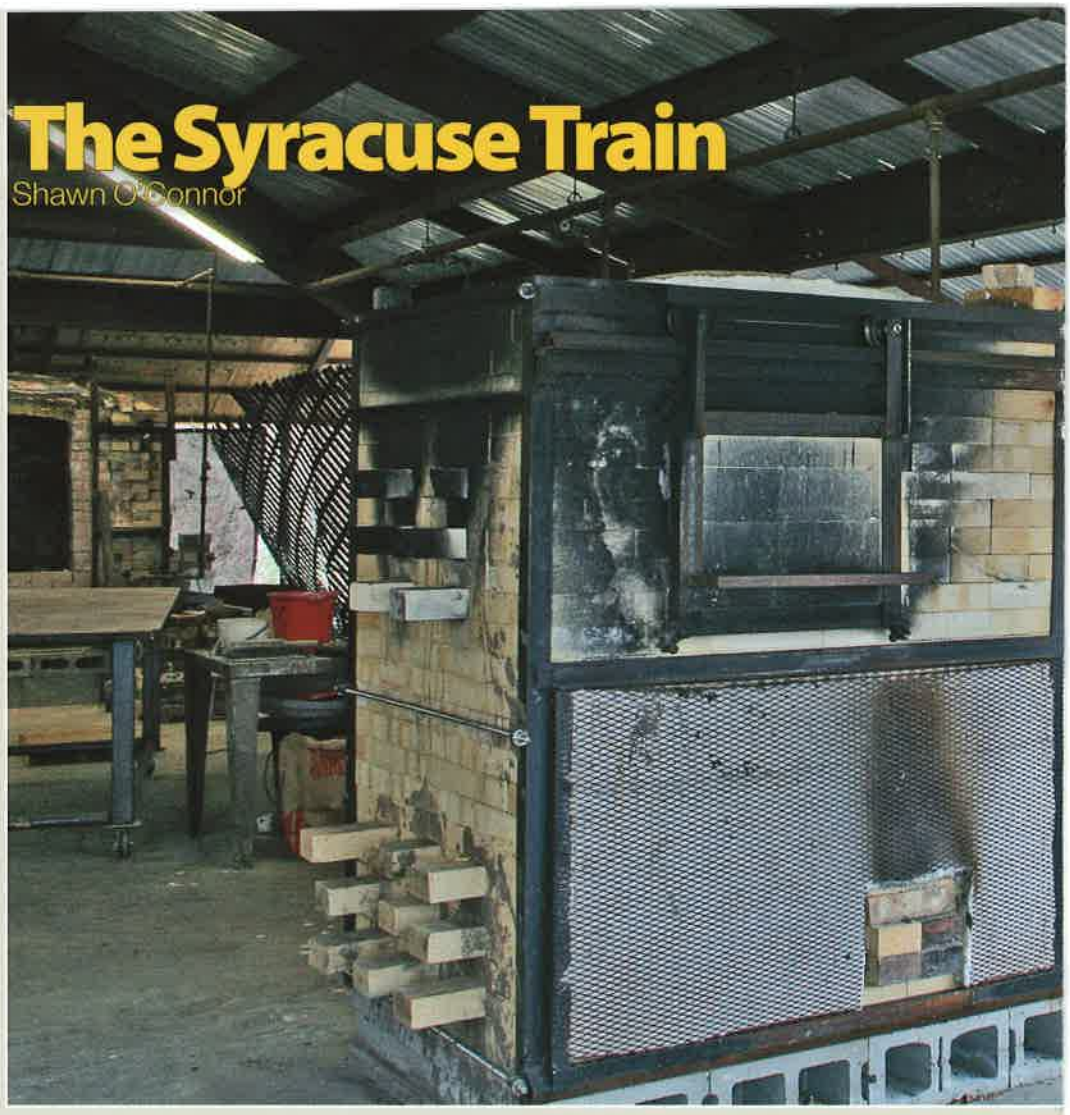
The Syracuse Train

Shawn O'Connor



I was raised in rural Maine in an old farmhouse that was heated exclusively by a wood stove. This meant that the fire was constantly being fed in order to heat the house, requiring a lot of work and attentiveness. Preparing a winter's worth of wood required many weeks of splitting, hauling, and stacking, a job I shared with my two siblings. This process became ingrained in my life from an early age, and I have always found the physical labour, rhythm, and the sense of accomplishment that comes with this activity, enjoyable. My first ceramic woodfiring experience came in 2005, at the Watershed Center for the Ceramic Arts (Maine), and I was instantly attracted to the process. I was fascinated with the rich surface left on the work and the way the flame pattern could be controlled by stacking.

