric
Water.....	32 ounces	1.0 liter
*Sodium or Potassium Cyanide.....	½ ounce	15.0 grams
Silver Nitrate.....	¾ ounce	22.5 grams

***Cyanide is a deadly poison and should be handled with extreme care. Use rubber gloves and don't expose yourself to its fumes. Cyanide reacts with acid to form poisonous hydrogen cyanide gas. When discarding a solution containing cyanide, always flush it out of the sink quickly with water.**

Dissolve the cyanide and silver nitrate separately, each in 16 ounces (500 cc.) of water and add the latter to the former until a permanent precipitate is just produced; allow the mixture to stand a short time and filter. This is called Monckhoven's Intensifier. It is unnecessary to expose negatives to light to insure complete development with the Monckhoven process. Redevelopment cannot be controlled as by the chromium method (Formula In-4) but it must go to completion.

Note: See precautions on handling negatives, page 20.

Images having greater permanency may be obtained by using the chromium intensifier formula given below:

Chromium Intensifier

[Formula
In-4]

Stock Solution	Avoirdupois	Metric
Potassium Bichromate.....	3 ounces	90.0 grams
Hydrochloric Acid, C. P. (E. K. Co.).....	2 oz. (fl.)	64.0 cc.
Water to make.....	32 ounces	1.0 liter

For use, take 1 part of stock solution to 10 parts of water. Bleach thoroughly, then wash five minutes and redevelop in artificial light or daylight (not direct sunlight) in either Nepera Solution 1:4 or in the Elon-Hydroquinone Developer* (Formula D-61a diluted 1:3) given on page 11. If the negative is not redeveloped fully, fix for five minutes, and then wash thoroughly. Fixing is unnecessary if redevelopment is thorough.

Repeating the process gives greater intensification.

The degree of intensification can be controlled by varying the time of redevelop-ment. The Eastman Chromium Intensifier supplied in tubes is equally as satisfac-tory as Formula In-4.

***Warning:** Fine grain developers, such as Formulas D-76 and DK-76, con-taining a high concentration of sulphite, are not suitable for redevelop-ment, since the sulphite tends to dissolve the bleached image before the developing agents have time to act on it.

Note: See precautions on handling negatives, page 20.

Silver Intensifier

This is the only known intensifier which gives an image of neutral color. The progress of intensification may be followed visually and arrested at any stage.

Stock Solution No. 1

	Avoirdupois	Metric
Silver Nitrate (E. K. Co.)	2 ounces	60.0 grams
Water, distilled, to make	32 ounces	1.0 liter

Keep Stock Solution No. 1 in a brown bottle.

Stock Solution No. 2

Sodium Sulphite, desiccated (E. K. Co.)	2 ounces	60.0 grams
Water to make	32 ounces	1.0 liter

Stock Solution No. 3

Hypo	3½ ounces	105.0 grams
Water to make	32 ounces	1.0 liter

Stock Solution No. 4

Sodium Sulphite, desiccated (E. K. Co.)	½ ounce	15.0 grams
Elon	350 grains	24.0 grams
Water to make	96 ounces	3.0 liters

The intensifier solution is prepared as follows:

Slowly add 1 part of Solution No. 2 to 1 part of Solution No. 1, shaking or stirring to obtain thorough mixing. The white precipitate which appears is then dissolved by the addition of 1 part of Solution No. 3. Allow the resulting solution to stand a few minutes until clear. Add, with stirring, 3 parts of Solution No. 4. The intensifier is then ready for use and the film should be treated immediately. The degree of intensification obtained depends upon the time of treatment, which should not exceed 25 minutes. After intensification, the film should be immersed and agitated for 2 minutes in a plain 30% hypo solution and then washed thoroughly.

The mixed intensifier is stable for approximately 30 minutes at 70°F. (21° C.).

Note: See precautions on handling negatives, page 20.

