" City of Choice"

# City of Cibolo
# FIRE FLOW TESTS
## Procedure and Submittal Process

" City of Choice"

**Fire Flow Tests Conducted within Green Valley Special Utility District:**
Fire Flow tests conducted within Green Valley Special Utility District shall not be able to apply for the 24 hour expedited Fire Flow Test, and shall be subjected to the requirements of the District and scheduled at their convenience.

**Fire Flow Test Expiration:**
Fire Flow test data is only valid for 1 year from the date of the test. Projects shall be designed and submitted within 1 year of the test date. Projects not starting construction or not designing a fire sprinkler system within 1 year of the test date may require a new flow test for verification the municipal system has not changed.

**Fire Flow Test Procedures (Performed by the Fire Marshal and Municipality's Water Purveyor)**

1. Before submitting an application for a Fire Flow Test the requestor should contact the Fire Marshal's Office to determine if any current Fire Flow records are available for the location in question. If no current Fire Flow Report is available a request for fire flow test shall be submitted. A permit application and map can be mailed to or dropped off at the Permit Office at city hall for processing and payment. P. O. Box 826 200 South Main Street Cibolo, Texas 78108
   A Fire Flow Permit Application can be downloaded at:
   https://www.cibolotx.gov/255/Fee-Schedule-Permit-Applications
2. The Fire Flow Test requestor shall field verify the proposed hydrants to be tested.
3. The permit application is verified for completeness by Permit Office for the following.
   a. Requestor name and contact information.
   b. A map showing proposed hydrants to be tested.
   c. Proposed project information.
   d. Associated fees are applied.
   e. Property owners name and signature.
4. The Permit Office will process the request.
5. The Permit Office will forward the request to the Fire Marshal's Office and Municipality's Water Purveyor for verification of the following and to schedule a date and time for testing.
   a. Verification by the Fire Marshal and/or Water Purveyor of the hydrant locations and that they are acceptable for producing fire flow for the intended project.
   b. Verify hydrants are in the same pressure plain.
   c. Verify hydrants are suitable for supplying fire flow to the proposed location and/or on the same main as the proposed fire line tap supplying the proposed project.
6. The Fire Marshal's Office shall verify the water district the Fire Flow Test is to be conducted in, and if the test is to be within Green Valley Special Utility District the Fire Marshal shall schedule with a representative of the water district to conduct the test.
7. Fire Marshal and/or Water Purveyor will communicate by email to the requestor the date and time for completing the test along with confirmation of the hydrants that should be tested.
8. The Municipal Water purveyor will confirm the water tower level at the time of the test and the diameter of the mains the hydrants are tested off of.
9. The Fire Marshal and Municipal Water Purveyor will conduct the flow test.
10. Fire Marshal's Office completes the Fire Flow Test Report and sends the results to the requestor.

**Fire Flow Test Procedures (Performed by a third-party tester and witnessed by the City)**

1. Before submitting an application for a Fire Flow Test the requestor should contact the Fire Marshal's Office to determine if any current Fire Flow records are available for the location in question. If no current Fire Flow Report is available a request for fire flow test shall be submitted. A permit application and map can be mailed to or dropped off at the Permit Office for processing and payment. A Fire Flow Permit Application can be downloaded at:
   https://www.cibolotx.gov/255/Fee-Schedule-Permit-Applications
2. The Fire Flow Test requestor shall field verify the proposed hydrants to be tested.
3. The permit application is verified for completeness by Permit Office for the following.
   a. Requestor name and contact information.
   b. A map showing proposed hydrants to be tested.
   c. Proposed project information.
   d. Associated fees are applied.
   e. Property owners name and signature.
4. The Permit Office will process the request.
5. The Permit Office will forward the request to the Fire Marshal's Office and Municipality's Water Purveyor for verification of the following and to schedule a date and time for testing.
   a. Verification by the Fire Marshal and/or Water Purveyor of the hydrant locations and that they are acceptable for producing fire flow for the intended project.
   b. Verify hydrants are in the same pressure plain.
   c. Verify hydrants are suitable for supplying fire flow to the proposed location and/or on the same main as the proposed fire line tap supplying the proposed project.
6. The Fire Marshal's Office shall verify the water district the Fire Flow Test is to be conducted in, and if the test is to be within Green Valley Special Utility District the Fire Marshal shall schedule with a representative of the water district to witness the test.
7. Fire Marshal and/or Water Purveyor will communicate by email to the requestor the date and time for completing the test along with confirmation of the hydrants that should be tested.
8. The Fire Marshal's Office will provide the requestor with the City's Fire Flow Test Report Form based on the Water Purveyor's water district.
9. The Municipal Water purveyor will confirm the water tower level at the time of the test.
10. The Fire Marshal and Municipal Water Purveyor will witness the flow test.
11. The Water Purveyor will sign the form along with the third-party tester.
12. The third-party tester shall verify the diameter of the mains the hydrants are tested off of.
13. The third-party tester completes the Fire Flow Test Report and sends the results to the Fire Marshal's Office for record.

**The following is the method for flow testing and marking of hydrants.**

**1. Fire Flow Testing.**

**1.1** Fire flow test on municipal/public hydrants shall be preformed by the Fire Marshal and Purveyor or representative of the fire department. Fire flow tests on private hydrants are the responsibility of the property owner or authorized agent to apply for and shall be preformed by the Fire Marshal and Purveyor or representative of the fire department. Fire Flow Tests conducted by a third-party tester is subject to the requirements as stated above and shall be witnessed by the Fire Marshal and Water Purveyor. Private hydrants shall be tested every two years.

