CLIP-OUT GUIDE

How to Plan and Build a Home Darkroom

You can do good work in an improvised darkroom, but you'll do much better in a well-planned permanent one

By David Vestal

A darkroom must shut out unwanted light. It needs ventilation, enough room to work in, and enough electrical outlets for an enlarger, safelights, a timer or two, a white room light and a white print-inspection light. It should be comfortable and easy to clean.

Hot and cold running water are not absolutely necessary, but have them if you can. A long processing sink is ideal; otherwise, a long table can hold your processing trays.

You'll need shelves for printing paper, utensils, and chemicals. You'll need a rack or line and clips for drying film, RC prints, and blotters. And you'll need a large wastebasket, some towels, and rolls of paper towels. You will need a strong and steady table to put your enlarger on and the other things you'll use on the dry side of your darkroom.

The list grows, but need is relative. Many photographers work well for years in kitchens, bathrooms, and closets. Resourceful people find ways.

Temporary darkrooms

Most improvised darkrooms must be set up and taken down each time they're used. Printing is enough work without that, so make the setting up and taking down as easy as you can. I can't tell you exactly what to do because I don't know your conditions; but here are some things to consider.

Kitchens, bathrooms, and laundry rooms are often used because they have running water and drains, but you can carry buckets of water in and out of a closet darkroom; many photographers do this.

One safelight is all you really need. If you can, put it up to stay. Otherwise you can mount it on a clamp and fasten it to a lightstand, a shelf, or whatever is handy. The same goes for your print-inspection light.

Sometimes a big, heavy enlarger can be kept in a closet on a sturdy, wheeled cart. You just roll it out and plug it in



Author's darkroom. Note dry (I.) and wet (r.) sides. Looseleaf binder on stool is full of useful darkroom data.



Simplified plan of darkroom designed for black-and-white film processing and print-making. Dotted lines with numbered sequence show step-by-step positions when author makes prints. See text.



Paper trimmer (cutter) is on dry-side enlarger table. Guide bar is set for seven in. to cut a one-in.-wide test strip from each 8x10-in. paper sheet.

for use. There are also small, lightweight enlargers, easy to carry.

Processing trays can go on any table big enough for four of them, or on a couple of card tables, or on planks held up by sawhorses, or even on the floor. I once used planks across the top of a bathtub. Put sheet plastic under the trays to keep the supporting surface clean and dry.

It's cheap and easy to black out windows with opaque cardboard cut to size and fastened in place with removable masking tape. Or you can use opaque curtains or window shades if you can keep light from leaking around their edges. Fitting them into black-painted grooves or baffles is one way. You can lightproof the crack under a door by laying a towel or a rug there. If too much light comes through the other cracks, simply hang a curtain across the doorframe.

You may be able to find and use a good existing darkroom. Many camera clubs have darkrooms, and in many towns there are rental darkrooms. However, even the best-equipped group darkroom is not as good to work in as your own simple one.

Whatever temporary darkroom you use, consider it in detail. You'll want to avoid its defects and keep its good points when you set up your own permanent darkroom.

The permanent darkroom

Setting up a black-and-white darkroom is like outfitting a ship. Many things must go into a small space, yet be ready at hand when you want them. Spend time planning before you cut any wood.

Draw the space where your darkroom will be to scale on graph paper. Cut pieces of cardboard to scale to stand for the enlarging table, sink, enlarger, trays, and so on. Here are some of the basic sizes:

Trays for 8x10-in. (20.3x25.4-cm) prints are about 12x14 in. (31x36-cm); trays for 11x14-in. (28x36-cm) prints are about 15x18 in. (38x46 cm). Enlarger baseboards range in size from about 12x15 in. (31x38 cm) to 18x48 in. (46x122 cm).

Move things around on the plan to see the different ways you can arrange them. When everything seems to fall into place well, move from graph paper to full size.

Mark out the actual space you'll use:

walls here, door there; sink here, enlarging table there, and so on. Then walk through the main movements of printing. You want a path with little or no unnecessary walking.

