

Costs of Black and White Photography
(35mm & medium format film)

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Abstract

Representative costs of starting traditional black and white photography are

- 35mm film £629.70
- 120 format film £872.70

Monthly running costs of exposing, developing and printing one film per week are

- 35mm £85.80
- 120 £48.55

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1 Disclaimer

This document has been written in the hope it will be both informative and useful. To this end the author has tried to ensure the information included is accurate and reliable. However this publication is provided ‘as is’, without a warrantee of any kind. This document must not be assumed to be error free

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2 Introduction

This document gives an estimate of startup and running costs of traditional black & white photography (film, chemicals, dark-room, enlarger) as a leisure interest. Prices are current for November 2013 and costs are in UK pounds.

The running costs are dependent on size of prints created, storage life of solutions, number of films exposed per month, etc. Hence some assumption of 'typical' usage must be made in generating these figures, but all assumptions are listed.

Costs are given for the popular 35mm film size which is the format I initially used. Thence I moved onto the less popular medium format size and hence the costs associated with this are discussed.

2.1 35mm film

35mm allows for either 24 or 36 exposures to be taken per film and the negative size is 35mm by 24mm giving an aspect ratio of 2 x 3. Obviously an enlarger will be used to give a print that is considerably larger than this. However there is a limit to the magnification that is possible before the film grain starts to be obtrusive and the quality becomes unacceptable. As a 'rule of thumb' the maximum sized print that can be made from a 35mm negative is about 12 inches by 16 inches (approximately 30cm x 40 cm).

2.2 Medium format film

Medium Format refers to 120¹ sized film. Up until the 1950s this was the most popular film size. However it is now more of a niche product. 120 film allows fewer exposures per film than 35mm, but the negatives produced are bigger.

The film has an overall width of 6cm leading to a negative that is actually 5.6 cm high. The width of the negative depends on the camera with typical values being a nominal value of 6 cm (giving a square negative), or 4.5 cm (giving an aspect ratio of 3 x 4). The (nominal) 6cm x 6cm negatives allow for just 12 exposures per film.

The larger negative size gives rise to a number of features:

¹and 220 film. 220 gives twice the length of 120 film but is increasingly difficult to obtain at sensible costs

- There is much more detail captured on the negative. This allows the negative to be enlarged considerably more than for 35mm film. As a ‘rule of thumb’ a (conservative) value for the maximum size for a print that can be made from 120 film is about 24 inches x 24 inches (60cm x 60cm).
- The negatives are sufficiently large they can be used to make acceptable sized contact prints. This involves processing by lying the negative directly onto printing paper and exposing. No enlarger is used and the final print is the same size as the negative. This opens up the possibility of alternative forms of photography for example making cyanotype prints.

3 Startup Costs

Before any photography can be attempted there are up-front costs that must be covered. For black and white photography these can be quite expensive with a decent camera and enlarger representing the bulk of the costs. Also a dark-room is necessary and there are typically costs associated with light-proofing a room.

Start-up costs for the two film formats are itemised below.

3.1 35mm Specific Costs

3.1.1 Film

There seem to be two approaches to choosing a favourite film:

- Adopt one film and stick with it for a period of months to understand its strengths and weaknesses. In this way one can develop an understanding of how the film is likely to react in any given circumstances.
- Try a number of different films, with different speeds from different manufacturers at the start of ones photography education. Thence choose a favourite film based on experience.

The former approach is cheaper as it allows bulk buying of film and minimising postage costs where purchases are over the Internet. A well known and much respected film is the 125ASA Ilford FP4 plus. This is described by Ilford [1] as:

ILFORD FP4 Plus is an exceptionally fine grain medium speed black and white film. It is ideal for high quality indoor and outdoor photography, particularly when giant enlargements are to be made. ... FP4 Plus is robust and will give usable results even if it is overexposed by as much as six stops or underexposed by two stops.

