SINGLE ACID ETCHING

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■ The concept of single-acid, or one-bath etching for rotogravure cylinders and plates is becoming more widely accepted and is being more fully exploited today. To take full advantage of single-acid etching requires a systemized approach. A single concentration of ferric chloride together with properly prepared carbon tissue permits the etching of gravure cells to predictable depths from solids through highlights. Cell conformation and tonality are excellent: a high order of repeatability is inherent.

Our single-acid etching system is based on three facts:

1. If highlight etching time ("sinking time") is kept a fixed percentage of highlight opening time, highlight cells will be etched to precisely predictable depths.
2. Identical carbon tissue resists will produce identical etchings in spite of variations in etching time, provided:
   a. Sinking time is kept the same percentage of highlight opening time.
   b. The iron Baumé is unchanged.
3. By teaming up a suitable carbon tissue exposure with a suitable Baumé any usable range of cell depths can be produced from standardized continuous tone positives. (You can etch 150 line conventional two-to-fifteen microns, two-to-sixty microns, or any range in between.)

Arc, pulsed-xenon, mercury vapor, or "blacklight" (ultraviolet fluorescent) lamps may be used for continuous tone positive exposures. A simple bracketing test and a system for plotting results makes interpolation for precise data easy. Only two facts need determination—carbon tissue exposure, and Baumé.

Accompanying illustrations show four examples of exposure-Baumé curves. Three examples for arc light tone exposures are given: (Figure #1) Kuhlman Siegwerk (French)