Reducers

Eastman reducer formulas may be classified according to their use as follows:

1. Cutting or Subtractive Reducers for Correcting Overexposed Negatives.
 - R-2 Acid Permanganate
 - R-4a Farmer's (single solution) Reducer
2. Proportional Reducers for Correcting Overdeveloped Negatives.
 - R-4b Two-Solution Farmer's Reducer
 - R-5 Acid Permanganate-Persulphate
 - R-8 Modified Belitzski (Also a cutting reducer).

Permanganate Reducer

[Formula
R-2]

Stock Solution A

	Avoirdupois	Metric
Potassium Permanganate.....	1¾ ounces	52.5 grams
Water.....	32 ounces	1.0 liter

Stock Solution B

Water.....	32 ounces	1.0 liter
Sulphuric Acid, C. P. (E. K. Co.).....	1 oz. (fl.)	32.0 cc.

Warning: When preparing Stock Solution B *always add the acid to the water slowly with stirring—never the water to the acid.* Otherwise, the solution may boil over and spatter on the hands and face causing serious burns.

The negative must be washed thoroughly to remove all traces of hypo before it is reduced. For use, take 1 dram A (4 cc.), 2 drams B (8 cc.), and 8 ounces (250 cc.) of water. When the negative has been sufficiently reduced, place it in a fresh Acid Fixing Bath (Formula F-5, page 18) for a few minutes, to remove yellow stain, after which, wash thoroughly.

If reduction is too rapid, add more water. Do not use this solution as a stain remover as it will attack the image before removing the stain. Use Formula S-6, page 24, for removal of stains.

NOTE: If a scum forms on the top of the permanganate solution or a reddish curd appears in the solution, it is because the negative has not been sufficiently washed to remove all hypo, or because the permanganate solution has been contaminated by hypo. The separate solutions will keep and work perfectly for a considerable time if proper precautions against contamination are observed. The two solutions should not be combined until immediately before they are to be used. They will not keep long in combination.

A close observance of the foregoing instructions is important. Otherwise, an iridescent scum will sometimes appear on the reduced negatives after they are dry, and this is difficult, if not impossible, to remove.

When washed, the films may be dried in the developing hangers or a clip may be attached to a corner and the films hung on a line to dry. The films should be dried in a clean place, free from dust.

Any slight tendency of the films to curl when dry may be overcome by placing them under slight pressure for a few hours. When removed, they remain quite flat.

Farmer's Reducer

[Formula
R-4a]

Stock Solution A

	Avoirdupois	Metric
Potassium Ferricyanide (Red Prussiate).....	1¼ ounces	37.5 grams
Water.....	16 ounces	500.0 cc.

Stock Solution B

Hypo.....	16 ounces	480.0 grams
Water.....	64 ounces	2.0 liters

For use, take Stock Solution A, 1 ounce (30 cc.); Stock Solution B, 4 ounces (120 cc.); water, 32 ounces (1 liter). Add A to B, then add the water and pour over the negative to be reduced. Watch closely. The action is best seen when the solution is poured over the negative in a white tray. When the negative has been reduced sufficiently, wash thoroughly. The two solutions should not be combined until they are to be used. They will not keep long in combination.

Farmer's Reducer may also be used as a two-solution formula by treating the negative in the ferricyanide solution first and subsequently in the hypo solution. This method has the advantage of giving almost proportional reduction and correction for overdevelopment. The single solution Farmer's gives only cutting reduction and corrects for overexposure.

[Formula R-4b] **Two-Solution Farmer's Reducer**

Solution A		Avoirdupois	Metric
Potassium Ferricyanide.....		¼ ounce	7.5 grams
Water to make.....		32 ounces	1.0 liter
Solution B			
Hypo.....		6¾ ounces	200.0 grams
Water to make.....		32 ounces	1.0 liter

Treat the negatives in Solution A with uniform agitation for 1 to 4 minutes at 65-70° F. (18-21° C.), depending upon the degree of reduction desired. Then immerse in Solution B for 5 minutes and wash thoroughly. The process may be repeated if more reduction is desired. For the reduction of general fog, 1 part of Solution A should be diluted with 1 part of water.

