

A New Approach to Long-Fire Results

by Dick Lehman

Almost twenty-five years ago I decided to build a kiln (to pursue the pot-making I had first come to enjoy as a college student) as a post-graduate avocational interest. I built a wood-fired cross-draft kiln. My decision to build a wood-fired kiln was not so much an expression of my commitment to a wood-fired aesthetic as it was a pragmatic decision: I had a free source of firewood which was easier on my then-meager budget than all the other fuel options. Far from embracing the wood-fired aesthetic, I was 'put-off' by all that brown and yellow "stuff" (ash) which accumulated on my glazes....and in fact did all I could to minimize the presence of any wood ash.

Time passed, and the avocation grew into vocation. My next kiln was a reduction-fired gas kiln, built to accommodate the needs of a production studio, and designed with uniformity-of-results in mind. The wood kiln was torn down and salvaged to build the gas kiln.

After a few years of using the gas kiln, I began to realize what a "gem" I'd (unknowingly) had in that little cross-draft wood-fired kiln. As my visual literacy developed, I found myself wishing that I had understood more about that "yellow stuff" that had earlier been accumulating on my pots....wishing that I had taken better advantage of that little kiln for its wood-fired potential, rather than just having used it as a tool to make a chamber hot enough to melt glazes. But it was too late for that.

However some years later I had both the time and the space, and the money to rebuild a similar cross-draft wood-fired kiln, and to begin the exploration that I had earlier neglected.

Surprisingly, very little time passed before I knew I had "outgrown" this second cross-draft wood-fired kiln. It was a wonderful little kiln, producing toasty-warm unglazed surfaces. The "brown and yellow stuff" warmed and highlighted the pots. It was dependable, firing to temperature with little difficulty or obstinacy. But my visual literacy had been changing: I had grown to most-appreciate the wood-fired works which were produced by kilns which had been fired for four, or eight, or twelve days! loved the luscious flow of natural-ash glazes in a wide spectrum of colors against the pyroplastic forms of these long-fired pots. This was the tradition I wanted to drink from and to explore. These were the kinds of pots that I wanted to make.

But it was clear that my little cross-draft kiln would never produce these kinds of effects. And even if it would have, the production would have been so minimal that I questioned how practical or economical it would be to fire such a small kiln for a week or more — no matter how convincing the results!

As my interests shifted, the cross-draft kiln became increasingly abandoned...to the point where it sat unused for several years. I was simply not interested in firing a kiln which could never produce the kind of work that I wanted to make.

And here was the dilemma for me: I wished to make the long-fire pots, but couldn't. Certain real and genuine limitations stood in my way: I really didn't have the money to purchase some property where an anagama-style kiln could have been built (and I was reasonably certain that my neighbors would not be agreeable to seeing a giant anagama growing out of my diminutive kiln shed). And if I'd had the property, I would not have been able to afford the materials to build an anagama (or to take the time to 'scrounge' for the materials)...let alone, I worried, the skill to build and manage such a large kiln. But worst of all, the time requirements of my current commitments (to my wife and children, to my production studio, to my employees, to my customers) seemed to preclude the possibility of regularly spending 8 days in a row firing a kiln, instead of working in the studio.

The limitations of time and money and skill and location and property loomed large. For a long time, I simply foreclosed on the dream of making the kind of wood-fired pots from a tradition which really moved me. But then I finally began to ask myself whether certain of these obstacles might somehow be overcome, even while working within the genuine limitations which I faced. It was only then that I began to think outside the 'boundaries' I had earlier accepted, and to embrace the possibility that perhaps there was a new way to work within this tradition...a new way to make these works, apart from the ways in which they had been made before by others.

The first consideration was to see if I could build such a kiln on the property I already owned, without relocating or investing in new real estate. Keeping the kiln quite small seemed to be a requirement for such a possibility.