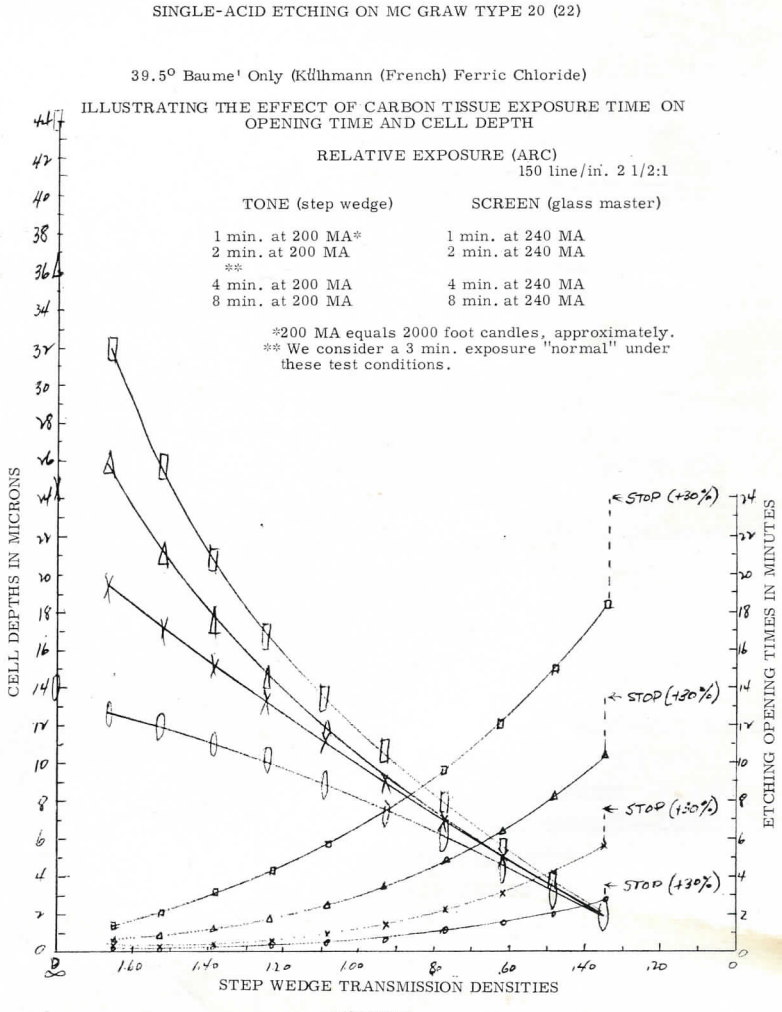

FIGURE 1

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ferric chloride at 39.5° Be; (Figure #2) Hunt's Blue Label (American) at 40.0° Be; (Figure #3) Hunt's Blue Label at 40.5° Be; Figure #4 shows Exposure Baumé curves for Blacklight tone exposures in Hunt's Blue Label at 40.5° Be. Figure #5 is a Sinking-Time Curves which allows you to preselect highlight cell depths systematically.

Procedure may be broken down into the following steps:

1. Review your carbon tissue processilng procedures and be sure they are standardized and consistent.
2. Review your cell depth range requirements and study the Exposure-Baumé curves choosing the one whose three upper cell depth curves most nearly meet your needs. (The bottom curve in each chart intentionally demonstrates the effect of carbon tissue underexposure.)
3. Our systemized procedure is based on Hunt's Blue Label ferric chloride. Prepare a quantity of this ferric chloride (or equivalent in terms of *both* penetration rate and copper removal rate at equal concentration) to the indicated Baumé with an accuracy of ±1/10 degree at a temperature of 70°F.
4. Expose your master step wedge plus an "excellent" continuous-tone positive of standardized density range (GTA .35 to 1.65) on three sheets of carbon tissue consecutively.
   - Sheet #1—Expose ½ your normal tone time (or integrator units) and ½ your normal screen time.
   - Sheet #2—Give your normal tone and normal screen exposures.
   - Sheet #3—Expose twice normal tone and twice normal screen exposures.
5. Wait one and a half hours (to minimize continuing action differences), then lay the three sheets on a cylinder (or plate),