In 2007 I entered the graduate programme at Syracuse University (New York) where there was

just one woodfire kiln – a fairly good sized anagama, and consequently I was left with long periods of time between firings. By the end of my first year, I had only fired the kiln three times which wasn't conducive to experimentation or the overall growth of my work. I needed a smaller kiln that I could fire more often, in order to experiment and achieve results which I could respond to. I had limited woodfiring experience up to this point and had never built a kiln before. I had under my belt, a total of 20 firings between four woodfire kilns, two of these being train kilns of different designs. I decided, because of my experience with these two kilns and the versatility this design allows, that I would build a train type kiln. With this kiln I could produce anagama like effects, or I could fire it quickly for glaze work. I wanted the kiln to be small so that I could fire about once a month. I based the design on one that I had previously fired at the Robert M. MacNamara Foundation (ME), built by Shoji

Top: Detail of steps in firebox floor. Middle: Detail of removable side-stoke grate. Above: Cast support for arched lid.

Opposite page, top: Detail of cast throat arch. Middle: Arched former for cast lid of chamber. Bottom: The sliding door of the firebox.

Satake and Martin Tagseth. The kiln ended up having a little less than 0.85 m^3 (30 cu.ft.) of stacking space. It tapers in just over half way back, to create some constriction in the ware chamber. This gives velocity to the flame as it moves through the kiln, producing almost straight flashing lines on the surface of work, which is very different from the slow lazy flame of the anagama that wraps around the work, producing a much more intricate flame pattern.

The kiln was constructed using around 3,000 common 2.5 series hardbricks, the majority of which were generously donated by two local businesses, Syracuse China and Crucible Materials Corporation. The 5 cm (2 inch) thick solid stainless steel grate bars came from a private donor. There are four of these in the fireboxes and they have shown no signs of wear after multiple firings. The rest of the bricks and materials were purchased with the department's budget and a small grant from the art school. The arch over the firebox was made up of 39 No.1 arch bricks and 12 commons, having a span of 90 cm (36 inch) and a rise of 12 cm (4 13/16 inch). The rest of the arches; firebox door; throat arch (see photo page 21, top), and lid, were made of KS4 Plus Castable, from Upstate Refractory (Newark, NY). Twenty-three bags of castable were used to cast all the custom pieces. The steel used was purchased from TARCO STEEL INC. (Binghamton, NY). The majority of the kiln frame is composed of 5 cm (2 inch) angle and 5 cm (2 inch) flat stock, at 5 mm (3/16 inch) thickness. The frame for the lid is made out of 5 cm (2 inch) angle running down the sides, 2.5 cm (1 inch) square tubing criss-crossing over the top (see photo page 23, top), and

a sheet of 6mm (¼ inch) expanded metal formed to fit the curve of the arch and hold the ceramic blanket in place. I also used expanded metal to hold a piece of blanket over the lower half of the firebox on the stoking side of the kiln. This is to help shield the stoker from heat radiating from the firebox, and together with the smooth sliding firebox door (see photo bottom right), means that stoking during high temperatures is relatively comfortable and easily accomplished by one person.

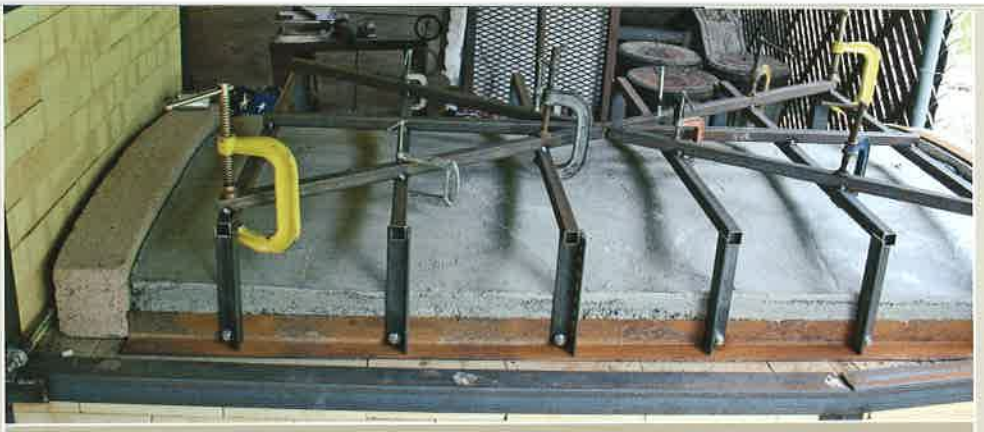
I knew that kilns in school situations received much more use and abuse than those in studio settings only having one owner. With this in mind I built the kiln incorporating many features that allowed for ease of replacement and repair. All of the cast pieces, with the exception of the lid, are easily removable for replacement. The forms for casting were built to be disassembled after the castable had hardened, so that each form could be reused if necessary. I used dry-cleaning plastic to line all the wooden forms before casting, so that they would not be ruined by water. The brickwork, all dry built, is in three separate sections; firebox (see photo page 20, top), ware chamber, and chimney. This allows for each section to be dismantled separately for repairs to be carried out as necessary. A feature included to add versatility was a removable brick grate in the side-stoke area (see photo page 20, middle). I did this so that the grate could be removed making room for another set of shelves. This would allow the kiln to be fired in a very different way. The grate allows air to enter under the side-stoke and the wood to burn more efficiently. There are air inlets built into the floor of the kiln under the side-stokes on each side of the kiln. These remain closed for the majority of the firing, but near the end, allow necessary oxygen for side-stoke combustion to produce the maximum amount of heat in this area.