Once the idea of smallness was established, I quickly realized that the few bricks which I had already stashed away might indeed be about all that I needed to rebuild/add onto the existing kiln.

"Time" still loomed as the biggest obstacle. How could I possibly make 'eight-day-fired-pots' without firing them for eight days?

I began to ask myself if there might be a way to fire such a kiln without sacrificing a week of my regular work-day-schedule at the studio in order to do the firing. A new "step-down" grate design from New Zealand seemed to hold out some possible solutions to this puzzle.

I was almost startled one day to hear myself say aloud, "What would happen if I incorporated this new grate design, then built a firebox so large that I would be able to put five hours worth of wood into it all at once....then adjust the primary air and damper so that I would not need to stoke again for another 5 hours?"

"A silly idea!" said one potter-friend.

"Even if it did work," said another, "you would have only one "zone" in such a little kiln...all the pots would look alike. You don't want that! That's not wood firing!"

But the idea of large and only periodic stokes (in a HUGE firebox) struck a chord with me. Not only could I build such a firebox onto my existing cross-draft kiln (without enlarging my kiln shed), but I already had most of the materials (and all the skill) needed to build it.

And if I could stoke only every five hours, that would mean that I could stoke before going into work in the morning, then make the 10-minute drive home from the studio (for lunch) to stoke again (my only concession from my normal work schedule, to the firing of the kiln), and finally, stoke after work at the end of the day, and several times through the night (when I would be home with my family anyway).

"So far, so good," I thought. That left the new obstacle of the "one zone" critique, which I had encountered. What if, I thought, instead of relying on the physical length of the kiln to create zones, I were to create my own "zones" by developing a handful of noticeably different clay bodies. If all the clays responded differently/individually to the kiln's single environment, I would have created my own "zones" through the choice of clay bodies.

Solving this problem took the most time. Over two and a half years, I modified and developed 13 different wood-fired clay bodies. Thanks to the generosity of friends who did have sizable wood-fired kilns, I was able to strike a deal with 8 of them: in exchange for their firing my pots made from these new clay recipes, I would give them the recipes. It was a win-win situation for us all.

The results were most-instructive. After seeing the results from these 8 kilns, I settled on 6 bodies that I would wish to try in a new/rebuilt kiln of my own.

The calculations I had made, in the meantime, in an attempt to assess just how much wood might be consumed over a five-hour period in the beginning days of an 8-day firing, led to the initial design of a firebox which was half as large as the kiln....an unconventional solution at best.

But the space taken up by the step-down firebox grate forced the final design of the firebox to be even larger still. The result is a firebox which is almost as large as the kiln itself.

The time to test the idea had come -- I was committed to giving these ideas a try. The oversized firebox with step-down grate was constructed as an addition to the existing kiln. And the kiln was fired.

The firing schedule looked like this. For the first six-and-a-half days, I stoked the kiln only five times a day: 1) before breakfast, 2) when I ran home from the studio for lunch, 3) after returning home from the studio at supper time, and then twice more during the night. (I'd at first thought that I would make concessions to a "fussy baby" and get up in the wee-hours of the night for the 'night-feedin.'. But the more I thought about it, I decided to make the kiln further fit into my schedule: so I compressed the night stokings so that the last one was at midnight [my normal bed-time], in favor of a full night's sleep for me.)

Over the first six-and-a-half days the temperature in the kiln remained steady at near 1300 degrees Fahrenheit. And with adjustments to the primary air and damper, I could cause the kiln to take a full five hours to burn the massive amount of fuel from each stoke.

The step-down grate seemed to deliver oxygen evenly to all the wood, thus preventing an overly-reducing atmosphere in the early stages of the firing.

Due to the large quantity of wood being burned in this "warm-up" period of the firing, a "snow-storm's-worth" of dry ash accumulated on all the pots: exactly what I had been hoping to see!