Here's a rough outline of my usual enlarging path: 1) Put a negative in the enlarger. 2) Take out a sheet of paper, trim it, put it in the enlarging easel, and expose. 3) Take it to the developer tray, 4) and to the stop bath, 5) and to the fixer, 6) and to the water tray. 7) Check the paper box; is it closed? 8) Turn on the print-inspection light. 9) Put the print on the inspection board, then back in the water. 10) Wash and dry hands. 11) Switch off the inspection light and go back to the enlarger for the next print.

My main zigs and zags are to check the paper—one step—and to switch the inspection light on and off—two steps each. I can stand that.

If you can work without extra walking, you won't get tired and lose judgment too soon; that's good for your prints.

The building's structure places some things; for instance, I put my sink where the house drainpipe is. And your path places things; the three timers I use for exposing, developing, and fixing prints are where I can reach them when I need them. In general, just use your common sense to make your darkroom as convenient as possible.

On the opposite page is the floor plan of my present darkroom, workable within its structurally imposed limits. The dashed line shows my printing movements, which are simpler than they look here. This darkroom actually has more shelves than the plan shows. There's a big paper shelf under the enlarging table, a long chemical shelf on the tray rack under the sink, and utensil shelves over the sink.

None of the carpentry is slick: I do my own. It serves the purpose. Some shelves are in their third or fourth lives.

My safelights are near the ends of the sink, leaving the enlarging table fairly dark so I can see the projected image under the enlarger when I print.

All kinds of notes, formulas, and data sheets are pinned to the walls.

The wastebasket is below the paper towels near the end of the sink.

There are kitchen-sink mixing faucets on both sides of the print-inspection board. In this basement darkroom,



Enlarging table in use: a picture has been chosen from the contact proof sheet and the proper 35-mm negative has been placed in the carrier, emulsion-side down.



When enlarging table is at a comfortable working height, often the ceiling is too low. Solution is to cut a hole in the ceiling.



Next to enlarger are: timer, antistatic gun, brush, magnifiers, focusing magnifier, enlarging lens, cardboards, pencils, radio. Not visible is voltage stabilizer.

the sink drain runs straight into the house drain.

My drying rack, with its many clips, is more than six feet off the floor to leave room for 35-mm film to dry there.

My negatives and contact prints are stored across the basement in my office. More shelves are in between.

I've considered adding a light trap to the darkroom door so I could come and go without letting light in. I may do it.

The oddest thing in my darkroom is the placement of the enlarging table. There's a dropped ceiling that my tall enlarger must stick up through to be usable in this room. The table has to be where it is or I couldn't crank the enlarger head up between the joists of the floor above. The hole for the enlarger head also helps ventilate the darkroom, since the space above the dropped ceiling is not walled off. Instead, I lighttrapped it by putting a wallboard baffle there to keep light out but let air pass. What looked like a fault turned out to be useful. You meet such puzzles when you must fit a darkroom into an existing space. Think about them and fiddle with them until they work.

Sinks

You can buy a stainless-steel, plastic, or fiberglass sink, ready to install; or you can build one. There are some things to know before you do.

Here I've relied heavily, for things outside my experience, on a handbook, *Photolab Design*, Kodak Publication No. K-13. I recommend it. K-13 is largely about big professional darkrooms, but tells much that anyone setting up a small one should know.

Copper water pipes, Kodak says, are preferable to galvanized-steel ones; and most plastic drainpipes are preferable to most metal ones. For solutions hotter than 57 C (135 F), they suggest polyvinyl dichloride drainpipe. Don't connect iron pipes directly to stainless-steel sinks: they stop being stainless after contact with rust. A short length of copper pipe between the iron pipe and the sink helps prevent this.

You can build a plywood sink and

waterproof it with fiberglass cloth, a boat-building technique that keeps water in as well as out. But I don't know how to do this and can't instruct you.

I once built a marine-plywood sink, painted it with waterproof paint, and caulked it. I made the sides too thin, so it sprang leaks at times and had to be recaulked; so I can tell you to use $\frac{3}{4}$ -in. plywood for the sides as well as the bottom. This sink served well enough for 10 years, though.

Harry Callahan, in Rhode Island, hired a boat builder to make his darkroom sink. It's neatly built of wood and painted light-gray with epoxy paint.

