

# TIP SHEET 6

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## THE AMAZING ROLL-UP BLOWING KILNFORMED BULLSEYE GLASS

Explored in Australia using Bullseye glass, the “Roll-up” is a unique departure from traditional Venetian or Scandinavian glass blowing technique. Roll-ups allow the practitioner to form vessels with sheet glass, a kiln and a glory hole. Since furnace glass is not necessary for the process, the Roll-up is economically accessible to a far broader range of working artists than other blowing methods.



Klaus Moje, *Nijjima Series*, 2000. Kilnformed and rolled-up glass, 6" to 23" (152 – 584mm) high.

### THE PROCESS

#### The Kilnformed Tile

The Roll-up begins with a kilnformed tile. Start with an 8 x 10" (203 x 254mm) tile that is 3/8" (9mm) – three standard sheets – thick. Make the tile so that the actual design is only 6 x 10" (152 x 254mm), with an inch-wide (25mm) strip of clear glass along the top and the bottom edges. This additional inch (25mm) of clear will be “lost” in the rolling and blowing process.

### TOOLS

#### Normal hotshop/blowing equipment

At least one *kiln* that can be used for fusing, pick-ups, and ideally one *kiln* for annealing

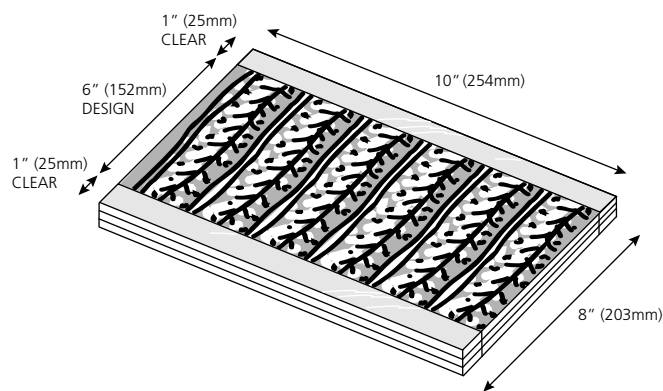
$\pi$  divider/calipers

Ferro(s)

Pastorale/fork

Normal kilnforming tools

No furnace required.

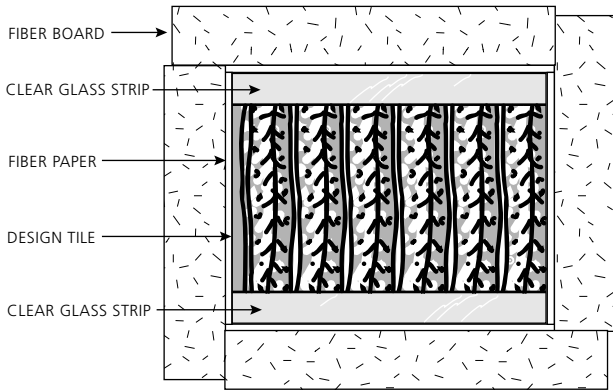


### GLASS

The entire palette of Bullseye Compatible colors in sheet glass, frits, stringer, etc., is appropriate for these processes. See notes under Viscosity (page 4) for more information. In addition, you will want to have some 1501-66 clear blowing cullet to make the collar and punty to roll up the kilnformed tile.

Because the tile must be at least 3/8" (9mm) thick and glass seeks a thickness of 1/4" (6mm) at a full fuse (around 1500°F/816°C for 10 minutes), you will need to dam the sides of the tile in the kiln to contain it from flowing out. Dams can be made from cut-up kiln shelves, soft bricks, vermiculite board, or fiber board. If using cut-up kiln shelves, you will need to coat them with glass separator (kiln wash) to keep them from sticking to the glass. After each firing, you will need to scrape

this material off and reapply it. If working with soft-brick, vermiculite, or fiber board, you will need to use strips of fiber paper as gaskets to keep the dams from sticking to the glass.