At day six-and-a-half, I switched into full-time-firing mode, and spent the last 36 hours of the firing in what might be seen as a more "normal" schedule: the stokes during this last day-and-a-half were approximately 12-15 minutes apart. Because the kiln had previously been so thoroughly preheated, the time to reach maturation temperature was minimal. I was able to immediately begin to melt all the accumulated dry ash produced by the first six-plus days of the firing. I was able to spend most of the last 36 hours at, or near final temperature. During that time I chose a more neutral atmosphere (with damper setting) to climb up to near cone 11. Then I would reduce (with damper setting) back down to about cone 9. This "up-and-down" cycle took about an hour each time. The result was more than thirty layerings of newly melted ash and atmosphere on top of the "base-ash" which had melted out.

The size of the firebox, and the air-delivery potential of the step-down grate created two real advantages for the later stages of the firing: 1) the stokings remained relatively infrequent (about every 12 minutes) right to the end of the firing, and 2) the "work heat" from the coal build-up was maximized by the step-down grate. (There was no need to remove accumulations of coals in this grate design).

The ease of the firing was the immediate good news. But the best news arrived with the unloading: rich fluid accumulations of a wide spectrum of ash colors typical of works from "long-fired" kilns, but with only the "man-hours" of a day-and-a-half- long firing. I had discovered, it seemed, a method for an "8-day-firing" which "didn't take eight days".

As I look back on the process of discouragement, then ideas, brooding, then testing, and finally trusting my hunches — I recognize the positive potential of the necessity of working within limits. Such limits forced upon me new ways of thinking and imagining....ways which were different from the traditions which I had inherited (but yet which relied on those very traditions for grounding). A blending of 'tradition' and 'freedom' led the way to new solutions...ones which I would never have come to, had I none of the limitations to overcome.

If I allow myself to imagine what it must have been like for those generations of early potters, centuries ago, who created the firing styles which we, today, embrace as traditional (or "Tradition"), I can't help but find myself believing that those potters were simply finding solutions to the limitations of their day; that they were blending what they had received as 'tradition' with whatever pragmatic 'freedom' they required to resolve the limitations which they faced.

Is not Tradition really the succession of solutions which, over eons, are accumulated and handed down to the next generations....and not something static and final? Is not Tradition as much our responsibility as our inheritance? Surely if we each take the best of what has been passed down to us and apply it, with a healthy dose of curiosity and innovation, to the problems and limitations of

our own lives — surely then we all will be making...we all will be extending that Tradition in the best possible ways.

Here are some of the clay bodies that I have been using: (The starting points for all these recipes are indebted to the recipe suggestions which Jack Troy presented in his recent book, Wood-Fired Stoneware and Porcelain.)

Lehman Recipe 5-D

It seems to respond especially well when it is quite hot, and records even the slightest ash accumulations (when it is hot). It has a pearly luster appearance, often over a deep caramel-y color; and heavy ash accumulations seem to flux well on this body producing vivid crystal-bearing runs over the pearly less-ashed areas. This clay does well even in the hottest areas of the kiln — I would not be afraid of cone 11.

This clay is typically porcelainous in its throwing difficulty.

55 - Grolleg
30 - Custer Feldspar
20 - Flint (325 mesh)
2 - Bentonite
8 – Redart

Lehman Recipe 5-D *

Here is a variation of the above recipe. It simply adds 36# of AP Green fireclay to the recipe. It is eminently more throwable than 5-D due to the addition of the fireclay. It is a noticeably darker body, though continues in the caramel to chocolate range. A pot in the firebox in a recent firing was thoroughly streaked with ash....colors ranged from deep chocolates to blacks and grays. Some of the ash made whitish crystals which ran over the darkest gray black ashed areas. Collections of thicker ash (pine) created green pools against the dark background.

Pots with less ash (or which were a little cooler) tended to show gold/gray ash on a chocolate brown body. The patterns were subdued, and were not what I would typify as the most responsive or flash-recording.

This can take the hottest flame.