I'd rather buy a sink than build one. Mine is a stainless-steel one from Calumet Photographic, 890 Supreme Dr., Bensenville, II. 60106. Photo/Line, 1506 W. 12th St., Los Angeles, Ca. 90015, sells inexpensive polyethylene darkroom sinks. And there are other sources. Two are Spiratone, Inc., 135-06 Northern Blvd., Flushing, N.Y. 11354, and Darkroom Aids, 3449 North Lincoln Ave., Chicago, II. 60657. They all offer catalogs.

Whether you buy or build, it isn't hard to get a sink that will fit your needs.

Use mixing faucets so you can blend hot and cold water to the temperature you want. High-priced thermostatic ones are available, but few of us need them. The kitchen kind does very well. Have two mixing faucets in your sink; then you can wash your hands while the prints are washing. Put garden-hose adapters and short hoses on the faucets. A good source for hoses and adapters is Pfefer Products, 485 Easy St., Simi Valley, Ca. 93065.

Place the faucets well above the sink—Kodak says 16 in. up—to leave room for gallon bottles and two-liter graduates under them.

Duckboards in the sink raise trays and utensils off the bottom and let the water flow. Kodak suggests moistureresistant cypress. I'm more primitive and just use two lengths of 1x2-in. pine from the lumberyard. A practical alternative is to cut corrugated fiberglass roofing material to size and then lay it in the sink.

Store trays on edge in a rack under the sink. I used 1x12-in. pine for top, bottom, and ends; and 1x4-in. uprights between them for dividers. Each slot is $3\frac{1}{2}$ in. wide by $15\frac{1}{2}$ in. high, inside dimensions—big enough for one 11x14in.-size tray.

The top of my tray rack is a shelf for ready-to-use developers, fixers, and so on. I just reach down when I want them. At one end of the tray rack is a 30-gallon plastic garbage can; its lid covers 100 pounds of hypo crystals (sodium thiosulfate, pentahydrated) for mixing print fixer.

Note on septic tanks: On moving to a small country town I began to be concerned about photographic chemicals and the septic tank. Kodak reassured me that a 300- to 500-gallon septic tank can accept up to 40 gallons of processing chemicals per day with no ill effects. (I might pour out four gallons on a strenuous day.)

Printing equipment

The enlarger. Most enlargers are good; none that I know of are perfect. A good one is rigid and vibration-free; its head is easy to raise, lower, and lock; and it's easy to focus. The lamphouse should not leak much light and should not overheat the negatives. The lamp should be easy to reach and replace. A slot or drawer for printing filters, between the lamphouse and the negative stage, is useful for variable-contrast printing.

Many enlargers are designed to handle negatives of varying size. My Omega D2V, for instance, enlarges from my 35-mm, 120 roll-film, and 4x5-in. sheetfilm negatives, using three lenses of 50mm, 75-mm, and 135-mm focal lengths. The variable condenser adapts to these formats and focal lengths.

It's a modular enlarger with interchangeable parts, one of several such designs. This makes them versatile and delays obsolescence.

Enlarger heads are of two main types: condenser and diffusion heads. The difference is in the light they emit.

"True condenser" or "point-source" heads are mainly for printing from microfilm. Few photographers enlarge pictures with them. Their lamps have very small light sources. They emit a hard spotlight beam and print from conventional black-and-white negatives in relatively high contrast.

Conventional condenser heads are really semidiffusion heads. Diffuse light from a frosted bulb passes through condensing lenses which direct it through the negative. Most condenser enlargers are of this type. They emit a floodlight beam, directional but softer than pointsource light, and they print in moderate, intermediate contrast.

Diffusion heads mix the light so it passes through the negative in all possible directions. They emit no beam at all, but a glow, and print in relatively low contrast.

Many photographers believe that one type of enlarger head or another is best. In particular, a vocal cult holds that cold-light diffusion heads are best and that condenser heads can't print as well. They claim that the cold-light head minimizes grain, prints highlight tones better than condenser heads, and eliminates the need to spot prints from scratched and dusty negatives.

And some photographers believe that condenser heads make sharper prints with more clearly separated tones.

The authorities disagreed, so I made my own tests to find out, printing with two condenser heads (point-source and conventional) and two diffusion heads (cold-light and dichroic), all on the same enlarger. Only the heads changed.

