

# Suction Elbow Flow Test Results Briefing

September 30, 2017

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On September 30, 2017, the folks from GBW Associates, LLC and Water Supply Innovations, LLC conducted a number of flow tests on a variety of different makes, models, and styles of 6-inch, fire department suction strainers. Included in that work were flow tests on three models of 90-degree suction elbows. The results from the suction elbow strainer performance tests are presented in this document.

All testing was done at the Hunterdon County Emergency Services Training Center in Annandale, New Jersey. Engine 1262 from the Glen Gardner Fire Company was used for each flow test. The pumper was equipped with a Hale QMax 2,250 gpm single-stage pump powered by a 515 hp diesel motor.

## **The Test Conditions**

All test conditions were kept constant from flow test to flow test:

- 20-feet of 6-inch Kochek lightweight suction hose connected to the pumper's officer's side main suction inlet;
- 3.52-feet of lift;
- 371-foot test site elevation;
- Air temperature between 60 °F and 69 °F;
- Water temperature between 60 °F and 70 °F;
- 50-feet of 4-inch hose from the pump's high-flow discharge supplying a 2-1/2-inch Hose Monster; and,
- Dual, 3-inch hoses, each 50-feet in length, each connected to a 2-1/2-inch discharge, and each supplying a portable monitor outfitted with an Akron Flow Test Kit and 1-3/4-inch smooth bore tip.
- A Task Force Tip Low Level Strainer with Float Attachment (A03HNX-JET-F) was used as the suction strainer for all four, flow tests. The Task Force Tips strainer was a top-performer in the strainer flow tests, thus it was chosen as the suction strainer for the suction elbow flow tests. Using the float attachment, the low level strainer's intake remained at a constant depth of 18-inches in the pond.
- The same person operated the fire pump.
- The same person oversaw pump operations and suction elbow deployment.
- The same person collected all physical data on each suction elbow.
- The same person recorded all gauge readings.

The only variable in the entire flow testing process was the suction elbow being tested.

Prior to the first suction elbow flow test a flow test was completed using no suction elbow. The Task Force Tips low level strainer with float attachment was attached to 20-feet of 6-inch suction hose which was then connected directly to the pumper's officer's side suction inlet. This test provided a baseline for comparison of all elbows: as elbows were added to the pump's suction inlet, a restriction in flow was expected. For each flow test, data was recorded at peak output flow, which in most cases was also the point at which pump cavitation began.

**The 90-Degree Suction Elbows**

		
Fol-Da-Tank 90-degree Suction Elbow Unknown Model # Casted "Red"	Fol-Da-Tank 90-degree Suction Elbow Unknown Model # Casted – Unpainted	Kochek 90-degree Suction Elbow Unknown Model # Welded
		
Task Force Tips Low Level Strainer w/Float A03HNX-JET-F)	90-Degree Suction Elbow In Use Turtle, Wisconsin	90-Degree Suction Elbow In Use Whitewater, Wisconsin

**90-Degree Suction Elbow Flow Test Results**

Device	Flow Achieved (gpm)	Motor Speed (rpm)	Vacuum Reading ("Hg)
No suction elbow (Baseline Test)	1738 gpm	1150 rpm	16.5 in
Fol-Da-Tank – Casted – Red	1565 gpm	1025 rpm	18.0 in
Fold-Da-Tank – Casted – Unpainted	1582 gpm	1125 rpm	18.0 in
Kochek – Welded	1586 gpm	1125 rpm	18.5 in

## **General Notes About the Flow Tests**

- The baseline flow test measured maximum flow without the use of a suction elbow.
- All flow readings were obtained using remote test gauges connected to a 2-1/2" HoseMonster flow diffuser and to an Akron Flow Test Kit on a portable deluge gun outfitted with a 1-3/4-inch smooth bore nozzle.
- Motor speed readings were obtained using the digital tachometer on the pumper's pump panel.
- Vacuum readings were obtained using a remote test gauge connected to the pump's vacuum test port.
- All test gauges were either new or recently calibrated. All test gauges were also field verified the morning of the flow tests. Therefore, all flow readings are expected to have a 5% or less margin of error.

## **The Findings**

All three, 90-degree suction elbows performed within a 25 gpm variance of each other. In all three flow tests, the suction elbows allowed at least 1,500 gpm to pass through to the pump. Having used the "big body" 2,250 gpm Hale QMax pump powered by a 515 hp motor, we feel that each of the elbows reached its maximum flow potential given the test conditions. The good news is that each elbow allowed for a 1,500 gpm supply. These test findings prove important when comparing the use of a front suction inlet (generally poor performance on a mid-ship pump) to the use of a 90-degree elbow on a main suction inlet. This comparison becomes even more important on pumps with lower capacity ratings (1,000 gpm to 1,500 gpm) – especially when desiring to draft from the front or rear of the vehicle.

Many thanks to all of the folks and fire departments that contributed time, equipment, and funds in support of this project. A complete listing can be found in the project's "official" white paper.

Questions or concerns about the flow test results can be directed to Mark E. Davis, CFPS at [www.gotbigwater.com](http://www.gotbigwater.com) by emailing [thebigcamel@gotbigwater.com](mailto:thebigcamel@gotbigwater.com) or by joining the Members Area of [www.GotBigWater.com](http://www.GotBigWater.com).