[Formula R-5] **Proportional Reducer**

Stock Solution A		Avoirdupois	Metric
Water.....		32 ounces	1.0 liter
Potassium Permanganate.....		4 grains	0.3 gram
*Sulphuric Acid (10% solution).....		½ oz. (fl.)	16.0 cc.
Stock Solution B			
Water.....		96 ounces	3.0 liters
Ammonium Persulphate.....		3 ounces	90.0 grams

*To make a 10% solution of sulphuric acid, take 1 part of concentrated acid and add it to 9 parts of water, slowly, with stirring.

For use, take 1 part of A to 3 parts of B. When sufficient reduction is secured, the negative should be cleared in a 1% solution of sodium bisulphite. Wash the negative thoroughly before drying.

[Formula R-8] **Modified Belitzski Reducer**

	Avoirdupois	Metric
Ferric Chloride, crystals.....	365 grains	25.0 grams
*Potassium Citrate.....	2½ ounces	75.0 grams
Sodium Sulphite, desiccated (E. K. Co.).....	1 ounce	30.0 grams
Citric Acid.....	290 grains	20.0 grams
Hypo.....	6¾ ounces	200.0 grams
Water to make.....	32 ounces	1.0 liter

*Sodium Citrate should not be used in place of potassium citrate because the rate of reduction is slowed up considerably.

Use the reducer solution full strength for maximum rate of reduction. Treat the films for 1 to 10 minutes at 65-70° F. (18-21° C.). Then wash thoroughly. If a slower action is desired, dilute 1 part of the solution with 1 part of water.

This modified Belitzski reducer is the only known single solution reducer which keeps well in a tank. It is especially recommended for treatment of dense, contrasty negatives.

[Formula S-6] **Stain Remover**

Developer or oxidation stain may be removed by first hardening the film for 3 minutes in the Formalin Hardener (SH-1), page 20, then washing for 5 minutes, and bleaching in:

Stock Solution A		Avoirdupois	Metric
Potassium Permanganate.....		75 grains	5.3 grams
Water to make.....		32 ounces	1.0 liter
Stock Solution B			
Sodium Chloride (table salt).....		2½ ounces	75.0 grams
Sulphuric Acid, C. P. (E. K. Co.).....		½ oz. (fl.)	16.0 cc.
Water to make.....		32 ounces	1.0 liter

Use equal parts of A and B. The solutions should not be mixed until ready for immediate use, since they do not keep long after mixing. All particles of permanganate should be dissolved completely when preparing Solution A, since undissolved particles are likely to produce spots on the negative. Bleaching should be complete in 3 or 4 minutes. The brown stain of manganese dioxide formed in the bleaching bath is best removed by immersing the negative in 1% Sodium

Bisulphite solution. Then rinse well and develop in strong light (except direct sunlight) with any non-staining developer, such as Formula D-61a (page 11), diluted with an equal part of water.

Tray Cleaner

[Formula
TC-1]

	Avoirdupois	Metric
Water.....	32 ounces	1.0 liter
Potassium Bichromate.....	3 ounces	90.0 grams
Sulphuric Acid, C. P. (E. K. Co.).....	3 oz. (fl.)	96.0 cc.

Add the sulphuric acid, slowly, with stirring when mixing the formula.

For use, pour a small volume of the tray cleaner solution into the vessel to be cleaned. Rinse around so that the solution has access to all parts of the tray, then pour the solution out and wash the tray 6 or 8 times with water until all traces of the cleaning solution disappear.

Tray Cleaner

[Formula
TC-2]

For Removal of Silver Stains

Solution A

	Avoirdupois	Metric
Water.....	32 ounces	1.0 liter
Potassium Permanganate.....	73 grains	5.0 grams
Sulphuric Acid C. P. (E. K. Co.).....	2½ drams	10.0 cc.

Add the sulphuric acid slowly while stirring the permanganate solution rapidly.

Solution B

Water.....	32 ounces	1.0 liter
Sodium Bisulphite (E. K. Co.).....	145 grains	10.0 grams

For use, pour solution A into the tray and allow it to remain for a few minutes, then rinse with water. Apply Solution B and wash thoroughly.

