Glass Campus

Glass Casting in a Kiln

Casting glass in a kiln is fun and easy. You can do miniature figures, design elements to be tack fused to other projects, jewelry cabochons, or sculptures as big as your kiln can accommodate. Any material that will stand up to the temperatures at which glass full fuses and will either not stick to the glass or can be coated to prevent sticking to the glass can be used as a mold. You can use molds you buy or make your own from found objects.

Mold Materials for Casting in the Kiln

The following materials can be used and require no coating:

- ceramic fiber paper
- ceramic fiber blanket
- plaster
- plaster/silica investment mix

The following materials can be used but must be coated to prevent glass from sticking:

- ceramic
- steel

Preparing the Mold with Kiln Wash

Carefully clean the mold to remove any dust and scrub out any remaining kiln wash from previous firings. Single-use kiln wash like “Hotline” is preferred to “Bullseye” because it’s easier to scrub out. Kiln wash can’t be trusted for a second firing after a full fuse so a fresh overcoat is needed. If you keep applying overcoats, you will fill in all the detail in the model. To avoid that, you have to scrub out any kiln wash left from the firing and apply fresh. An old used toothbrush is an effective tool for removing kiln wash but a bristle brush on a Dremel or hand drill will speed up the job.

Prepare the mold with 3 or more coats of thin kiln wash. More thin applications are better than a few thick coatings. Be careful to not apply so much that you fill in the fine detail in the mold. Don’t just coat the inside part of the mold that will be filled with glass but also coat the top upper surface to allow for any glass spilling out of the mold pocket.

Preparing the Mold with Boron Nitride

Sprayed on boron nitride will produce a smoother finish on kiln castings and will also reduce any spikes along the edge. The smoother finish encourages the glass to slide down into the mold without parts gripping along the mold sides resulting in sharp spikes. Spray on a single quick coat, allow to dry for a few minutes, then spray on a quick second coat. If you want to use boron nitride on a mold that had previously been coated with kiln wash, take GREAT EFFORT to be certain ALL the kiln wash is scrubbed off before applying the boron nitride. Any kiln wash left on can cause complete failure and result in the glass sticking to the mold.

Casting Material

As long as all the glass used is compatible, you can use a variety of different materials for casting in a kiln:

- frit
- scraps
- cullet
- nuggets
- billets

Filling the Mold

It’s important to put in enough material to be sure the finished casting will be enough to fill the mold. The glass level will drop as it melts into the mold. The smaller the pieces of glass you use, the less it will sink. On average, the finished casting will be about half the depth of the loose filled mold.

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Because the glass level drops, you might prefer to fill part of the mold with large pieces of glass filled vertically to provide enough glass to be sure the mold finishes filled.

Frit and Powder

Transparent glass powder and fine frit doesn't remain transparent when fired because the fine pieces trap small air bubbles and produces a slightly opaque look. Using larger pieces reduces the loss of transparency.

Air Entrapment

Pieces of glass laid flat can easily trap bits of air. If you instead place relatively large pieces of glass vertically, any air will chimney up and out between the pieces of glass as the glass melts from the bottom.

Firing Schedule Casting

	RAMP	TEMP	HOLD
1.	800°F (425°C)	1460°F (795°C)	25 min
2.	FULL	300°F (150°C)	0

This firing schedule is for COE96 glass.
For COE 90 add 25°F to the top temperature.

Spikes

It's not uncommon to have spikes or a sharp edge along the rim of the casting when it comes out of the kiln. Using boron nitride instead of kiln wash will significantly reduce the amount of spiking that need to be ground off.

Fire Polish

Casting in a mold will pick up some texture from the mold leaving the glass that faced into the mold less shiny than the glass facing out. That can be corrected by turning the casting over and firing in the kiln to a fire polish:

	RAMP	TEMP	HOLD
1.	400°F (200°C)	1000°F (515°C)	20 min
2.	1200°F (650°C)	1300°F (705°C)	4 min
3.	FULL	960°F (515°C)	60 min
4.	1200°F (650°C)	300°F (715°C)	0

This firing schedule is for COE96 glass.
For COE 90 add 25°F to the top temperature.

Mold Materials for Pour Casting

The most commonly used mold materials for pour castings are brass, steel, and graphite. Graphite and steel molds are very expensive and rarely used for other than relatively high volume production. Brass molds work extremely well and because brass melts at 1600°F (870°C) they can be made in your kiln or poured from a small torch heated crucible.

