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Smooth Bore Nozzles by Mac McGarry

Many articles have been written on the topic of different types of nozzles including the smooth bore nozzle. Of the articles written detailing and explaining nozzles, many have covered the various types of fog nozzles and their operation. However, most of these articles have referred to smooth bore nozzles as a single classification. There are many different variations of smooth bore nozzles from which the stream quality and reach can vary considerably.

In the most basic of terms, a smooth bore nozzle is a brass or aluminum tip with a fixed orifice or opening attached to a shutoff valve. The purpose of the shutoff valve is to simply control the flow of water. The purpose of "the tip" is to shape the water into a solid fire stream. While there are a few variations of shutoffs that can affect stream quality, the size and shape of the smooth bore tip will have the greatest influence on the quality and reach of the stream.

Nozzles, smooth bore or fog can be specified as a one-piece unit or in a format where the tip or tips attach to the shutoff as a threaded appliance. As a one-piece unit, a nozzle has little or no variation. However, as a threaded appliance a nozzle can be extremely versatile and offer more options and flexibility. The greatest degree of flexibility is derived from a shutoff with a built in smooth bore orifice to which a variety of fog or additional smooth bore tips can be attached.

There is a wide variety of smooth bore tips available from the major nozzle manufacturers. The different tip designs can produce varying qualities of solid streams. The primary factor affecting this stream quality is the length and degree of taper contained within the tip. This taper is responsible for shaping the fire stream giving it the tightness and reach indicative of a good solid stream. A long, gradual taper within the tip will produce the best quality stream with the longest reach.

Built in or integrated smooth bore tips simply design the smooth bore orifice into the shutoff and offer a great deal of flexibility. Early versions of these integrated smooth bores, sometimes referred to as slug tips, generally produced a lower quality solid stream. However, newer models have been greatly improved and produce a good quality stream. The integrated version will be a very compact, lightweight nozzle.

Two options are commonly added to an integrated tip. The first is for those who want the ability to have both a fog nozzle and smooth bore nozzle in one. This offers a company officer a great degree of flexibility. This is achieved by attaching a fog tip to the male threads on the outer edge of the integrated tip that can be removed if increased flows are required. A popular option is to attach a low-pressure fog tip to an integrated smooth bore. If a 175 GPM @ 50 PSI fog tip were removed to reveal a 1" smooth bore the increase in flow would be around 30 GPM (**depending on the 1 3/4" hose used**) and if the pump discharge pressure remains constant.

Another option today is to attach a smaller smooth bore tip to a larger integrated tip. For example, a 15/16" tapered tip could be attached to an 11/8" integrated tip. This variation would provide an adequate fire stream flowing 185 GPM @ 50 PSI. If more GPM is required to achieve knock down the outer tip could be removed and without changing the discharge pressure the integrated tip would provide an additional 40 – 55 GPM of flow if used with a "flow efficient" 1 3/4" hose that will support the higher flows.



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Two common variations of the smooth bore are stacked tips and tapered tips. Stacked tips are usually 2-3 smooth bore tips that decrease in size as they go up in the stack from the shutoff. Removing tips leaving a tip with a larger orifice increases the GPM flow. The transition area from tip to tip can create slight turbulence affecting stream quality of a stacked tip arrangement. Stacked tips will have a limited taper, which will also affect the quality of the stream.

Longer Tapered Tips generally produce the best quality solid stream.

A longer and more gradual taper inside the tip will generate a tighter and longer reaching solid stream. Elkhart Brass is producing new “old school style” long, tapered tips available for 1.75” as well as 2.5” attack lines. The 188A Tip has exceptional stream quality when mated with the new style 375 Series Shutoff. While the length and taper of the tip will have the greatest affect on stream quality, other factors can have an impact as well such as the shutoff design as well as other appliances that may be used.

The design and construction of a shutoff can affect how the water will flow through to the tip and ultimately will affect stream quality. A smooth transition from the hose to the tip is important, especially with an integrated design because of the short distance to shape the stream. Appliances such as stream shapers can also improve stream quality and increase reach by reducing the turbulence of the water as it leaves the hose.

If using a stream shaper with an integrated smooth bore or one-piece design it should be placed between the hose and the shutoff.

If a tapered or stack tip design is used then the shaper can be placed between the shutoff and the tip.

The space between the vanes is usually large enough to pass most debris but a large object that would normally pass through a smooth bore nozzle could potentially get stuck and severely restrict flow. One potential drawback when using a stream shaper is the potential for debris to obstruct the water flow, especially in high-rise applications. I don't recommend using a stream shaper on a high rise pack.

It is important that a fire department that is going to equip their Engine Companies understand the options available to them today. The smooth bore nozzle has been and will remain a vital tool in the Engine Company's arsenal. There are many variations of smoothbore nozzles and options to consider. The importance of matching the proper nozzle to good hose must also be taken into consideration. When mated to the proper hose, the smooth bore nozzle provides a very reliable, lightweight tool that produces a high flowing, hard-hitting fire stream which will improve the efficiency and effectiveness of your fire department during a structural fire attack.