

Technical Bulletin – Lead-Free Glass Tubing

Thank you for your interest in phosphor coated lead-free glass tubing from FMS Neon Products. FMS has manufactured the Brillite brand of phosphor coated neon sign tubing since 1946 and we look forward to putting that experience to work for you.

From the very beginnings of the neon sign industry, glass tube benders have constructed neon signs using lead glass because of its favorable working characteristics. However, in recent years the neon industry has moved away from lead glass due to environmental concerns.

In its place a new lead-free glass tubing was developed for use in neon sign applications. The lead-free glass was specifically developed to exhibit working characteristics as close as possible to those of lead glass. The lead-free glass is very similar to lead glass and even exhibits some performance advantages, but it does not work exactly the same. Most tube benders find that after some experience the lead-free material works very well and high quality neon pieces can be efficiently produced.

Following are a few ideas and comments that may shorten the learning curve and help you to become proficient at working with lead-free neon tubing as quickly as possible.

Working Characteristics - The new lead-free glass has a higher working temperature than lead glass. Below is a chart comparing significant temperature thresholds for lead and lead-free glass.

Viscosity Data	Lead-Free Glass		Lead Glass	
	<i>Celsius</i>	<i>Fahrenheit</i>	<i>Celsius</i>	<i>Fahrenheit</i>
Strain Point	455	851	392	738
Annealing Point	485	905	432	810
Softening Point	675	1247	635	1175
Working Point	1020	1868	985	1805

Heating Time - Because of differences chemical composition, lead-free glass takes longer to heat to the working temperature. Many tube benders may want to enrich their flames with oxygen to move the lead-free glass to the working point more quickly. However, great care must be taken to introduce oxygen to the bending process in a safe manner.

Handling - To reduce stress in bent units, benders should complete their bends as quickly as possible after removing the glass from the fires. As much as possible, avoid manipulating the glass with a block during the bend. Make sure the hot tube avoids contact with any conductive surface that will draw heat out of the tube and thereby introduce stress in the glass. Use an insulated cooling rack rather than laying the hot tube on any heat conductive surface such as a table. When splicing tubes or welding on an electrode, warm the glass to a greater distance from the weld than you would with lead glass.

Blackening - Leaded glass tubing has traditionally suffered from occasional blackening at the heated areas. This blackening is caused by lead being deposited on the surface of the

lead glass tube when too much gas (too little air) is present in the flame. Of course with the absence of lead in the lead-free tubing there is nothing present to cause blackening, so the lead-free tubing can be processed with a hotter, bushier flame.

Pumping – Lead-free glass can be processed using the same techniques and procedures as were used with lead glass.

Footage per Pound - Lead-free tubing is approximately 9% lighter in weight than lead glass. Since glass tubing is generally purchased by the pound, this results in more footage per given price.

Tensile Strength - Lead-free tubing is stronger than lead tubing. This results in a lower incidence of breakage due to non-stress related shock.

Compatibility - Lead-free tubing is compatible with lead tubing. The two can be welded together. However, care must be exercised to avoid blackening the lead glass as both materials are brought up to heat simultaneously.

Yellow Flare - Lead-free glass will throw a bright yellow flare when placed in the flame. Tube benders may want to wear dark glasses to filter out the flare, thereby reducing eye strain and maintaining a clear view of their work.

Once again, thank you for your interest in FMS Brillite phosphor coated neon sign tubing. We hope the information above will help you become accustomed to working with lead-free glass tubing. We welcome your questions and comments.

Please try the other high quality neon materials available at FMS including Brillite Neon Electrodes, Stazon Neon Blockout Paint, FMS McMahan Neon Tube Supports, and other neon related items.