

**FIRE DEPARTMENT – FIRE PREVENTION BUREAU**

1039 C Street, San Rafael, CA 94901 - Phone (415) 485-3308 - Fax (415) 453-1627 - [www.srfd.org](http://www.srfd.org)

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**Informational Bulletin****Backflow Preventer Forward Flow Test Procedures**

July 13, 2010

**Introduction:**

The backflow preventer forward flow test is required for new installations, prior to the system being placed into service and at least annually thereafter. This is one method for a typical installation; there are other approved methods for conducting the test. The results must be recorded on the appropriate State Fire Marshal (SFM) form for documenting Inspection, Testing, and Maintenance as specified in NFPA 25, as amended by CCR, Title 19.

**Test Procedure:**

1. The automatic fire sprinkler contractor must provide a test outlet in the system downstream of the backflow preventer. The test outlet provided must be large enough to flow a volume of water at least equal to the hydraulically calculated system demand, including inside hose stream demand where applicable.
2. Connect a test header with 2 1/2" fire hose connections to the system test outlet.
3. Provide necessary fire hoses and smooth bore nozzles (UL Play Pipes).
4. Flow hose streams. Record the number of nozzles flowed, the nozzle size and the pitot pressure read from each hose stream.
5. Read and record the inlet flow pressure and the outlet flow pressure of the backflow preventer while flowing. Stop flowing water. (See "Measuring the Pressure Loss" section below for guidance on measuring the pressure loss across the backflow preventer.)
6. Convert the pitot tube readings to gallons per minute (GPM).
7. Record the designed flow rate and the actual flow rate.
8. Compare performance test results to the hydraulic calculations. This comparison will verify that the water supply is adequate for proper system operation. Verify the following:
  - a. the actual flow rate meets or exceeds the designed flow rate;
  - b. the actual pressure loss across the backflow preventer is equal to or less than the designed pressure loss, and

- c. the actual pressure loss across the backflow preventer meets the manufacturer's performance specifications.

### **Measuring the Pressure Loss:**

The pressure loss across the backflow preventer must be measured while flowing at the minimum permissible flow rate.

Two approved methods are provided below:

1. To measure the inlet flow and outlet flow pressures you will need two inspector's gauges. Install an inspector's gauge in test cocks one and four of the backflow preventer. The gauge reading from test cock one is the inlet flow pressure and the gauge reading from test cock four is the outlet flow pressure. (Remove gauges at completion of the forward flow test.)
2. You may use a pressure differential test kit. To measure the inlet flow pressure you will need an inspector's gauge. Install the inspector's gauge in test cock one. Connect the high side hose of test kit to test cock two. Connect the low side hose of test kit to test cock four. Purge air from test kit. While flowing, read pressure on inspectors gauge, this is the inlet flow pressure, read pressure on test kit, subtract the test kit pressure reading from the inspectors gauge reading, the total equals the outlet flow pressure.

NOTE: The pressure reading on the test kit is the flowing pressure loss across the backflow preventer.

At the completion of the forward flow performance test, conduct the backflow performance test. This will verify the check valves will close tight and that the backflow preventer is operating as required by code.

When both performance tests have been completed and the test results indicate the backflow preventer has passed all test requirements, the system is ready to be placed into service. Record in the comments section of the SFM form that the number one and number two shut-off valves are open and valve supervision is on and that the shut-off valves are chained and locked. Distribute the SFM forms as specified in NFPA 25 and CCR Title 19.

### **General Information:**

1. **CAUTION:** You may be flowing large quantities of water at high pressure. Work safely. Think about where you will be disposing of the water from the flow test.
2. The test outlet from which you will be flowing should be located as close to the backflow preventer as possible to minimize pressure loss due to friction. There are many options available for providing a test outlet. Some examples are: using the fire department connection, providing a tee in the riser, or providing a 2 1/2" main drain. A 2 1/2" Standpipe hose connection or a fire pump test header may also be used to conduct the forward flow test.

3. Determining the correct number of hoses with the correct size nozzle orifice may be a trial and error process for some installations. The number of 2 1/2" fire hoses and play pipes necessary to conduct the flow test will vary depending on the system demand and pressure available. It is considered a good practice to avoid pitot tube readings below 10 PSI. If you are flowing with 1 3/4" nozzles and have a low pitot reading, try flowing with 1 1/8" nozzles. This will raise the reading on the pitot tube and give accurate test results. If you cannot obtain an adequate flow rate you may need additional fire hoses or larger nozzles, or there may be a control valve partially closed.
4. The minimum permissible flow rate is the hydraulically calculated system demand.
5. At the completion of the acceptance tests, and the completion of all other code requirements, the Building Inspection Division may issue an occupancy permit to the building owner.
6. If you have any questions, or if you need help while conducting the performance tests, you may call Deputy Fire Marshal John Lippitt at (415) 485-5067.