The cost of a pack of ten FP4+ 35mm 36 exposure film is £43.90 from the UK store Ag-Photographic [2].

An advantage of settling on a film, is that it makes the choice of chemicals quite easy, as it seems sensible to adopt Ilford developer and fixer for processing.

3.1.2 Camera

The starting point of photography is the camera and my preference is for a single lens reflex. Some options to buy new traditional film cameras, given in table 1.

However I decided to go second hand and to buy a Pentax K1000 model. According to Wikipedia [3]

The Pentax K1000 (originally marked the Asahi Pentax K1000) is an interchangeable lens, 35 mm film, single-lens reflex (SLR) camera, manufactured by Asahi Optical Co., Ltd. from 1976 to 1997, originally in Japan. The K1000's extraordinary longevity makes it a historically significant camera. The K1000's inexpensive simplicity was a great virtue and earned it an unrivaled popularity as a basic but sturdy workhorse. The Pentax K1000 eventually sold over three million units.

The camera was purchased from the website of the studentphotostore [4] at a cost of £150 including accessories. This was a reconditioned device and came in excellent condition, see figure 1

3.1.3 Enlarger

35mm film processing demands access to an enlarger, and my preference was to buy second hand. A Durst M370 BW enlarger was on special offer at the company Second Hand Darkrooms [5]. The enlarger has a reasonably good reputation as a robust albeit low end device, allowing print sizes of up to 12 inches x 18 inches. The light source is a 75 watt opal lamp. For 35mm work

Rollei single use black & white camera	Cost less than £9. However this is not reusable.
Blackbird Fly 35mm TLR Camera	Cost £95 and a tempting offer However it does have limited flexibility.
Holga 135 Classic	This comes at a cost of less than £40 and is a basic 35mm camera with a plastic lens. It is fully manual, but may not be very robust or flexible.
Phenix DC303K 35mm	Cost £180. A very tempting camera to try.
Praktica Z2860 AF Zoom Compact	Cost £60. The camera is fully automatic.
Vivitar 3800N with 50mm lens	Cost £130. A very tempting camera to try.

Table 1: Options for a new 35mm film camera



Figure 1: Pentax K1000 camera and kit



Figure 2: Durst B & W enlarger with 50mm lens

this must be fitted with a 50mm lens and the one selected was a Durst 50mm f2.8 lens again obtained from Second Hand Darkrooms, see figure 2.

Overall costs were

- Enlarger £88.00
- Lens £49.00

3.2 Medium Format Specific Costs

Again for medium format work, there are the startup costs of film, camera and enlarger to be met.

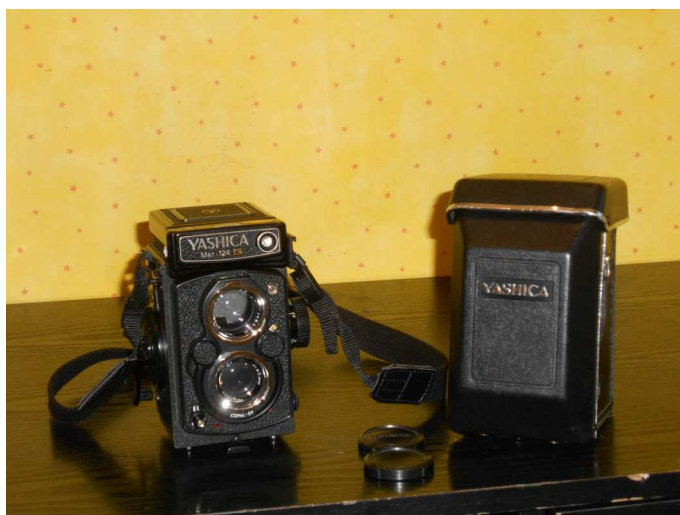


Figure 3: Yashica 124G Medium Format camera and case

3.2.1 Film

For reasons discussed in section 3.1.1 my film choice for medium format work is Ilford FP4 Plus. The cost of a ten pack of 120 films is £36.90 from the UK store Ag-Photographic [2]