This formula will remove most types of stains, but it is especially recommended for the removal of silver stains.

Retouching Advantages

Eastman Portrait Films offer an important advantage in that retouching can be done on both the face and back of the film. Any coarse retouching is greatly softened in the print if it is done on the back of the negative.

After the retoucher has become accustomed to film, twice as much retouching can be done in a given time. There is a resiliency to the film that makes for speed and sureness.

Opaquing is easily done by laying the film on a piece of glass, the method being the same as for glass plates.

If a film is to be coated with Ground Glass Substitute it can be placed in a No. 2 Film Developing Hanger and the solution flowed over the back in exactly the same way a plate is handled.

An advantage in the thinness of the Eastman Film is that prints can be made from either side of the negative with practically no loss of detail.

Varnishing or Waterproofing

Any negative of unusual value, either film or plate, should have its gelatin surface protected. We especially recommend Kodalok WP as a protection for the film negative, because it is as pliable as

the film itself, makes the film waterproof and protects the surface of the negative from finger marks, stains, etc. A negative that has received an application of Kodalak WP can be cleaned with a wet cloth without injury.

The negative should never be coated until it has been retouched. Equal parts of Kodalak WP and Kodalak Thinner should be used, and as the solution thickens by evaporation, on exposure to the air, Thinner should be added to keep it at the proper consistency.

Whether the film is flowed with the solution or drawn through the solution in a tray, the surface must be covered with one continuous flowing motion. A backward and forward motion may remove the retouching and the coating will dry in streaks.

Weights and Measures—Conversion Tables

In photographic practice, solids are weighed and liquids are measured either by the Avoirdupois or the Metric system.

The following tables of weights and measures give all the equivalent values required for converting photographic formulas:

Avoirdupois to Metric Weight

Pounds	Ounces	Grains	Grams	Kilograms
1	16	7000	453.6	0.4536
0.0625	1	437.5	28.35	0.02835
		1	0.0648	
	0.03527	15.43	1	0.001
2.205	35.27	15430	1000	1

U. S. Liquid to Metric Measure*

Gallons	Quarts	Ounces (Fluid)	Drams (Fluid)	Cubic Centimeters	Liters
1	4	128	1024	3785	3.785
0.25	1	32	256	946.3	0.9463
		1	8	29.57	0.02957
0.000975	0.0039	0.125	1 (60 mins.)	3.697	0.003697
		0.03381	0.2705	1	0.001
0.2642	1.057	33.81	270.5	1000	1

Solid Conversion Values

Grains per 32 oz. multiplied by	0.06847	=grams per liter
Ounces per 32 oz. multiplied by	29.96	=grams per liter
Pounds per 32 oz. multiplied by	479.3	=grams per liter
Grams per liter multiplied by	14.60	=grams per 32 oz.
Grams per liter multiplied by	0.03338	=ounces per 32 oz.
Grams per liter multiplied by	0.002086	=pounds per 32 oz.

Liquid Conversion Values* (U. S. System)

Ounces (fluid) per 32 oz. multiplied by 31.25 = cubic centimeters per liter.
Cubic centimeters per liter multiplied by 0.032 = ounces (fluid) per 32 oz.

*These tables do not apply when converting British Imperial to metric measure.

PRICE LIST

Eastman Par Speed Portrait, Super Speed Ortho Portrait, Commercial, Commercial Matte, Commercial Ortho, Safety Ortho Press, and Process Films

Price per dozen films.

2¼ x 3¼.....	\$.45	7 x 11.....	\$ 3.20
3¼ x 4¼.....	.65	8 x 10.....	3.20
3¼ x 5½.....	.90	10 x 12.....	5.60
4 x 5.....	.90	7 x 17.....	5.60
4¼ x 6½.....	1.30	11 x 14.....	8.05
5 x 7.....	1.45	8 x 20.....	8.35
6½ x 8½.....	2.20	14 x 17.....	13.70
12 x 20.....			\$12.65

Centimeters

4½ x 6.....	\$.40
6½ x 9.....	.50

Centimeters

9 x 12.....	\$.80
10 x 15.....	1.15

Price per box of two dozen films.