The results were quite clear and were reported in the January, 1981, issue of POPULAR PHOTOGRAPHY. Rather than repeat all that here, I'll briefly summa-



Wet side of darkroom. Note "white" inspection light in vicinity of fixer tray. Dry towels are handy to have around.



Tray rack and chemical shelf are on dry side under processing sink.

rize the findings.

Only one of the cold-lighters' claims proved to be true. Scratches on the base side of a test negative were minimized in diffusion-head prints and didn't need spotting. With condenser heads, the scratches did need spotting. Dust had to be spotted on prints from all heads.

Once the contrast of the paper was matched approximately to that of the projected image from each head—and that's how we normally print—grain, sharpness, and highlight and shadow tones were rendered alike by all four heads. The prints looked so much alike that neither I nor POPULAR PHOTOG-RAPHY's editors could tell by looking at them which print had come from which enlarger head.

In short, the whole controversy is nonsense. If you've been tempted to trade in your condenser or diffusion head for the other kind to improve your printing, don't bother. It won't. Except in overall contrast, they print alike. Just don't scratch your film.

An enlarger with both a condenser and a diffusion head would expand the contrast range of your printing, and that could sometimes, though seldom, be useful.

You don't need a color head for black-and-white printing, incidentally, but if you have one, use it. It's okay.

Enlarging lenses. Get the best you can find and afford. When I first used a good enlarging lens, I was surprised how much better and easier it made my printing. Tones I'd had to separate by

laborious burning-in and dodging were suddenly separating clearly in straight, unmanipulated prints.

Focusing magnifier. If your near vision is good, you may not need one. I use an old parallax-type Bausch & Lomb unit and like it, but it may now be easier to find a good grain-focusing magnifier. All it has to do is show you when the image is really sharp on the easel. Accurate focus not only makes your prints sharper, it gives them greater tonal clarity.

For cleaning negatives. Once I used only a soft, fine sable brush to flick dust off negatives. Now I've added a one-in.wide antistatic brush and a little piezoelectric antistatic "gun" to combat static electricity, which can attract dust to film. These cut down the amount of print spotting I must do.

As a last resort I sometimes use a wad of absorbent cotton dampened with film-cleaning solution from Kodak or Edwal. Then I must usually brush cotton fibers off the negative.

Voltage stabilizer. In black-and-white work it's no necessity, but it saves a print now and then when the house current fluctuates but the enlarging lamp stays steady. I use a small, inexpensive one: the timer feeds it a.c. electricity and the enlarger draws d.c. from it. It wouldn't work with any lamp that needs a.c.

Timers. I prefer clock-faced timers to digital ones whose numbers all scramble in the same little window. That's because a hand moving around a dial

gives me a clear sense of passing time that I don't get as easily from a digital timer. I have GraLab electric timers and GE and Franklin clockwork ones.

Paper cutter. Mine is an ordinary 15in. trimming board with an adjustable guide bar that lets me trim paper by safelight illumination.

For contact printing. I use an oldfashioned wooden printing frame with a glass face and a padded, hinged, removable back that's held in place with flat springs.

A newer type is a foam-padded board with glass hinged to one end that latches closed at the other end. I'd look for a plain one with no metal clips to hold and perhaps scratch the film, and no plastic ribs to separate the strips of negatives and perhaps make the contact prints unsharp. This type of contact printer is not quite as easy to use as the printing frame.

Or you can just use a sheet of plate glass and a flat pad under it as a contact printer. This is simpler but less convenient than the others.

Elaborate boxes with glass tops, hinged covers, and lamps inside are sold for contact printing, but I don't need one and you probably don't. I think they are meant for commercial mass-production contact printing.

Safelights. Elaborate and costly ones are available, but to me they seem no better than ordinary ones that use 15watt bulbs and amber filters such as the Kodak OC, safe for both contrast-graded and variable-contrast papers. I like a dark darkroom: that way, my safelights never fog my prints. I don't try to judge print tones by safelight illumination; it's too deceptive.

Inspection board and light. You can't reliably judge print tones by just any white light, either. It helps to set up an inspection board and a light for the purpose. This seems to be something the photo industry hasn't yet thought of, so you must improvise your own setup. Here's a simple way.