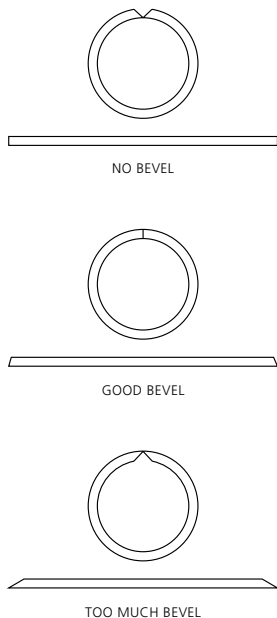


Although all kilns fire differently, the full fuse schedule used to fire tiles for rolling up is usually the following (in a Paragon GL 24AD):

RATE/DPH	TEMPERATURE	HOLD
600°F • 333°C	1250°F • 677°C	:30
AFAP <sup>1</sup>	≈1500°F • 816°C	:15
AFAP <sup>2</sup>	960°F • 516°C	:45
100°F • 55°C	700°F • 371°C	:00
AFAP	80°F • 27°C	:00

<sup>1</sup> As Fast As Possible – use full power.  
<sup>2</sup> As Fast As Possible – cut kiln power using controller. We do not advocate crash cooling. Leave your kiln closed, allowing it to cool naturally.

Once the piece is cool and has been at room temperature for 24 hours, the two edges of the tile that will be



joined together in the roll-up process should be beveled so that they will meet evenly and cleanly for a strong seal. This bevel will be right around 30 degrees, and will vary with the size of the piece. The thicker the piece, the more important the bevel will be to properly closing the seam.

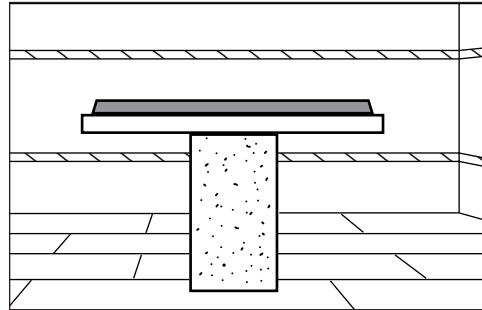
Load the beveled tile into a pick-up kiln on a prepared ferro<sup>A</sup> and bring it slowly up to temperature. A front loading kiln with the shelf at around hip height will be much easier to pull loaded

ferros out with the pastorate than a top loading kiln. The heat-up schedule for the tiles in the pick-up kiln is:

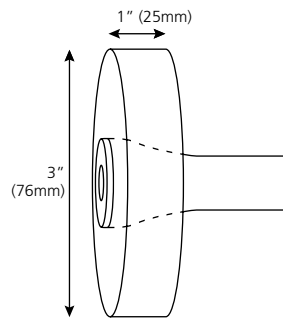
RATE/DPH	TEMPERATURE	HOLD
350°F • 194°C*	1115°F • 600°C	8:00**

\*Thicker tiles will need to be heated at a more conservative rate.

\*\*Hold for at least one hour at 1100°F/593°C before rolling up the tile. The hold time should correspond with the amount of time that you think it will take to get all of the tiles out of the pick-up kiln.



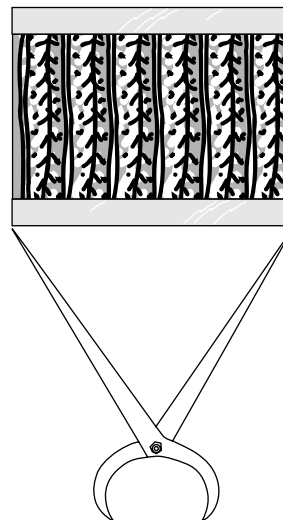
### STARTING THE ROLL-UP



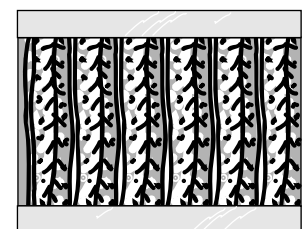
#### Preparing the Collar

Form a collar of clear glass on the end of a blowpipe.<sup>B</sup> This collar will be used to roll up the kilnformed blank off the ferro. Have the collar just a bit in from the end of the pipe so that heat doesn't close the hole.

