Superficially, view camera photography appears to be a simple procedure. We set up the camera, frame and focus the selected subject area, then meter a dark area of the scene to determine the exposure, and a light area to discover the subject contrast range, which determines development. Then, we set the shutter speed and aperture, pull the slide, and shoot. If we’ve visualized and metered appropriately, and controlled development effectively, the odds are good that we’ll produce a fine negative that will print easily and well.

Of course, the operative words here are “appropriately” and “effectively.” How do we know how much exposure the film needs to record shadow details with neither too much nor too little density? And, how do we know what developer to use, at what dilution and temperature, and for how long? One way to get this sort of information is to consult the manufacturer’s data sheets, but it’s preferable to test your chosen film, film developer, and paper yourself.

Traditional test methods rely on trial-and-error and are notoriously wasteful of both time and materials. Although the working data derived from them are limited in scope and somewhat simplistic, these empirical tests, if done sensibly, are generally satisfactory, because the photographic process is remarkably forgiving, and “close” is usually good enough to avoid failure.

But BTZS offers a better way. By moving the test procedures into the relatively controlled environment of the darkroom and substituting sensitometric analysis techniques for traditional test methods, we can produce more
reliable working information — and much more of it — than trial-and-error methods can provide. Furthermore, there’s a dramatic saving of both time and materials; for example, paper tests can be completed in an hour or two, and, after a one-time setup operation, it’s possible to do a complete film test in a couple of hours, using only five sheets of film.

Traditional testing usually treats films and papers as separate exercises, with greater emphasis on films. The aim is to produce a good negative first, then adjust the paper to match it during the printing process. BTZS reverses this approach by testing the chosen paper first to determine its contrast characteristic, then tailoring the film test data specifically to match the paper.

BTZS tests papers by running through all the grades (or VC filters), exposing them identically to a standard 21-step step tablet, and developing them normally. The step tablet provides an exposure range (ER) of about 10 stops, which is sufficient to exceed the range of most papers.

Here is the family of Ilford MG FB paper, using MG filters #s none, 00, 0, 1, 2, 3, 3-1/2, 4, 4-1/2, and 5. These curve families can be plotted by hand, but that’s tedious, so we normally run the test numbers through the special BTZS “WinPlotter” computer program to produce these graphs.1

In these film and paper graphs, the horizontal axis (x-axis) is calibrated in step tablet densities increasing from right to left, which means that the corresponding increments of exposing light transmission must increase from left to right. These are common log numbers, so an interval of 0.3 represents a factor of 2x, or one stop. For example, step 0.9 is 1/4th as dense as step 1.5, so it transmits 4x as much light, equivalent to an exposure increase of two stops.

The graph’s vertical axis (y-axis), also calibrated in logs, displays paper densities increasing from bottom to top. In this scale, 0.0 density represents paper white (minimum density or Dmin), and the curves top out at 2.1, which defines this paper’s maximum black (Dmax).

Paper choice is subjective, so let’s assume that, after considering image tone, weight, surface, etc., we decide to work with the sixth curve in this family, which is nominally filter grade #3. Plotter isolates and analyzes it instantaneously.

By convention, the useful limits of the paper curve are IDmin (minimum image density), set at 0.04 over Dmin, and IDmax (maximum image density) set at 90% of Dmax. In this example, Dmin is 0.00, so IDmin is 0.04 and IDmax is 1.89, for a density range (DR) of 1.85.

Tracing the IDmin line across to the curve, then down to the x-axis, we find that the minimum useful exposure, Emin, is provided by a negative density of 2.56; less light than this will underexpose the paper, and will not contribute usefully to image highlight formation. Similarly, running IDmax across to the curve, then down, shows that Emax, the exposure that will result in borderline black, is supplied by negative density 1.47. More exposure than this will overexpose the paper and produce total black. Subtracting 1.47 from 2.56, we find that the paper’s useful range of exposing light intensities — its exposure scale (ES) — is 1.09. In general, printing is easiest when the negative’s density range (DR) closely matches the paper’s ES, so the next step in the testing process is to produce a negative whose DR is 1.09.

Incidentally, while doing this analysis, Plotter has discovered that this is really a grade #2 paper, not a grade #3 as suggested by the filter number. This is not unusual; papers’ grade numbers often differ from one manufacturer to another, occasionally by as much as two grades. This is one more reason for relying on personal test data, rather than the manufacturers’ numbers.

The film tests are begun by contact printing the 21-step step tablet on each of five film sheets, using the enlarger as the exposing light source. A previously determined basic exposure setting, sufficient to print about 18 of the step tablet’s 21 steps, is adjusted as necessary to match the film’s rated ISO speed. The five films are exposed identically, using an exposure time of 1/2-second or less, to minimize reciprocity effects. The exposed films are then loaded into individual light-tight development tubes to await processing.

The BTZS tube development procedure is an important part of the system, both for its convenience and its efficiency.2 Each tube contains its own measured quantity of developer, and processing is accomplished by roll-
Taking the middle curve, for example, the developing time is eight minutes; the effective film speed (EFS) is 400+, the average gradient (G-bar) is 0.60, and the subject range (SBR) is 6.1 stops — all this calculated to produce the desired negative DR of 1.09 to match the paper’s ES.

Here’s what Plotter has done:
1. Located IDmin on the selected curve’s toe, using a method similar to Kodak’s Contrast Index procedure.
2. Added 1.09 (our desired DR) to IDmin (0.16) to find IDmax (1.25), thus defining the useful section of the curve.
3. Subtracted Emax (0.59) from Emin (2.42) to find the exposure range LogE (1.83).
4. Converted LogE to stops (1.83/0.3) to find the SBR (6.1 stops).
5. Compared the curve’s speed point (Emin 2.42) with a previously-established ISO reference point (2.4) to find that, under these conditions, this film is very slightly faster than its ISO rating.