5 x 7.....	\$2.90	6½ x 8½.....	\$4.40
8 x 10.....			\$6.40

Eastman Portrait Panchromatic, Super Sensitive Panchromatic, Safety Panatomic, Commercial Panchromatic, and Panchromatic Process Films

Price per dozen films.

4¼ x 6½.....	\$1.45	10 x 12.....	\$ 6.20
5 x 7.....	1.60	7 x 17.....	6.20
6½ x 8½.....	2.45	11 x 14.....	8.90
7 x 11.....	3.55	8 x 20.....	9.20
8 x 10.....	3.55	14 x 17.....	15.10
12 x 20.....			\$13.95

Price per box of two dozen films.

5 x 7.....	\$3.20	6½ x 8½.....	\$4.90
8 x 10.....			\$7.10

Eastman Film Holder No. 1

It fits Century View Cameras, Century Studio Reversible Adap-
ters, Eastman View Cameras, R. B. Cycle Graphics 5 x 7 and 8 x 10.

5 x 7.....	\$2.75	7 x 11.....	\$3.00
6½ x 8½.....	2.75	8 x 10.....	3.50

Eastko Film Holders

This holder fits all cameras using Eastman Film Holder No. 1.

Eastko Film Holder 5 x 7.....	\$1.85
Eastko Film Holder 8 x 10.....	2.75

Eastman Film Sheaths No. 3

4¼ x 6½.....	\$.20	6½ x 8½.....	\$.25
5 x 7.....	.20	8 x 10.....	.30

Sterling Film Holders

8 x 10.....	\$5.50	11 x 14.....	\$10.50
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These holders fit the F. & S. Home Portrait Camera, F. & S. Sky Scraper Camera, Folmer Commercial Camera, and any other camera taking Sterling Holders.

Graflex Film Holder

5 x 7.....	\$4.50
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Fits any 5 x 7 Graflex Camera.

Graflex Cut Film Magazine

5 x 7.....	\$19.00
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Holds twelve films in septums and fits any 5 x 7 Graflex Camera.

Eastman Portrait Film Washing Tank

Accommodates eighteen No. 2 or twenty-four No. 4, 8 x 10 Hangers and twenty-four No. 2 or thirty-two No. 4, 5 x 7 Hangers. A crosspiece makes it practical to wash both 5 x 7 and 8 x 10 films in the Tank at the same time.

Eastman Portrait Film Washing Tank.....	\$6.00
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Eastman Film Developing Hanger No. 2

7 x 11.....	\$.75	10 x 12.....	\$1.00
8 x 10.....	.75	11 x 14.....	1.35

Eastman Film Developing Hanger No. 4

4¼ x 6½.....	\$.60	6½ x 8½.....	\$.75
5 x 7.....	.60	8 x 10.....	.75

No. 4 Film Developing Hanger Rack

This Rack holds nineteen 5 x 7, or fourteen 8 x 10, No. 4 Film Developing Hangers and fits the No. 3 Eastman Hard Rubber Developing and Fixing Box. The films may be developed, rinsed, fixed, and washed without removing the hangers from the Rack. This Rack is made of the same highly noncorrosive metal as the Developing Hangers.

No. 4 Film Developing Hanger Rack.....	\$3.00
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Eastman Developing and Fixing Box, Hard Rubber

For Developing or Fixing Films in Film Developing Hangers

No. 2, for 4¼ x 6½, or 5 x 7 Films.....	\$4.50
No. 3, for 4¼ x 6½, 5 x 7, 6½ x 8½, or 8 x 10 Films.....	6.75
No. 3A, for 6½ x 8½ and 8 x 10 Films only.....	5.75
No. 2 Hard Rubber Floating Lid.....	1.20
No. 3 Hard Rubber Floating Lid.....	1.50

Kodalak WP

Kodalak WP, 16 oz. bottle.....	\$1.00
Kodalak WP Thinner, 16 oz. bottle.....	.80

Wratten Safelight Lamps

These popular indirect-light lamps use 25-watt bulbs and 8 x 10 safelights. They have two compartments. The lamp is in the upper, the safelight in the lower. The two models are similarly constructed except that No. 1 has a slide of opal glass in the upper compartment for white light.