Pour Casting

Molten glass can be melted in a furnace then ladled out or poured out into molds. Because there is no concern with air bubbles getting trapped in the glass, this usually produces a superior looking casting. Glass can be melted down from batch, billets, nuggets, cullet, or scrap glass but the same need for compatibility applies as for kiln casting.

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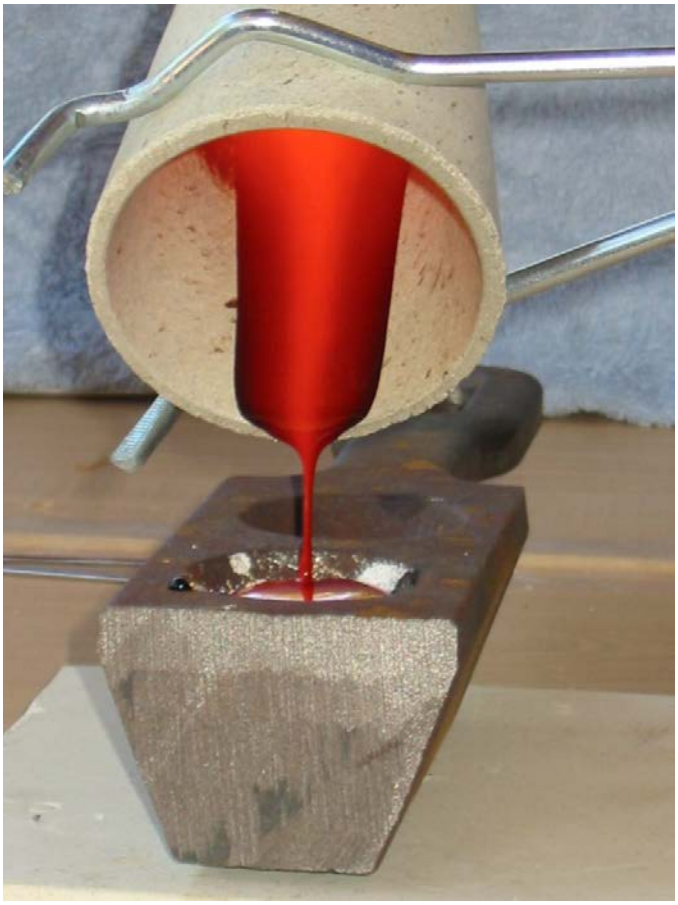

Pouring molten glass from a crucible into a mold

Pressing a casting shape into sand

Pouring into a sand mold

Sandcasting

This ancient glass casting method is still popular and a fun way to do glass casting. Just make a container to hold sand (a baking dish works well for small projects), take whatever object you want duplicated and press it into the sand to make an imprint – then pour molten glass into the created imprint.

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Types of Kilns

Any kiln that can heat up a crucible of glass hot enough to melt can be used for pour casting. A front loading kiln makes it much easier to remove a crucible full of molten glass but will a little ingenuity, it can be taken with tongs from any top loading glass or pottery kiln. Many kiln makers produce crucible kilns specifically intended to melt a crucible of glass to use for pour casting or to gather for glass blowing.

Crucible kiln

Crucibles

the crucible to be used to melt and pour glass must not only be a material that can withstand the high temperature the glass is heated to but must also be resistant enough to thermal shock to not crack when taken hot from the kiln or furnace. Ceramic clay fired to cone 10 (2350°F or 1288°C) can be used for relatively small pours. For larger pours, some materials used include: alumina, boron nitride, magnesia, quartz, silicon carbide, titanium diboride, vitreous carbon, and zirconia.

Glass casting crucibles

Working Temperature

Soda lime glass melts at 2700°F (1480°C) but it isn't necessary to heat it that high to pour it. You only have to heat it to the Transition Temperature *(the temperature at which if begins to flow).* The transition temperature varies slightly for different COE *(the higher the glass COE, the lower the temperature).* The transition temperature of soda lime glass is above 1500°F (815°C). As glass cools to that temperature, it begins to stiffen and becomes increasing difficult to pour. Thus, the higher the temperature you heat the glass to, the more time you will have to complete the pour before the glass becomes too stiff to pour easily. The hotter the better.