When all the curves have been analyzed this way, Plotter calculates and displays working data in chart form, plotting effective film speed (EFS) and developing time (Dev) against subject brightness range (SBR), G, and N-numbers. Here are the SBR/EFS and SBR/Dev charts, showing that, for example, for a normal (7-stop) SBR, this film/developer combination preserves its full rated film speed, ISO 400 (Figure 6), when developed for seven minutes (Figure 7).
The backlighting of this image turned the leaves to “silver” edged with attractive specular reflections on a pallette of dark, shimmering water. Using a 4x5” field camera mounted low, on a tripod with unextended legs, I obtained the desired image size with a 305 mm lens, set the aperture to f32, and further secured focus across the plane of the water with a very slight forward lens tilt. A polarizing filter removed distracting glare from the pond’s surface and provided a clearer view of the submerged plant stems. Exposure was easily determined with just two incident meter readings and the BTZS ExpoDev PDA program containing files from my personal paper and film tests. For this image, I selected a film exposure/development combination to match Kodak’s Polymax Fine Art paper “grade 2”, with a tested exposure scale of 1.08.

I took the “high” reading in the direct sunlight above the leaves and bloom, tilting the meter up slightly (and away from a straight line toward the camera) in order to hold the high values. I simulated the low value by taking the reading in the shadow of my camera bag, which was situated just to the left of the pond, only a few feet away from the image. Entering these values into ExpoDev produced an 8.5 stop subject brightness range which, when combined with entries for the polarizing filter and the close-up distance from subject to camera, resulted in a calculated exposure of 1.82 secs.

The negative, which was developed for the time calculated by ExpoDev (again, using data from my personal tests), prints easily on the targeted paper grade, requiring only slight dodging of the bloom and edge burns (with card moved in and out) to frame the image.
This chart information can be used directly in the field. For example, if you find some subject's SBR to be eight stops, you can see that the speed loss is negligible, so the meter can be set on 400, and the appropriate development time is about 5:40.

But, again, BTZS provides a better way. By exporting this film file to a companion program, “Expo/Dev,” installed in a handheld PDA device such as a Palm (Figure 8), the working data are refined and greatly enhanced. For example, Expo/Dev supports both spot and incident metering methods, and stores dozens of instantly available film/developer files, each containing automatic individualized reciprocity compensation for both exposure and development. It also calculates filter and bel lows factors, calculates depth of field, includes a timer for long exposures, allows unlimited “what if” adjustment of apertures and shutter speeds, calculates exposure settings, displays average gradients plus actual developing times, and stores a complete record of settings and calculations, including optional descriptive notes. In other words, Expo/Dev takes care of all the technical details, leaving you completely free to concentrate on the creative interpretation of your chosen subject matter.

Users who choose the “Zone” metering option are asked to enter the usual two meter readings and their corresponding zone assignments (Hi EV, Hi Zone, Lo EV, Lo Zone), from which Expo/Dev immediately calculates SBR, G-bar (instead of N-numbers), and EFS. The “Incident” option does similar calculations from only two entries (Hi EV, Lo EV). After these calculations, the two metering methods are treated identically.

The Incident Method, which most BTZS users seem to prefer, takes advantage of the fact that the incident meter’s translucent dome transmits 18% of the ambient illuminance to the photocell underneath, a light loss of 2-1/2 stops. Since that 18% represents average illumination, it suggests that the cell is “seeing” a total range of five stops—2-1/2 stops above and 2-1/2 stops below middle gray. This approximates the normal subject range of some color materials, but it is two stops less than the normal (seven-stop) range of B&W films. So, we extend it by taking two readings. A shadow reading takes care of the low range (dark gray to borderline black); a reading in full light records the high values (light gray to borderline white). Then, if the subject is normal, the difference between those two readings will be two stops, which we add to the standard five to find the SBR.

This procedure works well for any subject range within the film’s limits. For example, if the two readings overlap by one stop, the difference is –1, which, added to the standard five, yields a 4-stop SBR. Similarly, if the two readings differ by four stops, adding the standard five gives an SBR of 9. Of course Expo/Dev does this for you.

Readers who are interested in learning more about BTZS methods can visit http://BTZS.org to find several technical articles, and correspond with forum members via the message boards.

(Endnotes)
1 Available from The View Camera Store, www.viewcamerastore.com or 480-767-7105. They also provide a range of additional related services. See the article in the November-December 2006 issue for more details.
2 Available from the View Camera Store.
3 If you already own a similar manual tube processing system or one of the automated rotary tube systems (e.g., Jobo, Phototherm, or Wing Lynch) they will work equally well.
4 Available from the View Camera Store.
Phil Davis is the ‘father’ of the Beyond the Zone System. He is a bit elusive. After retiring from teaching in the U. of Michigan Art School, Phil spent many years revising his books (Photography and Beyond the Zone System) and being helpful to photographers one-on-one. Phil’s generosity devoting his time to helping others is typified by this anecdote from Howard Bond: “About 25 years ago, long after people had stopped using flash bulbs, I was interested in lighting a large room with open flash. I asked Phil how to figure the exposure. Without a moment’s hesitation, he said I should first put 100 watt regular bulbs in the room’s light fixtures, open the camera shutter, and turn on the wall switch to fire the bulbs. I asked Phil how to figure the exposure. Without a moment’s hesitation, he said I should first put 100 watt regular bulbs in the fixtures and take a meter reading. Then he told me how to convert the meter reading to a flash exposure. I wondered if there was another university art school photography teacher anywhere who could have answered that question.”