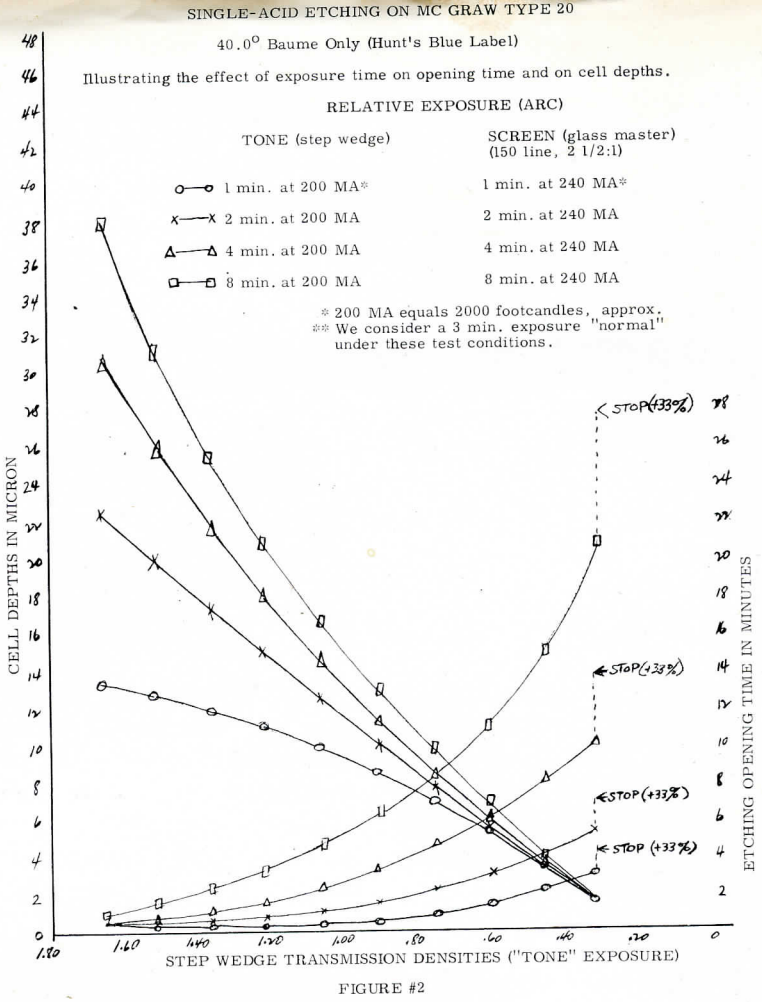

FIGURE #2

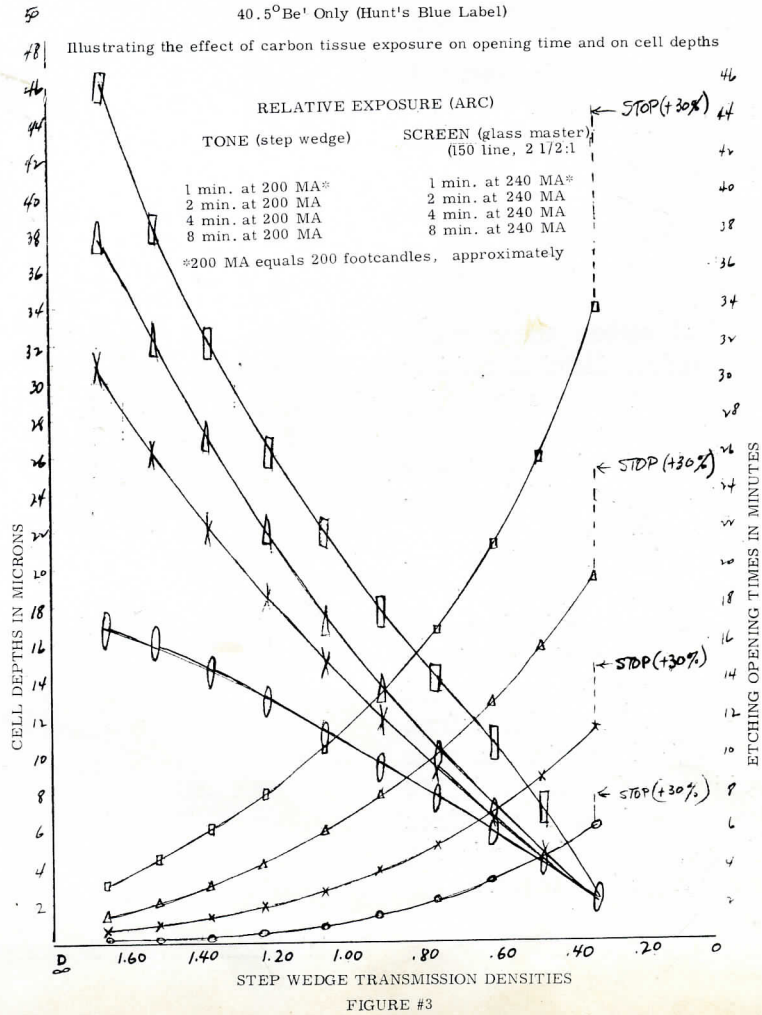

FIGURE #3

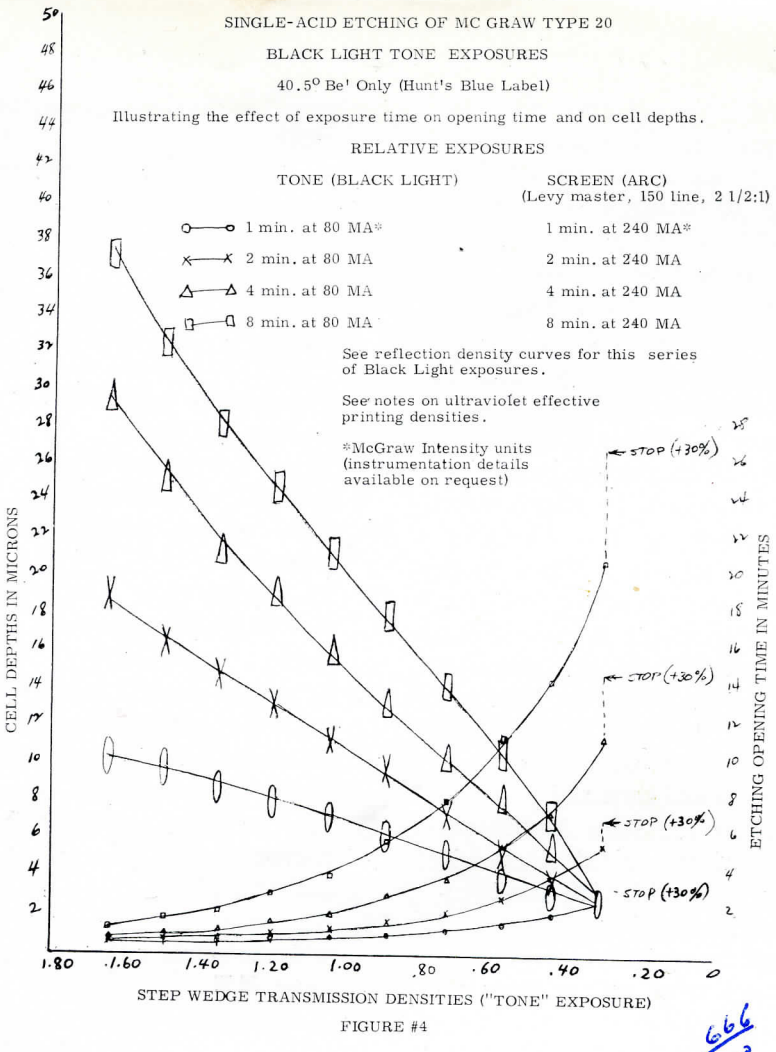