Fasten a large, white, plastic processing tray to the wall above your fixer tray or your water tray, bottom out. Light it obliquely with a reflector-spot or reflector-flood bulb in the 75- to 150watt range. This lamp can be mounted on a swiveling spring clamp. Its light should strike the surface of the board at 45 degrees or a flatter angle to prevent surface glare. Move the lamp around until you get even light of the right brightness across the whole board.

How bright should the light be? There is no standard; you must experiment. But here's a starting point: the brightness of the inspection board. A reflected-light meter reading on my white board with the meter set at ASA 400 gives an indicated exposure of 1/45 sec (between 1/30 and 1/50 sec) at f/ 11. This works for me, but you may need a different brightness. There's a large subjective element here.

To work it out, find a good print with a full range of tones from white to black, soak it in water for 10 minutes, and put it up on the board. Adjust the light until the print looks its best in all tones and the light is even across the board according to your light meter.

Why wet the print? Because prints darken and lose some contrast when they dry. When you start with a wet print chosen because it looks good dry, you have a fair chance to make new prints that look good wet on the board and still look good when they dry. (I should warn you that different papers "dry down" somewhat differently. This is not an exact science.)

You may need to readjust the light. If your prints turn out too dark, your inspection light is too bright; move it away from the board. If your prints are too pale, your inspection light is too dim: move it toward the board. Keep adjusting until your new prints dry neither darker nor lighter than you want them. Then leave the lamp where it is.

Print washer. You don't need one for RC prints; a tray wash is fine for them.

For fiber-base prints, you don't absolutely need one, but it can save a great deal of dull labor. I do not recommend flat, round ones that swirl the prints around in a clump; you can wash just as well by hand labor in a tray. Most socalled print washers, in fact, are almost useless.

I suggest you get the best archivalprint washer you can find: this need not be the most expensive one. These washers have upright tanks and dividers in them hold the prints separate.

A print washer should fit in your sink without crowding everything else out. It should wash prints well with either rapid or slow water flow, should hold water without leaking when the flow is turned off, and should be quick and easy to drain. The easier it is to clean the washer, the better.

Beyond that, we still don't know enough about print washing to be sure exactly what a print washer should be like. We have learned that it doesn't matter whether the water flows upward or downward in the tank, nor whether it's aerated. Common sense and some tests combine to suggest, without certainty, that the less water per print the tank holds, the more efficient the washer should be, since that way hypo-laden water is replaced by fresh water more often at any given flow rate. The water does not need to rush past like Niagara: hypo leaves fiber-base prints very slowly after the first few minutes of washing, and a slow stream will carry it away nearly as fast as a torrent.

The washer I now use and like is the Darkroom Aids washer designed by John Brezina. It has a compact, stainless-steel tank and a plastic lift-out print cage. I like it for its convenience and compactness: its washing efficiency is similar to that of the other washers now available.

Other archival washers that wash prints well, when used intelligently, include the Paterson print washers, the Kostiner archival print washer, and the Clear Solutions and Zone VI ones. The



And these are convenient to have around

Scissors.

A hardbound notebook (the print log). Magnifier or loupe.

"Feedback suppressor": A card with a negative-size window in it to isolate pictures on a contact sheet for inspection.

Note pads.

Black markers: Coarse felt-tip ones, and laundry markers for smaller writing.

Pencils and pens: Soft pencils and a ball-point pen.

Stiff, thin cardboard for dodging and burning-in.

Dodging tools: Small opaque disks on thin, stiff wire handles.

Freezer tape: For bottle labels and to hold paper boxes closed.

Protective hand cream: Against irritants in processing chemicals.

Thin latex gloves: Against toxic chemicals.

Knife: Mostly to open paper boxes.

Spare light bulbs: For the enlarger, the safelights, the room light, and the inspection light.

Extra towels and paper towels.

Pushpins or thumbtacks.

Soap, stainless-steel cleaner, etc.

Household sponges.

Variable-contrast printing filters.

Discarded prints: to put in the easel, blank side up, for focusing on.

last two are nearly identical. East Street Gallery washers are no longer made, but are excellent.

Processing chemicals

Start simply with ones you can buy. *Paper developer.* I suggest Kodak Dektol. Mix one gallon at a time.