The most challenging part of the kiln's construction was the lid. In researching train kilns, I found

that people have dealt with lids in many different ways. Some are made in one piece that lift off with the assistance of a crane; some consist of multiple sections that can be lifted by hand; others have set roofs with a door on the side of the chamber for loading. The variation is huge, ranging from an arched form to a flat roof design. I decided to build an arched lid that would be all in one piece (see photo page 21, middle). One of the main reasons for this decision was that I had access to a crane that the sculpture department was removing from their shop. With a little customizing and elbow-grease to clean it up, I had the tool I needed for lifting the heavy lid. The lid is a 7.6cm (3 inch) thick castable arch, 68.6cm (27 inch) wide, with a 7.6cm (3 inch) rise, and is insulated with an additional 5cm (2 inch) of ceramic blanket. There are 10cm (4 inch) stainless steel bolts cast in the lid about every 15cm (6 inch), running down both sides. The bolts are attached to a metal frame that spider webs across the top to evenly distribute stress when lifting the lid with the crane. The lid lowers onto two custom designed blocks that fit into the underside of the arch (see photo page 20, bottom). A thin strip of fibre is used to create a gasket around the edge of the lid to prevent heat from escaping. The lid has held up really well so far, and has developed only one crack, during the fourth firing. If I were going to do this again I would cast the lid in three different sections and then bolt them all together. I think that this would allow for some stress relief and prevent cracking. It would also allow for a damaged section to be replaced if required.

To date the kiln has been fired seven times producing some great results. The firings have averaged around 30 hours, the shortest being 25 and the longest 37 hours. The firing starts with an overnight pre-heat using a portable propane burner. This brings the temperature slowly up to about 150–200°C (300–400°F). At 6am the following morning I start to introduce wood, until enough of an ember bed has been established to allow the gas burner to be removed. We get most of our wood from a local logger who supplies pulp paper companies. It is mostly softwood – spruce and hemlock, and produces a dark coloured ash. It is not the ideal choice of wood, but we can get it by the trailer load extremely cheaply. Additionally we have a small supply of hardwood – mostly oak and maple, which I use until cone 6 is reached in the front and then switch to softwood. Hardwood strips obtained from a hardwood flooring operation are used for side-stoking.

The last two firings have gone as follows (after the introduction of wood): red heat is reached in about 7 hours. The chimney cross-section is 33x23cm (13x9 inches). I damper-in leaving an opening of 5x23cm (2x9 inches) at cone 012 for an hour to get a light body reduction. After body reduction the damper is set fairly open for the remainder of the firing. This seems to give the best distribution of heat from front to back. The primary air for the firebox is usually half open on the bottom row only, this being approximately 20% of total primary air available. It is necessary to periodically open more ports if the ember bed starts to choke up. The secondary air starts out fairly closed in the beginning when we are bringing the kiln up slowly. Towards the end of the firing the secondary air is much more open to get a faster climb and BTU's required to achieve temperature. Side-stoking starts when cone 04 goes down in the back. The front of the kiln is usually around cone 2 at this point. Once side-stoking is started the kiln climbs to cone 10 at around hour 27 or 28. The kiln is then held at cone 10 for four hours. This seems to be plenty



Constructing framework for the chamber lid using angle iron and square tubing. All photographs: Shawn O'Connor.

of time for all the flyash to melt and for the chamber to even out in temperature. The kiln ends up usually cone 11 in front and cone 10 in the back. It is best to stack this kiln pretty open on the floor, especially in the front section. The rest of the chamber can be stacked fairly tightly, excluding the throat arch area or the 'triangle of death' as it is sometimes referred to. The kiln is allowed to cool for two days before unpacking.

I have been extremely pleased with this kiln so far. After a few firings I was able to have a good understanding of how it worked and start producing work that I was happy with. The kiln is small and I would not build one of a similar size for a personal studio situation, but it works well in the academic realm. It allows for a quick turnaround time and firing cycle. It also allows students to have a woodfiring experience without the time commitment that the larger anagama requires. The experience of building the kiln itself was immeasurable and gave me a greater understanding of how woodfire kilns function.

Shawn O'Connor is due to complete his MFA at Syracuse University (NY) in May 2010. He will subsequently be undertaking a year long residency at Arrowmont School of Arts and Crafts.

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