FIGURE #4

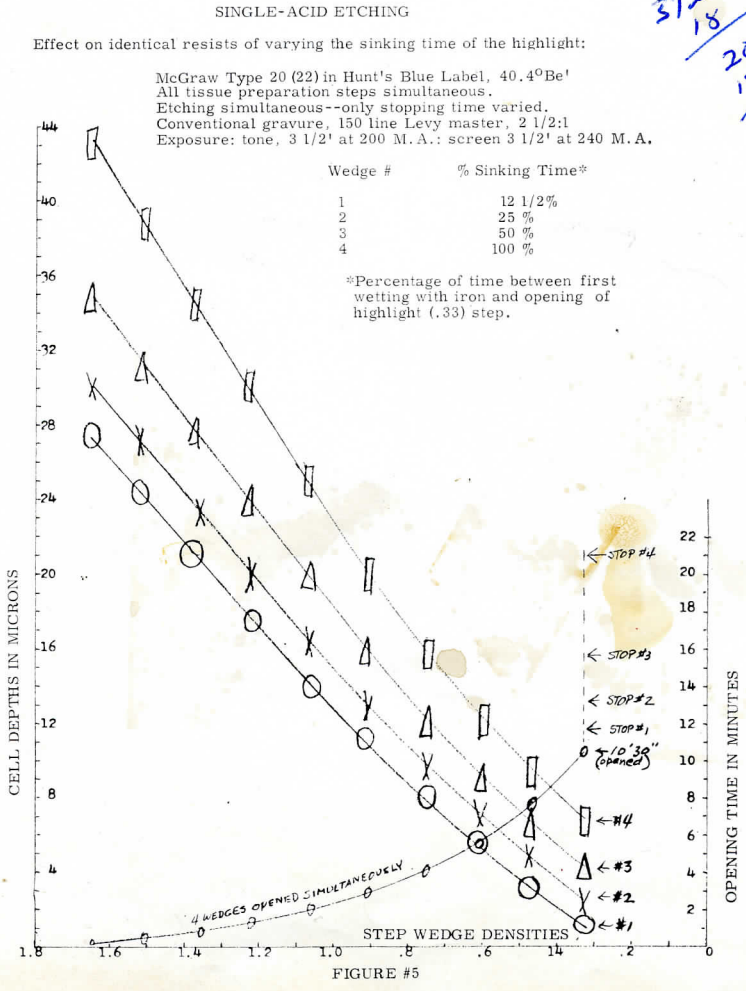

FIGURE #5

develop, cool, rinse and dry per standardized processing procedures.