These lamps are supplied with safelight but not electric bulb. When no safelight is specified the Series 2 will be furnished.

	No. 1	No. 2
Wratten Safelight Lamp, including safelight, cord and plug.....	\$10.00	\$8.00
Extra Safelight, any series, each.....	1.25	1.25

Kodak Safelight Lamp Improved

This is a smaller indirect-light lamp for 5 x 7 safelights. It uses a 25-watt lamp and is furnished with a Series 2 Safelight. It has an adjustable bracket for attaching to wall or shelf and for tilting the lamp.

Kodak Safelight Lamp, including safelight, electric cord and plug.....	\$4.00
Extra Safelights, any series, 5 x 7.....	.75

Eastman Safelight Lamp

This is a 5 x 7 lamp giving direct light for which a 10-watt lamp must be used. It may be attached to a drop cord or an ordinary wall fixture. Series 2 Safelight is furnished.

Eastman Safelight Lamp, including safelight, screw plug and lamp socket.....	\$3.00
Extra Safelights, any series, 5 x 7.....	.75

Indirect Light Boxes

These metal boxes are to be hung from the ceiling to provide general, indirect illumination. The single boxes hold one 10 x 12 safelight—the double boxes, two, there being a switch for each light. Cord and plug are included, but not safelights, electric bulb, or supporting chains.

	Single	Double
Indirect Light Box with cord and plug.....	\$9.00	\$18.00
Wratten Safelights, any series, 10 x 12, each.....	—	1.75

Wratten Safelights

Series 00, for Developing-out Papers

Series 0, a bright orange for use with Bromide Paper and Lantern Slide Plates

Series 0A, a greenish yellow safelight for use with Bromide Papers and Lantern Slide Plates

Series 1, for Films and Plates not color-sensitive

Series 2, for *Super Speed* and Orthochromatic Plates and Films including Verichrome

Series 3, for Panchromatic Films and Plates

	5 x 7	8 x 10	10 x 12
Wratten Safelights, any series	\$.75	\$1.25	\$1.75

Wratten Filters

Wratten Filters for use with Orthochromatic and Panchromatic Films are supplied in three forms: Gelatin Film, "B" glass cemented filters (a good optical glass), and "A" glass cemented filters, commonly called "Flats" (hand surfaced optically flat glass). Unless otherwise specified, "B" filters are supplied for photographic use.

The filters most commonly used are:

K1, a light yellow filter giving good correction for short exposures.

K2, a stronger yellow filter producing good correction with daylight and approximately correct color rendering with Mazda clear globe lamps.

X1, a pale green filter which gives correct rendering of all colors when used with Eastman Super Sensitive Panchromatic Film with daylight, or Eastman Portrait Panchromatic Film with incandescent tungsten lighting.

X2, a deeper green filter which gives correct rendering when used with Eastman Super Sensitive Panchromatic Film with incandescent tungsten lighting.

G, a strong yellow filter for photographing dark yellow woods, badly stained copies, or for eliminating haze in distant landscapes.

F, a deep red filter for photographing dark mahogany, blue prints, etc.

Tricolor: A, orange-red; B, green; C, blue.

A is for photographing mahogany, rosewood, and similar materials.

B is for photographing typewriting, figured rugs, carpets, etc.

C is for three-color work only.

Commercial Set of 8 Filters

This set includes the filters most generally used: K1, K2, X1, G, F, A, B, and C. The exposure factors for these filters are given in every package of Panchromatic Film.

Cemented in B glass, 3-inch squares, per set in case	\$35.00
Cemented in B glass, 2-inch squares, per set in case	22.00
Single Filters, 3-inch squares, each	3.75
Single Filters, 2-inch squares, each	2.10

Eastman Adjustable Filter Holders

For use with the 2-, 3-, and 4-inch square Wratten Filters. By means of a simple automatically adjusted ring, the 4-inch filters may be securely attached to any lens barrel from $2\frac{3}{8}$ to $3\frac{7}{8}$ inches in diameter, and 3-inch filters to any lens barrel from $1\frac{11}{16}$ inches to $2\frac{3}{8}$ inches in diameter, and the 2-inch filters to lens barrels from $1\frac{1}{8}$ inches to $1\frac{9}{16}$ inches in diameter.