The thickness of the collar should be 1" (25mm), the same size as the "extra" clear glass on the edges of the kilnformed tile. The diameter of the collar should be the length of the kilnformed tile divided by  $\pi$  (3.14)<sup>C</sup>.



$\pi$  DIVIDERS



COLLAR DIAMETER =  $X \div \pi$

Another easy way to determine the diameter of the collar is to use a  $\pi$  divider, or calipers.

As you are getting close to completing the collar, have an assistant take the kilnformed tile on the ferro out of the pick-up kiln with the pastore and begin to heat it in the glory hole. It is essential that the entire tile receive even heat, so it may be necessary to pull it out of the glory hole and rotate the ferro 180° on the pastore and then go back into the glory hole. As you are heating the tile, look for the very beginnings of orange heat and edges that are slightly softened. At this point, the tile is ready to be rolled up.<sup>D</sup> During repeated heatings in the glory hole the bevelled edges will invariably soften and round-out, losing their angle. Be sure to reestablish the angle of the bevelled edges with a tagliol before attempting to roll the tile up.<sup>E</sup>

### Placing the Collar

You will roll the tile up along the clear glass that borders the top of the design. Begin rolling about 2.5" (63mm) in from the beveled edge furthest from your body. Roll up the tile towards yourself. Stop rolling once the collar is 2" (51mm) from the beveled edge closest to you, lift the piece off of the ferro, and bring it to the glory hole to begin heating.



### Closing the seam

After rolling up the tile, heating in the glory hole should be done using a "flipping" technique rather than constant turning. Heat the piece with the open edges of the cylinder face down until it begins to sag and then quickly turn the pipe 180 degrees so that the open edges of the cylinder are face up and the piece begins to sag in the other direction. Continue flipping the piece in this fashion until the piece becomes pliable. Bring the piece out of the glory hole with the seam facing down, and then flip the seam up when the gaffer is ready to begin closing the seam.

Begin joining the seam at the end furthest from the collar. Use two pairs of pincers to pull the beveled edges together, connecting the inside, front edge first. Then continue to draw the edges together towards the collar to close the seam. Use the back of your pincers or a tagliol to avoid excessive tool marks.



Next heat the piece to a marvering temperature and marver it until the seam is fully incorporated into the body of the vessel. Jacks can be used on the inside of the piece by an assistant while marvering to smooth the inside seam.



<sup>A</sup> Traditionally, ferros are made from 1/4" - 3/8" (6 - 9mm) mild steel and prepared with an even layer of fine clay. For the Roll-up process, especially when working with tiles thicker than 3/8" (9mm), this presents a problem. Invariably, it is difficult to get the kilnformed tile hot enough without also getting the steel ferro so hot that the clay separator spalls off of the ferro and sticks to the glass. An alternative is to use 1/2" (13mm) thick kiln shelves. Shelves should be cut so that there is approximately 1/2" (13mm) of space around the kilnformed tile. In other words, an 8 x 10" (203 x 254mm) tile would require a 9 x 11" (229 x 279mm) shelf. Mix a batch of separator at 1/3 alumina hydrate, 1/3 china clay, and 1/3 talc by weight and then mix it with water at a ratio of 1 part separator to 5 parts water by volume. Apply 5 coats of this mixture to the shelf and then dry it in the kiln at 500°F/260°C for 20 minutes.

<sup>B</sup> If working without furnace glass, you will need to make the collar from cullet. Theoretically, the collar can be made from any glass, because it will be cut off, and therefore need not be made of compatible glass. In practice, however, it should be the same glass as the kilnformed tile because then it will behave in the same way as the rest of the glass on the blowpipe. Have the cullet in a pick-up kiln (this can be the same kiln where the kilnformed tiles are holding at 1115°F/600°C). Heat the pipe until it is red hot and then pick up a very small chunk of glass. Work that chunk until it is gooeey, then use it to pick up a larger chunk of glass on the side of the pipe. Continue in this fashion until you have completed the collar.

