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2-1/2” Discharge Flow Test

Evaluating the Flow Capacity of 5” LDH Used on a 2-1/2” Discharge

Seneca County, New York
April 5, 2009

Overview

- On April 4th and 5th, 2009, the Seneca County, New York, Office of Emergency Services held a Rural Water Supply Operations Seminar and Drill presented by GBW Associates, LLC of Westminster, Maryland.
- During the tanker shuttle drill on Sunday the 5th, some discussion arose involving the flow capacity of 2-1/2-inch discharges on centrifugal fire pumps.
- The specific inquiry involved the use of 5-inch hose on a 2-1/2-inch discharge and the amount of water that could be move through that hose.
- Ovid FD Engine 1104 (1,250 gpm) was used to conduct a flow test involving the capability of a 2-1/2-inch discharge when using 5-inch hose.

The Pumper

- Ovid Engine 1104
  - 1984 Saulsbury/Ford chassis
  - Hale 1,250 gpm single-stage pump
  - One, 6-inch suction intake connection.
  - Carries 6-inch suction hose.

The Problem

- Traditional 2-1/2-inch discharges are generally limited in their flow to only a percentage of the fire pump's rated capacity.
- Just because a 2-1/2" x 5" adaptor can allow 5-inch LDH to be connected to a pump's 2-1/2" discharge, this does not mean that a high flow rate will be obtained – as would be expected with LDH.

The Hypothesis

- A single, 2-1/2-inch discharge cannot flow the rated capacity of the pump even when pumping into a 5-inch LDH line.

The Test Set-up

- Engine 1104 (1,250 gpm) was connected to a 6-inch dry fire hydrant using 16-feet of 6-inch suction hose.
- The dry fire hydrant had been used previously in the day for filling tankers in the 2-hour water shuttle exercise – so the hydrant was confirmed operational and unobstructed.
- Lift was less than 10-feet thus allowing the pump to develop full capacity if possible.
- Two flow tests were run using two different hose set-ups.

The Test Set-up: Flow Test #1

- A portable master stream device outfitted with a 2-inch tip was supplied by a 100-ft section of 5-inch LDH which was connected to one of Engine 1104's 2-1/2-inch discharges.
- Flow was measured using a pitot tube at the 2-inch tip.

The Test Set-up: Flow Test #2

- A portable master stream device outfitted with a 2-inch tip was supplied by a 100-ft section of 5-inch LDH which was then supplied by two, short sections of 3-inch hose using a clappered siamese.
- The two, 3-inch lines were connected to two of Engine 1104's 2-1/2-inch discharges.
- Flow was measured using a pitot tube at the 2-inch tip.

Establishing Constants

- In order to collect comparable data, a few constants had to be established.
  - The same suction hose set-up was used each time.
  - The vehicle's transmission remained in the same gear each time.
  - No other devices were used to flow water while the portable monitor was flowing.
  - Each test was stopped when there was "no more throttle" available.

Test Results: Flow Test #1

Master Discharge Gauge Reading	Nozzle Pitot Reading	Flow
80 psi	40 psi	751 gpm
100 psi	50 psi	840 gpm
105 psi	54 psi	873 gpm
125 psi	64 psi	**950 gpm**

Single, 5-inch LDH hose, 100-ft in length supplied by a single, 2-1/2-inch discharge.

Test Results: Flow Test #2

Master Discharge Gauge Reading	Nozzle Pitot Reading	Flow
80 psi	50 psi	840 gpm
100 psi	62 psi	935 gpm
105 psi	66 psi	965 gpm
125 psi	74 psi	**1022 gpm**

Single, 5-inch LDH hose, 100-ft in length supplied by two, 2-1/2-inch discharges.

Summary

- It was demonstrated that a single, 2-1/2-inch discharge could not supply 1000 gpm to a 5-inch LDH.
- However, when two, 2-1/2-inch discharges were used, the 1,000 gpm goal was reached.
- The results of this simple demonstration are important to remember because it is easy to connect a 5-inch line to any discharge – however, we have to remember that unless that discharge is designed for high flows – that discharge most likely will be limited in its flow capacity.
- Kind of like putting a 2-1/2” fog nozzle on a ¾” booster line – you are still limited in flow.

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