Making Photogravures with polymer plates

A modern technique of historical photo-mechanical printing using steel-backed polymer plates, etched with water, and printed by hand with traditional intaglio processes.

Scott Barnes
Sample Chapter
not for resale

Note: The images in this sample chapter are in color. The images in the first edition of the entire book are black and white.
Chapter 5
Base Exposure Time

The base exposure time is the minimum time needed to achieve 100% black. The time is different for each person's work flow because of several variables that affect the intensity of ultraviolet radiation.

**Strength (and type) of UV radiation**

Different exposure units emit different levels of ultraviolet light. They will also emit different wavelengths of ultraviolet light. Most commercially available exposure units are calibrated to emit between 340 - 370 nm, but you should check the bulb type to make sure.

**Distance from UV source**

The farther away the polymer plate is from the ultraviolet source, the less UV radiation it will receive in any given time. The plate will need more exposure time the farther away it is from the UV source.

**UV absorbing layers**

Glass and plastic block varying amounts of ultraviolet light. Thicker glass or plastic will block more ultraviolet light than thinner glass or plastic. The image transparency is made of plastic, and will block some ultraviolet light before it has any ink printed on it. The glass in the contact frame will block some ultraviolet light. Some UV exposure units have glass that protect the bulbs. That glass will also block some ultraviolet light. (caution: while these layers block small amounts of UV light that will make a difference in your pictures, they do not block enough to make the work environment safe for your eyes. Protect your eyes by making sure your system does not have any places where light can escape, and by wearing UV filtering safety glasses!)

Photogravure is an intaglio printmaking process. Traditional copper photogravure uses an aquatint pattern (made with rosin) to create a very fine dot matrix in which the artist controls the depth of each dot. The deeper the dot, the more ink it will hold. More ink means deeper tone. Less ink means lighter tone. KM73 polymer plates are fine enough to hold a similar dot matrix. However, the way the “aquatint” is created is different. Instead of using a traditional aquatint process, polymer plates must be exposed to a film that has a random dot pattern (preferably using a stochastic screening process that appears random to the human eye). This “stochastic screen” creates the “aquatint” on the polymer plate. The terms “stochastic screen” and “aquatint screen” are used interchangeably in many printmaking circles.

Each artist must experiment to discover how long to expose the KM73 plate, with the stochastic screen, to make a good enough aquatint pattern to print 100% black. Once the base exposure time (minimum time) is found, a simple calculation can be made to find the optimum exposure time.

Making Photogravures with Polymer Plates by Scott Barnes
With the safe light turned on in the darkroom, take out one of the KM73 plates and place it on the contact frame. Trace a line around the plate. (If the frame you made is has a black backing, you can use tape to trace the outline of the KM73 plate.)

Make marks at regular intervals outside the traced rectangle of the plate. These will help guide you as you expose different parts of the plate for different amounts of time to UV light.

Depending on the exposure unit you have, times can vary from just over 1 minute to 16 minutes long. If you do not know the intensity of your system, you may want to make many marks, allowing you to make many exposures.

Write the times on the contact frame. Do not rely on memory to record the exposure time.

The marker will wash off the plate during processing, but the ink will have blocked enough UV light to leave visible marks. You can also scratch the plate instead of using a marker. The plate needs to be marked so that the times can be found later.

The experiment shown in this chapter exposed this plate from 2 minutes to 16 minutes, in 1 minute intervals.
(image 5-05) Remove the protective UV film from the top of the plate.

(image 5-06) Make sure that the marks on the contact frame and the marks on the plate are lined up.

Being slow and methodical during this entire process will save you a lot of headache in the future. The goal is to get very useful information that is going to be the basis of future calculations. Make sure that the plate does not move during this experiment.

(image 5-07) Place the stochastic screen ("aquatint screen") on top of the plate.

(image 5-08) Leave a small part of the plate uncovered by the stochastic screen.

The printed side of the screen must face the emulsion side of the plate. The KM73 plates have steel backings with greenish polymer emulsion on the front. The printed side of the stochastic screen has a matte appearance to it. The other side will appear glossy.

Leaving a small part of the plate uncovered will give it full exposure to UV light, curing it. Any writing on that part will be readable. This is the part where you will have made marks by scratching (or with some kind of marker) that will allow you to track the different exposure times.
(image 5-09) Clamp the glass to the top of the contact frame to hold everything in place.

(image 5-10) Place the contact frame over the exposure unit.

The acid etched side of the glass (matte) must go against the stochastic screen.

Here is the order for the stack you have created:
UV exposure unit, (ultraviolet light shines through the glass, through the screen, onto the plate)
contact frame glass,
stochastic screen,
KM73 plate,
contact frame back

(image 5-11) Expose the plate for 2 minutes.

(image 5-12) Remove the contact frame from the UV exposure unit.
(image 5-13) Carefully unclamp and remove the glass. Do not allow the screen or the plate to move in this process.

(image 5-14) Using the light-blocking bag that the plates are shipped in, cover a strip of the plate that was marked with a 2'.

The light-blocking bag goes on top of the stochastic screen. If it went between the screen and the plate, it would create gaps through which light could leak.

Make sure that the edge of the light-blocking bag lines up with the mark that was made on the plate and contact frame. This is how you are tracking the exposure times.

(image 5-15) Clamp the glass on top of the bag (screen, and plate). Place the entire contact frame on top of the UV exposure unit, and expose it for 1 minute.