Stop bath. Mix your own for each printing session. It takes a few seconds. Add 50 ml of 28-percent acetic acid to each liter of water, or $1\frac{1}{2}$ fluid oz. per quart. A quart or liter is enough for 20 8x10 prints.

Fixer. For RC paper, I'd suggest Ilfospeed Fixer, Unicolor B/W Fix-1, or a similar product. Typically, these are nonhardening rapid fixers.

For fiber-base papers, I'd suggest Kodak Fixer (that's the name of the product). It is a hardening nonrapid fixer. It's okay for RC papers, too.

Washing aid. You don't need a washing aid with RC papers. For fiber-base papers, they are extremely useful. Not all washing aids work equally well: preliminary tests indicate that among the most effective are Heico's Perma Wash, Kodak Hypo Clearing Agent, and Edwal 4 and 1 Hypo Eliminator. (Of the many products I haven't yet tested, some may be equally good.)

Wash much longer than the instructions that come with washing aids tell you to: in every test I've made, the recommended wash time has proved to be much too short.

Residual hypo test solution. No wash time is right for all conditions and purposes. To find out what wash time you need, test "prints" from the wash for residual hypo: when the test solution makes no stain, the wash is at least better than most, and may be complete.

I know of two residual hypo test solutions that can be bought: the twofluid-oz. Kodak Hypo Test Kit, CAT 196 5847; and Heico's four-fluid-oz. PW Residual Hypo Indicator, available directly from Heico, Inc., Delaware Water Gap, Pa. 18327.

The test "print" should be a sheet of unexposed photo paper of the same kind as the prints you're washing are on, which has been put through the developer, the stop bath, and the fixer in the same way as the prints. The silvernitrate stains don't come out.

For print drying

RC prints can simply be hung up by



Rack for drying prints hangs from the ceiling.

one corner to dry. For fiber-base prints you'll need a squeegee (the windowwashing kind is fine) and either some photographic blotters or some fiberglass screens. The prints can either be laid on a screen face-down and left until dry or, better, held between two screens to limit warping. If you use blotters, which give you flatter prints, avoid all nonphotographic blotters for chemical reasons. Squeegee water drops off fiberbase prints before putting them in blotters or on screens. (There's more to drying prints, but that's the subject of another article.)

I don't need a heat dryer, and probably you don't.

Enlarging papers

Start learning to print with a normalcontrast glossy RC paper. Grade No. 2 is "normal contrast," and so is variablecontrast paper used without a filter.

Here's a short list of good RC papers I've used. There are certainly others as well. Start with just one paper and stay with it until you know what you're doing. The list is just to pick from: you don't need them all.

Ilfospeed Glossy No. 2; Ilfospeed Multigrade Glossy; Agfa-Gevaert Brovira-Speed 310, No. 2; Unicolor Resin Coated Photographic Paper, Glossy No. 2; Kodak Polycontrast Rapid RC II; Kodabrome II RC, Medium.

The glossy surface gives you a greater range of tones than dull-surfaced paper can, and normal-contrast paper fits the tones of most good negatives. The reason for starting with blackand-white RC paper is that it is quick and simple to process and dry. You see your results quickly and with a minimum of work. The main disadvantage of RC is that at present these papers are considered less permanent than wellprocessed fiber-base papers; the prints may not last as long.

Once you are printing well enough on RC papers to begin to want permanent prints, then start learning to use fiber-base papers. They need more processing steps and more care, but they reward you for both. Here, too, start with a glossy No. 2 paper; and I suggest you use double-weight paper. It's easier to handle without damage than single-weight paper and curls less when dry. It costs more, but then, you get more.

Here are some good fiber-base papers I've used. Again, there will be others. Again, stick to one paper at least until you feel at home with fiber-base print processing.

Ilfobrom 2.1K (DW glossy No. 2); Kodak Medalist F2, DW; Kodak Polycontrast F, DW; Oriental Seagull G-2 (DW glossy); Agfa-Gevaert Portriga-Rapid PRN 111 No. 2 (DW glossy); Unicolor Exhibition SG2 (DW glossy).

If you try more than one of these papers, you may notice that not all No. 2 papers have exactly the same degree of contrast. That has never been standardized by the industry. The variety that results can be useful, though, so don't let it worry you.

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