55 - Grolleg
30 - Custer Feldspar
20 - Flint (325 mesh)

2 - Bentonite
8 - Redart
3 – AP Green fireclay

Lehman Recipe 12-D

It is lighter in color than 5-D, a caramel color, and is easily moved to a slick surface by small amounts of fine melted ash. Heavier ash build-ups tend to lighten the color of the surface, and seem always to have some floating crystals in the more-heavily ashed areas. It is a little more pyroplastic than #5, but has withstood more than cone 10. I am not afraid to go right to the front of the kiln with this body — particularly if there are not things stacked on top of it.

This clay also will trap carbon in the body, and has produced some dark gray to black patten leather surfaces. These black areas are always on the least-ashed sides of the pots, and the transitions from the black to the gray to the gray crystals,....then into the pinks, purples, teals, greens, golds, and yellows.....well, sometimes it is breathtaking.

36.8 - EPK
24.5 - Nepheline. Syenite.
14.3 - OM4 Ball Clay
19.1 - Flint (325 mesh)
5.1 - Bentonite
4.0 – Redart

Lehman Recipe 12-D*

This recipe is like 12-D but with the addition of 36# AP Green Fireclay. This is a versatile clay, easily withstanding the hottest parts of the kiln. When lightly ashed, it is quite dark (chocolate) and quite understated in it's response to small amounts of ash. Protracted heat will produce crystalline surfaces even with the smallest amount of ash. It reminds me of Bizen bodies when lightly ashed: understated ash areas against a smooth-bodied deep dark body.

But when there is an accumulation of ash (and plenty of heat) the ash appears to flow with vivid striations all the way down the side of the pot. It gives the indication that the ash flowed from the top to the bottom of the piece, however there is not enough collection of ash-glaze at the bottom to substantiate the appearance...it is a bit of an illusion.

I wedged chunks of sintered Custer spar into this body. On the hottest, most-ashed surfaces, the Custer began to melt, and to "resist" the striations of the ash flow. The result was the appearance of multiple long-tailed meteors zipping toward the top of the piece -- quite lively.

36.8 - EPK
24.5 - Nepheline. Syenite.
14.3 - OM4 Ball Clay
19.1 - Flint (325 mesh)
5.1 - Bentonite
4.0 - Redart
36.0 – AP Green Fireclay

Lehman Recipe 4-D

35 - English Grolleg

15 - 6-Tile Kaolin

15 - #401 Yellow Banks (80 Mesh)

12 - OM4

10 - Flint (325 mesh)

10 - F-4 Feldspar

2 - Bentonite

This body is, overall, pretty light in color. However it is quite responsive in almost any area of the kiln. It "notices" the presence or absence of ash very quickly...and transitions between the effects of flashing are often quite articulated. This can take the hottest temperatures

Lehman Recipe 13-D

55 - English Grolleg

25 - Nepheline Syenite

15 - #401 Yellow Banks (80 mesh)

10 - Flint (325 mesh)

2 - Bentonite

This body is quite fine in texture and tends to be quite light in color. Although I suppose the Yellow Banks clay is largely responsible for some of the caramel colors we see in the areas of transition between heavy ash deposits, and light ash deposits. There is often some "metallic oil spotting" in these transition areas. This body also tends to trap some carbon, making for areas of shiny black in the lighter-ashed areas (backsides of pots), where the nepheline syenite has fluxed on the surface of the pot. Several times we have seen some slight shivering on the surface of the pot in the areas of transition between the carbon trapped/light ashed areas, and the heavier ashed/crystalline covered surfaces of the 'front' sides of the pots. Usually a light wipe of a 220 grit wet/dry sand paper (used wet) takes off all this microscopic shivering (that one discovers more by feel than by sight)...the shivering seems not to return later, or to continue in any way. The wet sandpaper will tend to lighten the areas where the microscopic shivering is removed....but in the end, the 'feel' of the pots is quite nice to the touch in these areas.

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