(image 5-16) After the 1 minute exposure, move the light-blocking bag over by one mark. Replace and clamp the glass. Expose for 1 more minute.
After the 1 minute exposure, move the light-blocking bag over by one mark. Replace and clamp the glass. Expose for 1 more minute.

This exposure process is additive. The initial exposure of 2 minutes plus any additional time that the section of the plate is left uncovered. 2 minutes, +1= 3 minutes, +1= 4 minutes, +1= 5 minutes, +1= 6 minutes, +1= 7 minutes, +1= 8 minutes, +1= 9 minutes, +1= 10 minutes, +1= 11 minutes, +1= 12 minutes, +1= 13 minutes, +1= 14 minutes, +1= 15 minutes, +1= 16 minutes. If you have some data that gives you an idea of how long your exposure needs to be, you may choose a smaller time range for your experiments, and work with shorter intervals, to achieve finer results.

After making all of the exposures, place the plate in water and let it sit for 1 minute.

This entire washout process only takes 2 minutes: 1 minute soaking, 1 minute gently brushing. The brushing process is not a scrubbing process. The brush should move back and forth across the plate in a varying pattern with no more weight on it than the weight of your resting and relaxed hand. (see chapter 1)

Caution: wear gloves for this part of the process. These commercial plates were not designed for handling with bare hands.
Immediately after washout, bring the plate over to a flat surface and dry it with paper towels.

Gently pat the paper towels to quickly absorb most of the water.

Wet polymer plates are still not 100% cured, and are vulnerable to over-handling. Remove the water quickly and gently. Do not scrub the plate or you will ruin the dot matrix that has been created by the stochastic screen.

Crunch the paper towels into a ball, quickly and carefully blot the rest of the water from the plate.

Run a hair drier across the plate for 5 - 9 minutes. This will heat cure the polymer on the plate.

This part of the process is tricky. Applying too much pressure with the paper towels will leave an impression on the polymer plate. Any water that is not removed from the plate quickly will leave marks as well. Set up paper towels before beginning the exposure process so that they are ready to go as soon as the plate comes out of the washout tray.
Prepare the magnetic work surface for printing.

Placing a piece of newsprint over the magnetic surface will help keep the work area clean, and allow you to pick up the steel-backed polymer plate easily.

The polymer plate must still be post-exposed (after being fully heat-cured) before printing. The post-exposure time is at least as long as the base exposure time. Since this experiment is about finding the yet-to-be-known base exposure time, then it is better to err on the side of caution. Let the heat-cured plate sit in a sunny window for an hour. After that exposure to sunlight, post-expose the plate for the same amount of time as the longest exposure time in the experiment (in this example: 16 minutes) More is explained in chapter 1.

Prepare ink for printing.

Use a soft plastic scraper to pick up the prepared ink.
Chapter 5: Base Exposure Time

**Note:** Some steps are skipped, with the assumption that you have read other chapters about preparing ink, inking and wiping a plate, and printing. These selected steps have been left in this chapter so that you can see the overall workflow involved with finding the base exposure time.

- chapter 1 Main Workflow: (includes all missing steps for inking and printing)
- chapter 9 Preparing Paper
- chapter 11 Preparing Ink
- chapter 12 Folding Tartan
- chapter 13 Inking tips

(image 5-29) Spread ink on the plate.

(image 5-30) Wipe plate with tarlatan.

(image 5-31) Final wipe with pieces of phone book or tissue paper.

(image 5-32) Get a piece of paper.
Place paper on blotter.

Blot the paper once.

Blot the paper again.

Center the inked plate on the bed of the press.

Place a second piece of print-making paper (dry) over the blotted print-making paper.
Pull the wool blankets over the paper and plates. Run everything through the press to make a print.

Compare the print with the plate. Look for the first strip that prints 100% black. Note the exposure time for that strip.

Paper towel pattern will show up in the print because of the underexposed areas in the polymer plate. Do not worry about this pattern in this test plate.

Do not clean the plate right away. It contains valuable information that is easier to read when it has ink in it after printing.

Place the inked plate on to the contact frame and match the numbers.

In the print, 10 minutes seems to be the time needed. Looking at this plate, however, seems to indicate that there is some more density in longer times.

Chapter 5: Base Exposure Time
10 minutes is the shortest exposure that achieves 100% black in this print. But, there is more to it than just reaching 100% black. The minimum exposure time is the base exposure time, but it is not the optimum exposure time. Looking at the plate, which still has ink in it (image 5-44), indicates that the 10 minute strip has a rough aquatint pattern. Longer exposure times still print 100% black, but the plate shows a finer aquatint pattern. A finer aquatint pattern will yield better tonal range in later steps.

Under such high printing pressure, ink blurs and blends a bit. This blending compensates for some imperfections in the aquatint pattern on the plate. But, it only compensates for 100-90% black. The imperfections start to show at 80% and lighter. After experimenting with a few different exposure units, having run this base exposure time experiment several times, I have developed a formula that provides an optimum exposure time. The optimum exposure time is one that produces an aquatint pattern that most accurately matches the pattern of the stochastic screen.

\[ \text{minimum exposure time} \times 1.6 = \text{optimum exposure time} \]

I use the optimum exposure time as the time for both the stochastic screen exposure and the image exposure. For the experiment in this chapter the minimum exposure time (a.k.a. base exposure time) is 10 minutes. To find the optimum exposure time, multiply 10 minutes by 1.6 to get 16 minutes. I’d use 16 minutes for the stochastic screen exposure, and 16 minutes for the image exposure.
(image 5-46) Here are the notes from the experiment run in this chapter.
“Jeep”