Darling Downs

POTTERS' CLUB

Kiln training handbook

Version 2026

Table of contents

What is a firing? 1
Points before loading 1
- Size 2
- Construction 2
- Dryness 2
- Glaze running 2
- Batwash 2
- Booking your firing 2
- Kiln log 3

Loading the kiln 4
- Mixed loads 5
- Cones 5

Selecting the correct firing program 7
- Bisque firing 7
- Glaze firing 7

Using the kiln controllers 9
- Tetlow 9
- Rhode kiln 9
- Please check your program 10
- Bungs and doors 10

Unloading the kiln 12

What is a firing?

Prior to firing a dry clay object is simple dried mud, which would turn back to slop on contact with water. Firing converts the material of this temporary form into a hard substance which can contain a cup of tea and last for thousands of years, to tell of the culture which created it. This is astounding!!! How does it happen?

As ware heats (even from "dry" ware), free water is driven off, then chemically bound water is driven from the mixture of compounds: 0 to 150 degrees for the rapid release of "free water"; then 150 to 600 degrees for chemically bound water. The temperature rise must be slow enough for that water to exit the ware without exploding it. Also, this water must be free to escape from the kiln.

Carbon compounds are oxidized (burnt).

Various forms of silica crystals change form, and therefore change volume. Most of these changes occur as the clay is heated and reverse as it cools. Ware shrinks as it loses water, expands in one phase of crystal state change and ends up 8 to 15 % smaller than in its unfired state.

Vitrification means "becoming glass". Chemical reactions occur between fluxes and other materials which bind them into new compounds. The range of temperatures over which this occurs varies with the composition of the clay body. This is the basis of clay bodies being called Earthenware, Midfire or Stoneware.

Notes:

Points before loading

Size

Obviously we must construct work to a size which will fit, with gaps all around, into whatever kiln we plan to use.

Construction

We always need to exclude air trapping in ware. Escape of trapped air will cause cracking or even explosion on firing

Dryness

Ware must be dry before bisque firing. If the piece is cooler to the touch on your cheek than a wooden object, it is not entirely dry. Application of glaze to bisque introduces water, and ware needs a further period of drying before glaze firing. Drying time varies with conditions. Firing damp ware risks the piece itself, the surrounding ware and impairs the kiln's longevity.

Glaze running

Strange to say, glaze, which looks so chalky in the unfired state, becomes glass during firing. It becomes runny like honey when it melts, and then solidifies to an absolutely unforgiving rigidity. There must be an adequate space between the lowest point of applied glaze and the contact point on the shelf, or mobile molten glaze may bond the ware to the shelf.
Just how runny the glaze becomes is dependent on glaze composition and temperature. This is why it is vital to be accurate about the firing temperature appropriate to the glaze. If confusion occurs and too high a temperature is reached, glaze may run and bind to the shelf causing fracture of the ware, and damage to the shelf. Obviously if two glazed surfaces are touching they will bond.

If too low a temperature is achieved glaze will be immature: often still dry and chalky looking, and not functional as a waterproof seal. So, the essential thing is to use appropriate glaze for the nature of the clay body, and to keep an absolutely clear record of what glaze has been applied to your pieces.

Batwash

This is the chalky white surface coating one side of the shelves. It is a second line of protection for the shelves in case of accidental contact with gaze. We only coat one side (the uppermost) because it can tend to flake off and could spoil the surface of work onto which a flake fell. You can resurface any gaps in the batwash layer by painting it on from the supply prior to loading. The stainless steel trolley table is a great place to do that, as it is designed to be cleaned easily.

Booking your firing

This system has changed from time to time. At present you can book a slot from the kiln booking books which are typically located near the sign-in book. One titled Rhode, the other Tetlow. You need to allow 4 days for a Rhode booking and 3 days for a Tetlow booking.

Remember that you must pay for your firing.
There are QR codes in the kiln annex which you can scan and be taken straight to the payment page. Alternatively, you can go through the toowoombapotters.club website.

- Navigate to the “Members Area” and enter the pin code (same as the current back door code).
- Click on the “Firing” tab and there you will find the links to the payment page

Kiln log

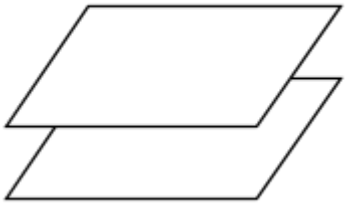
There is a kiln log in the kiln annex. You must complete an entry for your firing indicating name, phone number, date, receipt number and goal temperature.

Notes

Loading the kiln

ALWAYS CHECK THE TEMPERATURE OF A KILN BEFORE OPENING THE DOOR!

Layers of shelves are separated by props ideally three to a shelf. These need to be placed fairly directly above the previous layers' props. This is so that shelves are only under direct compression between props and not tending to carry load at distance from where they are supported.