6. Wait at least two hours with good air circulation to insure resist moisture content equilibrium. This time can be used for painting up the cylinder and reviewing the exposure-Baumé curve to determine if the expected highlight opening time will be nearer five, ten, or 20 minutes.
7. Check cylinder, iron, and air temperatures (they would preferably fall between 70 and 72°F. and be equal to each other.)
8. Pour the single Baumé smoothly over the slowly turning cylinder in one continuous overlapping spiral from one end to the other, *starting the timing clock at the same moment.* (You pour to avoid trapping airbells.)
9. You can pour, swab, or (preferably) rotate in a close fitting tray brought up to liquid contact with the cylinder *after* the wetting by pouring.
10. Watch the three resists to see which one's *highlight* will open nearest the time anticipated.
11. Ignoring the other two resists determine the time at which the .35 highlight of the chosen resist opens and begins to etch.
12. Multiply this time in minutes by 1.3 (this is equivalent to adding 30%) and stop the etch at the calculated time by flushing liberally with water.
    a. If you want a 2 micron highlight (conventional gravure), add thirty percent. (Multiply by 1.3).
    b. If you want a 5 micron highlight (magenta screen lateral dot positives), add 60% (multiply by 1.6).
    c. For other depths, see the Sinking-Time Curve. (Figure 5).
13. Clean up the cylinder, measure depths of highlight and solid, proof, the cylinder and assess your results.

14. If you are too flat, repeat the etching using tone and screen doubled exposures.
15. If you are too contrasty, repeat the above using half the exposure.
16. Do not be timid about this. Bracket your cell depth needs. By doing so you are much better prepared to interpolate to correct and final values on the third try.

On subsequent etchings watch tissue exposure and processing carefully: watch Baumé and temperatures. Do not be overly concerned by highlight opening time changes as large as twenty percent. Continue to give the same percentage Sinking Times and the etchings will be found to be identical from positives of standardized end densities.

Let the tissue and iron do their work without interference. Particularly, do not change the Baumé. If you have truly prepared, exposed, and processed the tissue systematically, and if your Baumé and etching temperatures are unchanged, the etchings produced will be identical in spite of changing penetration times. (The slower the penetration, the slower the copper removal. The two effects are self-cancelling and identical etchings result.)

An exception to the prohibition against changing the Baumé would be to "save" a cylinder on which one or more subjects, through inaccurate density assessment or other errors, are obviously out of etching step with the others. In this case local "doping" can be done to provide the re-etcher something to go on. For doping, a Baumé *no more than one degree lower* than the standard Baumé will suffice. The cause for the imbalance should then be traced to its source and corrected.

Following are some further advantages of systemized single-acid etching: In addition to tonal superiority, increased smoothness and improved repeatability:

1. Rough tones and/or "tone reversal" in the shadows does not occur.
2. "Dark Halo" is eliminated. Shallow highlight cells show excellent uniformity and smoothness.
3. Highlight contrast is greatly improved.
4. The resist survives evtremely long etches to great depths with no signs of distress.
5. There is no tendency to break through non-etching areas.
6. Total etching times are decreased.
7. The etcher can demonstrate that he has done his work correctly.
8. Control of pictorial tonality reverts to the photographic department where it, properly, has always belonged.
9. Proofing techniques can be improved through greater standardization.
10. Re-etching can be concerned with the subtle rather than the gross. ■ ■

I Tone Reversal -

II Dark Halo - non uniform opening and etching