<sup>C</sup> It is better to err on the small side when making the collar.

<sup>D</sup> If the tile is too cold, it will be difficult to roll up and may crack. If the tile is too hot, it will stick to the ferro, or be very sloppy when you roll it up.

<sup>E</sup> Some practitioners prefer to use very light heats in the glory hole to preserve the beveled edge and to keep the ferro from becoming too hot and sticking to the tile. They rely instead on torching the center of the tile to heat it. This is especially true for thicker Roll-ups.

### Closing the Cylinder

Close the cylinder using jacks along the join between the clear and the design portion of the tile. The clear is there partly to conserve the design and partly to hold one end of the cylinder together with a ring of uniform viscosity. Without the clear, the different glasses can move at different rates and the design can flow and deform, making it difficult to control. After you have closed down the cylinder, cut with diamond shears.

You now have a bubble, and you are blowing glass.



A common alternative to closing the cylinder with jacks is to attach a kilnformed disc to the end of the cylinder to create the bottom of the piece. The kilnformed disc on a shelf/ferro is taken out of the pick-up kiln and heated in the glory hole in essentially the same fashion that the kilnformed tile was. At the same time, the end of the cylinder is heated so that it will be pliable enough to stick to this disc once it has been adequately heated in the glory hole. Attach by holding the rolled up tile vertically by the blow pipe and then lowering onto disc. Then marver the piece to ensure that you have an adequate seal. Once again, you have a bubble, and you are blowing glass.

### Annealing

Put away blown pieces in an annealer that is holding at 1000°F (538°C). When you have put away all of the blown work, follow this schedule for pieces rolled-up from 3/8" (9mm) tiles:

RATE/DPH	TEMP	TIME	or	TIME	TEMP	HOLD
AFAP	960°F • 516°C	1:00		:01	960°F • 516°C	1:00
75°F • 41°C	700°F • 317°C	:00		3:30	700°F • 371°C	:00
AFAP	80°F • 27°C	:00		:01	80°F • 27°C	:00

## IMPORTANT CONSIDERATIONS

### Blowing Glass

These notes describe a hybrid process of fusing and blowing. They are not intended to teach anyone how to blow glass. Hot shop and blowing experience are required. Kilnformers can partner with blowers to execute this process.

### Viscosity

Different colors of sheet glass have different viscosities. Black 0100-30, for example, is very soft and responds fairly quickly to heat. To address this challenge, use Bullseye's Stiff Black 0101-30 in place of 0100-30. White 0113-30 is stiff and may be slower to respond to heat. Clear 1101-30 will be somewhat stiff, but can be replaced with 1501-30 which is formulated to have a longer working range for blowing. In general, transparent glasses will heat quickly and become very soft, then cool quickly and set up. Opalescent glasses will tend to heat more slowly, but then hold their heat for a longer time.

Glasses of different viscosities will behave differently in the glory hole and in blowing. This can present challenges in terms of controlling shape and form. On the other hand, it can be utilized as a design element (to create a ribbed effect, for example). In the design stage of the tile before the fusing process, differences in viscosity can be exaggerated or balanced through your choice of glass.

### Design

- When you fuse your tile, the side fired against the shelf will appear to be very "tight" and lines will be more straight and crisp than the top surface of the tile. Decide which of these sides you want to be the exterior of the vessel, and lay that side face down on the ferro. Remember that what will eventually be the top of the vessel is the edge along which you will attach the collar and roll up the tile.
- Design with the seam in mind. Many practitioners plan to make the seam a vertical feature in the composition of the Roll-up.
- Remember that you may lose a small amount of glass in the beveling process. Furthermore, you may need to vary the angle of the bevel depending on the thickness of your tile.

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