	2 inches	3 inches	4 inches
Eastman Adjustable Filter Holder, for Wratten Square Filters.....	\$1.25	\$1.50	\$2.50

Prices subject to change without notice.

Eastman Kodak Company
Rochester, N. Y.

January, 1936

Printed in U. S. A.

TO SAVE YOU TIME

YOU need a fresh developer quickly—just add an Eastman Prepared Developing Powder to water and stir. The preparation of a properly balanced developer is just that simple. Made from Eastman Tested Chemicals, packed in tin, and always fresh.

Eastman Prepared Developing Powders

<i>Powders to make</i>	<i>1 Qt.</i>	<i>½ Gal.</i>	<i>1 Gal.</i>	<i>5 Gals.</i>	<i>10 Gals.</i>	<i>48 Gals.</i>
Formula D-52	\$.25	\$.35	\$.60	....	....	....
Formula D-72	.25	.35	.60	\$2.50	....	....
Formula D-73	....	....	.70	2.50	....	....
Formula D-75	....	....	....	....	\$1.75	....
Formula D-75R	....	....	....	2.50	....	....
Formula D-75b	....	....	....	....	3.15	....
Formula D-76	.25	.35	.60	....	....	....
Kodalk Formula DK-50	....	....	....	....	2.15	\$ 9.30
Kodalk Formula DK-50R	....	....	....	2.50	....	....
Kodalk Formula DK-60	....	....	....	....	2.50	10.25

EASTMAN KODAK COMPANY, Rochester, N. Y.

Books and Booklets

The following books are published by the Eastman Kodak Company and will be of interest:

The Photography of Colored Objects. A book which makes plain the theory underlying the photography of colored objects in monochrome and color and the application of that theory to those branches of practice which are of most immediate importance. New edition, completely revised. Green Kodaleather binding. Price, \$1.00, postpaid.

Fundamentals of Photography, by Dr. C. E. K. Mees, written with the object of providing an elementary account of the theoretical foundations of photography in plain and simple language. Fully illustrated and bound in stiff covers. New edition, rewritten. Price, \$1.00, postpaid.

Elementary Photographic Chemistry. A simple account of photographic chemistry, the properties of the chemicals used, and practical information on formulas, and preparing and using photographic solutions. New edition. Green Kodaleather binding. Price, \$1.00, postpaid.

Films, Plates, and Filters for Commercial Photography. A booklet which makes clear the principles involved in the photography of colored objects and the use of panchromatic films, plates, and filters. New edition, rewritten. Free on application.

Photomicrography. A booklet dealing with the photographic problems of photomicrography, with a chapter on color photomicrography and the use of stains and filters. New edition. Green Kodaleather binding. Price, \$1.00, postpaid.

Photographic Sensitometry, by Loyd A. Jones. A book dealing fully with this subject including under chapter headings, Sensitometers, Development, Density Measurement, Interpretation of Results, and Spectral Sensitivity. Fully illustrated and bound in stiff covers. Price, \$1.50, postpaid.

Wratten Light Filters. A description of Wratten Light Filters, with the absorption curves of over one hundred such filters; also tables of their percentage transmission at various wave lengths and their total transmission. A valuable book for technical and scientific workers. Price, \$.50, postpaid.

EASTMAN KODAK COMPANY, Rochester, N.Y.

BALANCE . . .

DEPENDABLE developers demand that the chemicals with which they are compounded be of a standard strength and purity. Eastman Tested Chemicals are maintained at invariable standards to insure balanced chemical reactions—to enable Eastman formulas to produce the finest possible negatives and prints. Eastman Kodak Company, Rochester, N. Y.

Specify

EASTMAN TESTED CHEMICALS