3.2.2 Camera

New, reasonably priced medium format cameras are available in the form of the Holga 120. This is a popular camera though with rather limited functionality. Costs range from £20 to £40 depending on the quality of lens and presence of a flash. However in addition to film size, the author wished to experiment with a good quality twin lens reflex camera. Hence the decision was made to purchase a Yashica Mat 124-G camera from the Internet company studentphotostore [4]. The camera is bulky and heavy reflecting the large metal component in its construction. Essentially it is a copy of a Rolleiflex 3.5T and has a similar quality, albeit the lens is not considered as good. It shoots twelve 6cm x 6cm negatives on a single roll of 120 film. The lens is 80mm f3.5.

The cost of the camera was £225.00 and this represents a typical cost for a good quality vintage medium format camera, see figure 3.



Figure 4: Kaiser B & W enlarger with 80mm lens

3.2.3 Enlarger

It is possible to convert the 35mm Durst M370 BW enlarger to accept medium format film, but this is a rather expensive option (replace lens, condenser and negative mask) with limited functionality. Hence the decision was made to go for a different (second hand) device. Specifically the company Second Hand Darkrooms [5] were able to supply a Kaiser VP6002 enlarger along with a Durst 80mm f5.6 lens at the following costs.

- Enlarger £235.00
- 80mm lens £59.00

See figure 4

Item	Quantity	Cost
Ilford ID11 developer	1 litre	£ 5.23
Ilford rapid fixer	1 litre	£10.44
Ilford wetting agent	1 litre	£11.70
Ilford stop-bath	500 ml	£ 5.23
Ilford multigrade paper developer	1 litre	£ 9.95
Total		£42.55

Table 2: Developer, Fixer and other Chemicals

3.3 Cost of Common Equipment

To perform home development of black and white films, there is a need to set up a darkroom and to stock this with appropriate chemicals and paraphernalia. The following sections suggest what kit needs to be bought along with prices.

3.3.1 Printing Paper

Given the choice of Ilford for film, it seemed reasonable to print on Ilford paper. A multigrade paper is a good choice as this enables the contrast of the printed image to be controlled by the use of filters in the enlarger. Papers are available as either Fibre or Resin Coated. The former give a greater tonal depth, but require more rinsing than resin coated. They are also the more expensive option. For amateur use, the decision was made to go with the cheaper resin coated papers. These are available in gloss, pearl and semi matte finishes, all at the same cost. Finally there is the choice of paper size. For general purpose a print size of 5 inches x 7 inches was chosen as a good compromise. This is big enough to look impressive and yet small enough to fit into a photograph album. was chosen.

A box of 100 Multigrade Resin Coated 5" x 7" printing papers costs £22.12.

3.3.2 Chemicals

Chemicals required for processing film and printing paper are listed in table 2 . This selection will enable both film and prints to be developed and fixed.

3.3.3 Darkroom

Ideally a dark room will be lightproof, be well ventilated and have a sink and running water. These were not available but a spare bedroom with a desk for trays of solutions and space for a couple of enlargers was a possibility. The room is not particularly well ventilated, but in use this has not proved to be a problem. Heating when necessary is supplied by a fan heater (to keep the developing solutions at 20 degC). A bucket is used for the rinsing of both film and prints.

Two purchases were necessary however viz

- A changing bag to allow a film to be inserted into a developing tank in complete darkness (the darkroom cannot be made dark enough to allow a film to be handled).
- Black out material to apply to the bedroom window. This, used in conjunction with a roller blind, makes it possible to darken the room sufficient to handle photographic prints.

Costs of these items are

Item	Quantity	Cost
Paterson changing bag	large	£20.45
Blackout material for window	36 x 48 inches	£23.49

3.3.4 Miscellaneous items

The miscellaneous items, itemised and costed in table 3, will be found either useful or essential for developing and printing black and white film.