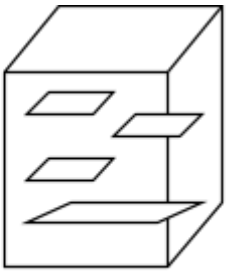


There needs to be 5 cm between ware and heating elements to avoid these being damaged by fuming from the ware and glaze. Elements have a life span and are costly to have replaced. We need to make this as long as possible.

For a bisque firing ware can be stacked in contact, but a glaze firing requires space between glazed surfaces to avoid transfer of colour or sticking together of surfaces. Remember that there will be small expansion in some phases of the firing.

You may also choose to put your glazed work on a "cookie". A cookie is a piece of pre-fired ceramic that is put under your piece as a sacrifice in case your glaze runs. This keeps the glaze from sticking to the kiln shelf. The cookie can be broken off later.

Heat circulation needs to be even. A uniform density of packing promotes this. If half shelves are used, variety of shelf heights between the two sides of the kiln helps heat circulation.



Mixed loads

As these are community kilns, there are certain things which are not allowed that you might be willing to attempt with a private kiln. This is to keep things safe while catering to the needs of most members. This is also to facilitate a learning environment without over complicating kiln firings.

This means we do not allow the following:

- Firing greenware at a glaze firing
- Mixing greenware and bisqueware in the same load

Cones

These are highly researched and standardized mixtures of materials which soften and collapse after a very specific amount of "heat work". They reflect the fact that not just temperature, but also the time taken to get to that temperature will have a bearing on the fusion and melting of clay and glaze.

Typically three cones will be used. For the central one, choose that which bends at the heat work appropriate to the glaze, at which you plan to finish the firing. Other cones are typically placed one on either side of the central one. Usually 3 consecutive numbers would be used. They have a set angle at their base, so that if you stand them on their bases they lean away from the vertical. The numbers on them are consistently imprinted so that when the number is facing you, the cone is leaning to the Left.

Cones need to be arranged in an elongated wad of soft clay such that the lean is all to one direction. They will fall in that direction. The cone which will soften and fall first must lead the line-up, and so-on in order. You can look up your intended temperature in a table to find out which cones will be suitable. (This table can be found on the lid of some cone boxes.) Remember that the "0" cones progress 022 (lower temp) through to 01(higher temp). Cones without 0 progress 1,2,3, etc. lower to higher temps. The physical size of the cone does not matter, only its number.

For example the central cone for a firing to 1220° would be placed: 5,6,7, thus:

Target temp

Notice that the clay holding wad has a large, long pad extending to catch the fallen cones so they don't stick to the shelf.

WADS MUST BE PEPPERED WITH HOLES.

Ideally these cone packs are placed in the kiln so they can be seen looking through the spy holes in the door or vertical walls of the kiln. Those of us who fire manually typically do not turn the kiln off until we see the cones reach the appropriate state. Even if you expect the kiln controller to do all of the operation, cone packs give very valuable information about the true heat conditions in the kiln, even indicating variations between parts of the kiln. This can really help you to decide in what direction to change loading if glaze results are not ideal.

Cones in the annex are for Members use.

Notes

Selecting the correct firing program

The kilns have been pre-programmed with various firing programs to suit the needs of most members. Members are not permitted to change these programs. If you have special firing requirements, please contact a member of the Board.

Bisque firing

Bisque firing must begin slowly, and can increase in rate once water and gasses have been driven off.

Bisque (1000c) program 2:

Ramp 1	Part 1	75°/hr	To 200°	
	Part 2	100°/hr	To 600°	
Soak				0 mins
Ramp 2	Part 1	120°/hr	To 995°	
Soak				5 mins
END				

Typically used by members.
Note: bungs are not required for this bisque fire program.

The controller is programmed with a slow bisque program (program #1) however this is typically only used for class work.

Soaking:
Sometimes temperature rise is paused and temperature held stable for a time. This is called a "soak". You will note most of these programs include a short soak time.

Glaze firing

The glaze firing program selected will depend on your clay body. The kiln is programmed with several programs to suit the common clay body types. See the charts below.

Note: bungs should be put in at 200° for all glaze firings.

The following programs are for the Rohde kiln.

Midfire glaze (1220c) program 4:

Ramp 1	Part 1	150°/hr	To 1000°	
	Part 2	100°/hr	To 1150°	
Soak				0 mins
Ramp 2	Part 1	75°/hr	To 1215°	
Soak				5 mins
END				

Most common clay body used by members

Earthenware glaze (1100) program 3:

Ramp 1	Part 1	75°/hr	To 200°	
	Part 2	120°/hr	To 1020°	
Soak				0 mins
Ramp 2	Part 1	75°/hr	To 1090°	
Soak				10 mins
END				

Stoneware glaze (1260) program 5:

Ramp 1	Part 1	150°/hr	To 1000°	
	Part 2	100°/hr	To 1200°	
Soak				0 mins
Ramp 2	Part 1	75°/hr	To 1255°	
Soak				5 mins
END				

Raw highfire (1550) program 6 (no glaze):

Ramp 1	Part 1	50°/hr	To 300°	
	Part 2	80°/hr	To 600°	
Soak				0 mins
Ramp 2	Part 1	120°/hr	To 1100°	
	Part 2	75°/hr	To 1145°	
Soak				10 mins
END				

Luster (800) program 7:

Ramp 1	Part 1	100°/hr	To 795°	
Soak				5 mins
END				

Notes

Using the kiln controllers

Tetlow

The kiln controller has set programs already entered.
There is a laminated sheet in the kiln annex giving the details of how those firings are structured.

