

Firing Recipes *For* *Beginners In Fusing & Slumping*

There are many firing recipes; most produce the same end result. Some are complicated and some are quiet simple. There is no right or wrong recipe. It all boils down to you getting the end result you want.

The following guide for fusing and slumping is what we use in our studio for simple projects requiring, 2 – 3 layers of glass, which has worked well for many years. For thicker, more complex glass projects, and casting we use entirely different recipes for those projects.

Try the following recipes and other recipes which artists recommend then combine information and design the recipe which works best for your projects.

Fusing

Ramping

Ramp slowly at 300 °F per hour. This slow ramp rate allows the glass to heat uniformly, especially in respect to its thickness. In other words you want the inside of the glass and bottom of the glass to be the same temperature as the top piece of the glass. This is especially true when you have glass chips and stringer sandwiched in between two pieces of glass. You can relate this to cooking a steak. If you cook the steak with a really hot flame the outside will be done while the inside will still be raw.

Ramp slowly will allow the glass will heat up uniformly and the top piece of glass will drop down evenly and squeeze the air out. If you heat fast the outer edges of the top glass may drop first and trap air bubbles inside the piece you are fusing.

There are recipes, which have multiple ramp rates and short soak times on the way up to the final soak temperature and on the way down from the soak temperature. Some artists do this stair stepping to let the glass temperature “catch up” with the chamber temperature and or kiln shelf temperature. From a physics stand point it is better to heat linear which creates uniform temperature throughout the glass rather then the catch up technique which can cause thermoshocking. Stair step ramping up to “Squeeze” air out can also be accomplished by simply ramping slowly linearly rather than stair stepping with multiple steps.

Soaking

Books and teachers recommend soak temperatures ranging from 1350 °F to 1490 °F for fusing, some even fire over 1500 °F.

For single jewelry pieces 2-3 layers thin glass we usually soak at 1375 °F for 10-15 minuets. This gives the piece a nice appearance with the edge rounded over and the corners square. If you fire to a higher temperature with thin glass you increase the chance the piece will round the corners more and the edges may curve than you may want.

For tableware and tile which is 2-3 layers thick of standard thickness glass we usually soak at 1450 °F for 10 minuets. This gives this thicker piece a nice appearance with the edge rounded over and the corners square.

Some artists open the kiln to quick cool (venting) from the soak temperature down to 1000 °F to stop the fuse process. Many artists have stopped doing this due to the digital controller. Another problem with venting, opening and closing, the kiln to quick cool the glass may cause kiln brick dust to fall down on to the hot glass and ruin the glass. Flash venting was started many years ago because most of us had manual controllers and venting was the best way to control the fusing process. Most kilns now have digital controllers making flash venting not necessary.

We like to fire to a set temperature and if I need the glass to fuse more I add time if I need the glass to fuse less I subtract time and leave the temperature alone. By adjusting time we have only one variable change during a firing sequence. Example: Black glass becomes softer quicker than clear or white glass when heating. Thus black glass can come to a complete fuse or slump before clear & white. Changing the soaking time works well and is simpler than changing temperature and time.

Note: Try not to fire black glass pieces along with clear & white glass pieces at the same time. The black glass pieces will be fused before the clear & white glass.

You want to let the project cool down to less than 200 °F before opening the kiln, otherwise the glass may thermoshock and crack / break. After the firing is complete look at the glass items. If they are not fused enough add 5 minuets and repeat the firing, if they are over fused subtract 5 minuets from the firing for the next fusing. Repeat this process until you get the firing sequence for a particular item and glass then record it on your recipe sheet for that project.

Annealing

If the thickness of the glass when fused is $\frac{1}{4}$ " or less in thickness and the piece is less than 10" across we usually do not do a formal annealing step with a brick kiln, however if the kiln is a fiber kiln we do a formal annealing step. A brick kiln gives up heat slowly and self anneals as it cools down. The fiber kiln does not retain heat and cools down rapidly.

Slumping

We usually use a ramp rate of 100 - 200 °F per hour. We want the whole item to get soft uniformly so when it starts to slump or sag it does it uniformly. If it heats up too fast then the item will drop fast and you will end up with thin areas in the glass where it slumped or sagged. Or it may even distort while in the mold.

We like to soak at 1250 °F because it allows the item to become soft and move uniformly so we maintain control of the shape of the glass during the slump into the mold.

For drop rings we like to soak at 1150 - 1200 °F. If you use higher temperatures your glass may sag too fast which causes thinning of the sides.

For a bowl or a plate, less than 12", I usually ramp at 200 °F per hour, soak at 1250 °F for 15-30 minutes.

If the mold is larger than 12" we ramp at 100 °F, soak at 1250 °F for 15-30 minutes, then ramp down at 100 °F, to 200 °F for 5 minutes. With larger molds we found they retain a lot of heat and may thermoshock the glass.