3.4 Summary of start-up costs

In order to start taking, developing and printing black and white photographs the following figures represent typical startup costs

Equipment	Common	35mm specific	Medium format specific
Paper	£ 22.12		
Chemicals	£ 42.55		
Darkroom	£ 43.94		
Misc.	£245.09		
Camera		£150.00	£225.00

Enlarger & lens		£126.00	£294.00
Total	£353.70	£276.00	£519.00

Hence indicative prices for black and white photography are:

- 35 mm £629.70
- Medium format £872.70
- Both 35mm and medium format £1148.70

4 Running Costs

Having established the startup costs of black and white photography for either (or both) 35mm and medium format photography, it remains to estimate the running costs, that is the cost to process and print a film and hence the cost of a single print. This will be explored for each film format.

4.1 Factors influencing running costs

It is hard to estimate running costs of photography in the abstract as it depends on the number of films exposed and processed each month. Specifically the developer, stop bath (and to a lesser extent the fixer) have limited lifespan. If insufficient film is used and processed during the chemical lifespan then the stock solutions will need to be discarded before they are used up and this will push up costs. If the chemicals are stored in a dark and cool environment, their working lifespan can be extended somewhat with little risk of ruined film. However this may not be true for photographers working in a warmer climate than that in the UK.

Assume the exposure of 1 film per week and assume chemicals are discarded after their specified lifespan.

4.1.1 Volumes used for processing

The amount of chemical for film development depends on the size of the developing tank. The numbers below are for a Paterson tank assuming films be developed individually rather than a number at a time. The volume of chemicals used for processing prints are sufficient to give a sensible depth to a 8inch x 10inch developing tray.

Item	Unit Cost	Total Cost
Washing up bowl	£ 1.00	£ 1.00
Bucket	£ 1.00	£ 1.00
Clothes pegs	£ 1.00	£ 1.00
Jugs, 4 of	£ 1.00	£ 4.00
litre bottle x 6	£ 4.00	£ 24.00
Negative ring binder 35 mm	£ 6.80	£ 6.80
Negative ring binder 120	£ 6.99	£ 6.99
Pages for negatives	£14.15	£ 14.15
Photograph album	£16.99	£ 16.99
Photo corners (500)	£ 2.99	£ 2.99
Film squeegee	£11.78	£ 11.78
Developing tank and reel	£21.98	£ 21.98
developing tray (set of 3)	£12.80	£ 12.80
45 ml measure	£ 5.63	£ 5.63
300ml measure	£ 6.65	£ 6.65
Thermometer	£12.80	£ 12.80
Film clips (pair)	£ 8.60	£ 8.60
Focus finder (used)	£15.00	£ 15.00
5x7 easel (used)	£ 6.95	£ 6.95
8x10 easel (used)	£ 9.99	£ 9.99
Safelight	£27.99	£ 27.99
Multigrade filters	£23.00	£ 23.00
Two print tongs (used)	£ 3.00	£ 3.00
Total cost		£245.09

Table 3: Miscellaneous Darkroom kit

Chemical	Lifespan stock soln	Lifespan working soln
ID11 film developer	1 month [6]	zero (use once only)
Multigrade paper developer	6 month [7]	24 hours
Rapid Fixer (film & print)	6 month [8]	1 month
Ilfotol wetting agent	12 months [9]	7 days
Ilfostop stop bath	12 months [10]	7 days

Table 4: Lifespan for photographic chemicals

Use	Required volume of working solution
Developing tank - 35mm film	300 ml
Developing tank - 120 film	500 ml
Printing tray	600 ml

4.1.2 Lifespan of stock and working solutions

The lifespan of Ilford photographic chemicals is given in table 4 using information from various Ilford technical notes that can be obtained from the Internet. The lifespans are given for a tightly stoppered half full bottle.