Step 1: SWITCH ON
Switch on the large lever style switch on the wall. The diagram on the controller has flashing red lights, which indicate what section and segment is open to alteration with the arrow keys.

Step 2: FIND THE PROGRAM YOU NEED
Press Program number will flash

Use or to cycle through program numbers to find the one you want

Press to enter that number

Step 3: CHECK THE PROGRAM
Check the program to ensure it is as it should be. One of the club's kilns was destroyed by the inexplicable presence of a long ramp, which should not have been in the program, yet was there. The detailed instructions are in the A4 manual. Use this, step by step, as you practice this until you feel confident you understand it. Always feel free to phone if you have any doubts: 0423 763 241 (Sam Hudson - President)

Section one is a delay timer. This should be at zero.

There are rise segments and soak segments. Practice the sequences to become familiar with how it displays rate of temperature rise then target temperature for each segment. Some programs will go back to segment 2 when indicating the next rising segment. This can look confusing, but just take notice of the numbers indicating rate of rise and final temperature of the segment.

Note that there are some segments which end on the same temperature as the previous segment. These segments are only fillers. They are necessary because of the structure of the controller, but they have no action in the firing. The controller will display the word "FULL" for these segments.

Step 4: STARTING THE FIRING
Once you have cycled through the ramps and soaks "END" appears. The controller will then take 10 seconds to come back to start position. You can then press Start button

Rhode kiln

The controller for the Rhode kiln is a handpiece on a cable. Always return it to its cradle. Never put it on the kiln. It will melt. Switch controller on bottom R. It will cycle through three test-type displays, then show current kiln temperature. (You will need to have checked temp before opening the kiln to load it.)

Use to move through segments of the program.

As with the Tetlow and alter the values

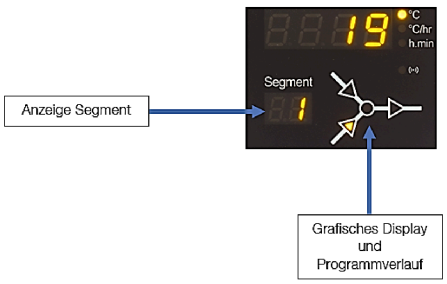
enters the value and moves to the next parameter.

returns to previous parameter

Segment 0 is a delay timer

Each Segment will require a Ramp (rate of change), a temperature, and a time.

The diagrammatic display indicates what is being set:



The upward arrow indicates heating ramp,

The downward arrow indicates cooling ramp

Central circle indicates temperature.

Level forward arrow indicates duration of soak.

Check through the desired program to ensure values match those on the laminated sheet.

Please check your program

We ask you to check through the program because inexplicable errors have appeared in the past, with kiln destroying consequences. It is very important to keep the parameters as written for the 6 standard programs.

Bungs and doors

The door needs to be closed with gentle tension on the springs.
Bungs / vents are left out as the kiln is started.
This is important to allow water vapour to escape the kiln.

- For a bisque firing, bungs are not needed.
- For a glaze firing, you return to insert bungs at a temperature of 200 degrees.

You MUST PLAN to attend to put the bungs in.

You can figure out when the kiln will get to temperature by studying the program’s ramp speeds.

The kiln will not fire efficiently into high temperatures if bungs are not put in. You may choose to use the delay timer at the start of the program to set the timing of the Bungs In and completion of firing to socially acceptable hours, please just be mindful of other bookings as doing this might push your time to completion into another booking.

Notes

Unloading the kiln

Once a program is finished, the kiln will slowly begin to cool down by natural heat loss to the atmosphere.

Bungs can be removed at 200°.

DO NOT OPEN THE KILN door until the temperature gauge reads below 100°

Keep in mind that even at that temperature, pieces will still be very hot. It is safest to let ware cool slowly. Be careful not to burn your hands or cause cracking in your eagerness to see your finished work. Be aware that the pyrometer measures air temperature. Ware and shelves will be considerably hotter than the air temperature.

Once the kiln has cooled enough to open, it is recommended to turn it off at the wall.

Bisque ware must be handled with clean hands. The deposition of oils on the surface will affect evenness of glaze application. It should also be stored free of dust, for the same reason.

Kiln shelves and props need to be inspected for damage or glaze droplets. Adherent material can and must be removed. If you just put it away and hope for the best it may stick to someone else's work next firing.

You can find a hammer and chisel in the toolbox. Note: you MUST wear safety glasses for this procedure.
If you need assistance, please contact 0423 763 241 (Sam Hudson - President)

Shelves and props need to be returned to the right place when you unload.

Note