



# Northstar Glassworks, Inc.

## Boro News Newsletter

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## Flame Settings and Torches

### Introduction

To create the myriad of scintillating effects that can be achieved with Northstar glass there are a number of crucial factors. Key players in the equation are flame settings and torch type. Flame settings not only control the amount of heat the piece absorbs, but also plays an essential role in determining what color the piece will be. As explained in our users manual, striking colors react differently in varying flame environments. For example, NS-47 Aurora will turn to the blue/green end of the spectrum when worked in a heavily oxidizing environment, while turning to reds/earth tones when worked in a reducing flame.

So what is an oxidizing flame? It varies with torch type and from lampworker to lampworker. Sometimes what a lampworker believes to be an oxidizing flame is not oxidizing enough for the effect they are trying to produce. In this newsletter we will explore what type of flame is oxidizing enough to produce brilliant colors, how different torch types react with the glass, and how to work the color in the flame.

### Torch Size and Type

When purchasing a torch there are several factors one must consider in order to work colored borosilicate. The two crucial factors are the size of the torch and whether it is a surface-mix (external), or pre-mix (internal) torch. The first issue is torch size. Paul Trautman notes in his article "Size Really Does Matter" in the August/September 2001 Vol. 15 No. 2 of Glassline. "You can't go wrong with buying a bigger torch, it's really a matter of cost and your long term needs." He asserts that when working with color, "...if a very oxidizing flame is needed, less heat is available to melt the glass [because an oxidizing flame is cooler than a neutral or slightly reducing flame]. If you are working a very small piece you can get away with a small torch. But if you are working a larger piece, a small torch flame, which may be hot

enough to melt your glass in a reducing or neutral environment, will be too small to oxidize and still melt the glass." Therefore, working a larger piece on a small torch can cause difficulty in achieving certain effects. The point is: For any size torch the hottest flame is neutral to slightly reducing. With a larger torch it is possible to heat larger quantities of glass in an oxidizing environment. Even though an oxidizing flame is cooler, the volume (size) of the flame of a larger torch is greater and is able to heat the larger piece.

After tackling the issue of size, the next factor is torch type. The two types of torches on the market are surface-mix (external) and pre-mix (internal). The basic difference between the two torches is where the gases combine. With surface mix the gases combine outside the torch, while with pre-mix the gases combine inside the torch body. A recent addition to the market is the triple mix torch. Triple mix torches are a kind of surface mix torch, offering additional oxygen ports. When working color, the more control over the oxidation/reduction state of the flame, the more versatile the colors become. In the eyes of Paul Trautman, "...external mix torches give better control over oxidation/reduction. This is because the gases are burned more efficiently in this type of flame and therefore it is easier to create a more oxidizing flame."

### Torch Operation

To optimize the oxidation/reduction control you have with your torch, check your pressure settings. It is often the case that there just is not enough pressure in the line to produce the flame necessary to work the color to its full potential. For the large torches on the market such as the Carlisle CC burners, the Bethlehem PM2D, and the GTT burners, manufacturers recommend running the torches between 1/4psi to 10psi propane and 10psi to 20psi oxygen. With smaller torches, such as those produced by Nortel and

National, manufacturers suggest running them at roughly half of what the larger torches run on. Many of the experienced lampworkers report better oxidation/reduction control when working with significantly higher pressures than suggested by manufacturers. Paul Trautman runs his Bethlehem water-cooled PM2D at 5psi propane and 40psi oxygen. The large torches love oxygen, but the reward in beautiful colors that add value to your work will more than pay for the larger oxygen bill.

### Flame Settings

The next step in maximizing control of oxidation/reduction is flame settings. The ratio at which you set your oxygen to propane is crucial for certain color effects. When dialing in flame settings you start with just propane. The flame is relatively cool and is very reducing. When the oxygen is turned on the flame temperature increases and the flame becomes less reducing. As more oxygen is added the flame becomes hotter until reaching a maximum temperature at which point the flame will roughly be neutral. After reaching the maximum temperature, oxygen added to the flame causes it to become cooler and oxidizing.

In order to achieve an oxidizing enough flame, so as not to dull or muddy certain colors, turn the oxygen up until the torch begins to hiss loudly. This will cause a bit more noise than you are used to, but it is critical when working certain colors such as NS-33 Turbo Cobalt and the Exotics that require extremely oxidizing environments. Robert Mickelson suggests leaving the outer oxygen on even when only working the inner flame to create a super-oxidizing environment if needed.

### Where To Work In The Flame

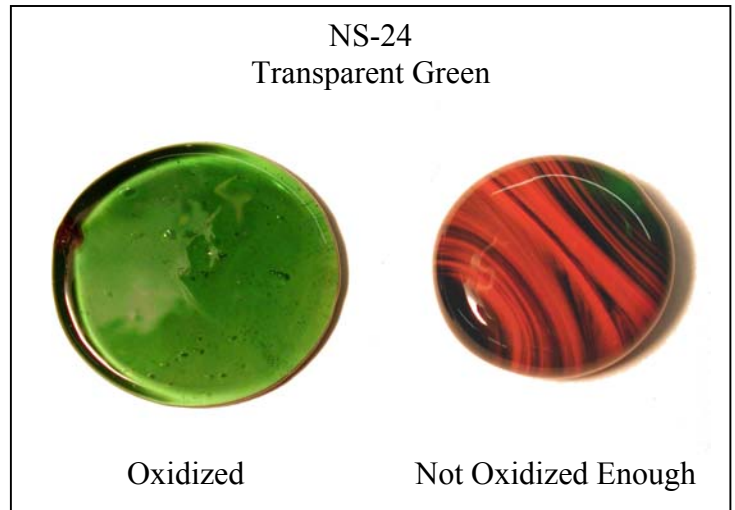
With striking colors and flame sensitive colors, where it is worked in the flame must be taken into consideration, which is especially important for users with smaller torches. The further away from the torch head you work, the more oxidizing the flame. This is because the gases have more time to mix and combust.



**Northstar Glassworks**  
**Spring Open House**  
**April 5<sup>th</sup>, 2002**  
**4 to 8 pm**

### The Importance of Oxidation

As noted in the introduction, striking colors and flame sensitive colors are affected by flame's oxidation/reduction state. The photographs below show how colors react when worked in an oxidizing flame and a neutral/slightly reducing environment.



### Closing

With all facets of lampworking, be it technique, color, or torch operation, the key to success is experimentation. The process of experimentation involves trial and error, patience, and persistence. Remember, working glass is more of an art than a science, so above all, HAVE FUN!!

Missed a newsletter? Want to see that black and white photo in full, vibrant color? Need more info about the open house? Visit [www.northstarglass.com](http://www.northstarglass.com)

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