4.1.3 Working capacity of solutions

The following table gives the capacity of Ilford working solutions. The total number of films or prints that can be processed correspond to use of one litre of working solution at the specified dilution. The technical papers give capacity in terms of number of 35 mm films or number of 8 inch x 10 inch papers that can be developed. However a 120 film is (approximately) the same area as a 35 mm film whereas simple arithmetic gives capacity in terms of 5 inch x 7 inch prints.

Reagent	Working concentration	Will Process
ID11 film dev	1 : 1	5 films
Multigrade paper dev	1 : 9	228 prints 5" x 7"
Rapid fixer	1 : 4	24 films
	1 : 9	182 prints 5" x 7"
Ilfostop	1 : 19	15 films
		137 prints 5" x 7"

4.1.4 Miscellaneous information

- The number of photographs that will fit into a single photograph album is 116.
- The number of 35 mm films that can be stored in one set of negative holders is 25
- The number of 120 films that can be stored in one set of negative holders is 25

4.2 35mm Running Costs

Assuming the processing of 1 film a week. Thus for each (four week) month the following costs will be accrued.

- Film
Purchase of 4 films £17.56.
- Film Developer
Purchase one packet of ID11 each month at a cost of £5.23
Assuming this is used as a 1:1 dilution this will require the discard of 400 ml of stock solution each month to prevent this exceeding the lifespan of the developer. The working solution for developer is used once and then discarded.
- Ilfostop stop bath for film
Purchase costs per month will be £0.6276
There is no wastage with this product as I will get through a 500ml bottle in 8.3 months just developing film and the lifespan of the stock solution is 12 months. In reality, the stock solution will be used more rapidly than this as the same stop bath is used for processing prints. The working solution of stop bath will only be used once, as the lifespan is only 7 days and thus there is not much safety margin if this was used to process two films a week apart.
- Ilford rapid fixer for film
Purchased costs per month will be £1.4616
This figure is derived by assuming 350 ml of fixer will be prepared and the working solution used twice (two films processed a week apart).

Hence 140 ml of stock solution will be used during one (four week) month with a concentration 1:4 for films. As the working solution will last one month and this quantity will process 8 films, this provides a reasonable safety margin. At this rate of usage it would take over seven months to use a single bottle of stock solution and lifespan is only six months. However the same fixer will be used for processing prints and thus the stock solution will be used before its maximum lifespan is exceeded.

- Ilford Ilfotol film wetting agent
Purchase costs per month will be £0.936
20 ml of wetting agent is used per film and at this rate of usage one bottle will be able to process 50 films over a period of 12.5 months. Since the lifespan of the stock solution is 12 months, there will not be any significant discard due to ageing.
- 5 x 7 inch printing paper
Purchase costs per month will be £32.7376
Assume all 36 exposures of each film will be printed and allow 4 papers a month for estimating exposure. Hence the number of print papers used will be 148 per month. Hence 1.48 boxes per month will be used.
- Ilford multigrade developer for prints
Purchase costs per month will be £2.388
Working solution for printing can only be used once. For a single printing session I will use 60 ml of stock solution. This has the capacity to process 137 prints whereas I will be using it to process only 36 prints. Hence I have a wide safety margin. At this rate of usage the stock solution will be used in 4.17 months and its lifespan is six months. Hence there will not be any discards of developer.
- Ilfostop stop bath for prints
Purchase costs per month will be £1.2552
Stop-bath working solution has a lifespan of 7 days. Hence a new batch must be mixed for each printing session to avoid risk. For a single printing session there will be a use of 30 ml of stock solution, and this will process a maximum of 82 prints
- Ilford rapid fixer for prints
Purchase costs per month will be £1.378
The working life of the stop bath is 1 month and hence one batch of fixer will be used to process two films on two consecutive weeks. The

amount mixed up will be 660 ml (to allow for loss due to carry over during the first printing session). Hence fixer usage (at a concentration of 1:9 will be 66 ml per fortnight. This amount of fixer has capacity to process 120 prints whereas it will be discarded after fixing 72 prints. Hence there is a wide margin of safety.

- Negative storage
Purchase costs per month will be £0.272
The negatives from a single film will be stored in a single negative file page.
- Print storage
Purchase costs per month will be £21.952
This assumes all negatives will be printed and each print will be stored in a photograph album using photo corners.

4.2.1 Summary of Costs

Total costs per (4 week) month for exposing and processing one 36 exposure film per week are £85.80. That is cost per print is £0.60 each. The annual expenditure will be £1115.37 and 1872 prints will be produced each year.

4.3 Medium Format Running Costs

Assuming again the exposure and processing of 1 film a week. Thus for each (four week) month the following costs will be accrued.

- Film
Purchase 4 films at a cost per month of £14.76
- Film Developer
Purchase one package of ID11 each month at a cost of £5.23
Assuming this is used as a 1:1 dilution this will generate 2000 ml working solution which is exactly the quantity required during the month to develop the four films. There is no need for any chemical discard.
- Ilfostop stop bath for film
Purchase costs per month will be £1.046
There is no wastage with this product as I will get through a 500ml bottle in 5 months just developing film and the lifespan of the stock solution is 12 months.

- Ilford rapid fixer for film
 Purchased costs per month will be £2.2968
 This figure is derived by assuming 550 ml of fixer will be prepared and the working solution used twice (two films processed a week apart). Hence 220 ml of stock solution will be used during one (four week) month with a concentration 1:4 for films. As the working solution will last one month and this quantity will process 26 films, this provides an excellent safety margin. At this rate of usage it would take four and a half months to use a single bottle of stock solution with lifespan is six months.
- Ilford Ilfotol film wetting agent
 Purchase costs per month will be £0.936
 20 ml of wetting agent is used per film and at this rate of usage one bottle will be able to process 50 films over a period of 12.5 months. Since the lifespan of the stock solution is 12 months, there will not be any significant discard due to ageing.
- 5 x 7 inch printing paper
 Purchase costs per month will be £11.06
 Assume all 12 exposures of each film will be printed (along with an additional papers each printing session to test exposure). Hence the number of print papers used will be 50 per month.
- Ilford multigrade developer for prints
 Purchase costs per month will be £1.658
 Working solution for printing can only be used once. Given the generation of 12 negatives per week, it makes sense to print only every other week. Hence 600 ml of working solution will be used per fortnight and this translates to 120 ml of working solution per month. At this rate it will take eight months to use a bottle of developer, but the lifespan is only 6 months. Hence there will be a discard of 280 ml each six months. This waste of developer is reflected in the monthly cost.
- Ilfostop stop bath for prints
 Purchase costs per month will be £0.6276
 Stop-bath working solution has a lifespan of 7 days. Hence a new batch must be mixed for each printing session to avoid risk. For a single printing session there will be a use of 30 ml of stock solution. Given two printing sessions per month, it will take 8.33 months to use a bottle of solution. However the lifespan is 12 months and hence there will be no discard of old solution.

- Ilford rapid fixer for prints
Purchase costs per month will be £1.378
The working life of fixer is 1 month and hence one batch of fixer will be used to process two films even over a period of two weeks. The amount mixed up will be 660 ml (to allow for loss due to carry over during the first printing session). Hence fixer usage (at a concentration of 1:9 will be 132 ml per month. This amount of fixer has capacity to process 240 prints whereas it will be discarded after fixing 48 prints. Hence there is a wide margin of safety.
- Negative storage
Purchase costs per month will be £0.2796
The negatives from a single film will be stored in a single negative file page.
- Print storage
Purchase costs per month will be £9.2833
This assumes all negatives will be printed and each print will be stored in a photograph album using photo corners.

4.3.1 Summary of Costs

Total costs per (4 week) month for exposing and processing one 120 film per week are £48.55, that is cost per print is £1.01 . The annual expenditure will be £631.15 and a total of 624 prints will be produced each year.

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