**1.2** Fire flow test will consist of two hydrants, one hydrant for pressure readings, and one hydrant for flow readings. Flowing of additional hydrants without changing the hydrant the pressure is read from will be calculated as each additional hydrant. Changing hydrants the pressure is read from constitutes a new fire flow test for each hydrant and from each hydrant flowed.

**2. Rating Pressure.**

**2.1** For the purpose of uniform marking of fire hydrants, the rated capacities should be based upon actual flow for all hydrants having a static pressure in excess of 40 psi. For testing of hydrants theoretical discharge Tables shall not be used to calculate flow. The formula used for calculating flow is 29.84 x Cof. x $2.50^2$ x $P\sqrt{}$ = Q.

**2.2** To obtain satisfactory test results of calculations of expected flows or rated capacities, sufficient discharge should be achieved to cause a drop in pressure at the residual hydrant of at least 25 percent below static pressure for all hydrants having a static pressure in excess of 40 psi. For testing fire flow theoretical discharge Tables shall not be used to calculate flow and determining flow discharge. Tests without a pitot(s) that sample water from the middle of the stream at the hydrant shall not be permitted.

**2.3** It is recommended that a minimum residual pressure of 25 psi should be maintained at hydrants when delivering the fire flow. Pressures dropping below 25 psi will stop the test immediately to prevent damage to the municipal system.

**2.4** It should be noted that the use of residual pressures of less than 20 psi is not permitted by many state health departments and is not permitted by the City of Cibolo.

**3. Layout of Test.**

**3.1** After the location where the test is to be run has been determined, a group of test hydrants in the vicinity is selected as approved by the *fire code official*.

**3.2** Once selected, due consideration should be given to potential interference with traffic flow patterns, damage to surroundings (e.g., roadways, sidewalks, landscapes, vehicles, and pedestrians), and potential flooding problems both local and remote from the test site.

**3.3** One hydrant, designated the test (residual) hydrant, is chosen to be the hydrant where the normal static pressure will be observed with the other hydrant(s) in the group closed, and where the residual pressure will be observed with the other hydrant(s) flowing.

**3.4** This test hydrant is chosen so it will be located between the hydrant to be flowed and the large mains that constitute the immediate sources of water supply in the area, and closest to the location the test is being performed for. All reports shall include hydrant layout diagrams and indicate the residual hydrant designated with the letter R and hydrant(s) to be flowed with the letter F.

**3.5** The number of hydrants to be used in any test depends upon the strength of the distribution system in the vicinity of the test location as approved by the *fire code official*. The pitot reading shall be measured from both 2.5 inch ports from one hydrant to determine available fire flow. Unless otherwise determined by the *fire code official*.

**3.6** To obtain satisfactory test results of expected flows or rated capacities, sufficient discharge should be achieved to cause a drop in pressure at the residual hydrant of at least 25 percent, or to flow the total demand necessary for providing fire suppression services in a fire emergency.

**4. Equipment.**

**4.1** The equipment necessary for field work consists of the following:

(1) A single 0-160 or 0-200 psi bourdon pressure gauge with no more than 1 psi graduations or equivalent as approved by the *fire code official*.

(2) A hydrant cap with a T connection for the 0-160 or 0-200 psi gauge and a cock at the end for relieving air pressure or equivalent as approved by the *fire code official*.

(3) Two *approved* pitot tubes that sample water from the center of the stream at the hydrant with 0-50 or 0-60 psi bourdon pressure gauges with 1 psi graduations or equivalent as approved by the *fire code official*. Due to higher pressures in certain parts of the jurisdiction 0-100 psi bourdon pressure gauges with 1 psi graduations will be needed as indicated by the *fire code official*.

(4) Hydrant wrenches.

(5) Diffusers, deflectors, mats, or other *approved* devices as necessary.

**5. Test Procedure.**

**5.1** Testing procedure for fire flow.

(1) Opening the hydrants to be tested, water should be allowed to flow for a sufficient time to clear all debris and foreign substances from the stream(s) then close the hydrant(s).

(2) In a typical test, the 0-160 or 0-200 psi gauge is attached to one of the 2½ inch outlets of the residual hydrant using the special cap.

(3) The cock on the gauge piping is opened, (as soon as the air is exhausted from the barrel, the cock is closed) and the hydrant valve is opened full.

(4) A reading (static pressure) is taken when the needle comes to rest.

(5) At a given signal, each of the other hydrant(s) is opened in succession, with discharge taking place directly from the open hydrant ports.

(6) If more than one hydrant is opened they should be opened one at a time.

(7) At that time, a signal is given to the people at the hydrants(s) to read the pitot pressure of the streams simultaneously while the residual pressure is being read.

(8) The final magnitude of the pressure drop can be controlled by the number of hydrants used and the number of outlets opened on each.

(9) After the readings have been taken a signal is given, and hydrants should be shut down slowly, one at a time, to prevent undue surges in the system.

**6. Pitot Readings.**

**6.1** Procedure for pitot readings.

(1) When measuring discharge from open hydrant ports, it is always preferable from the standpoint of accuracy to use 2½ inch outlets rather than pumper outlets.

(2) In practically all cases, the 2½ inch outlets are filled across the entire cross-section during flow, while in the case of the larger outlets there is the possibility of a void near the bottom of the stream where there are varying pressures.

(3) When measuring the pitot pressure of a stream of practically uniform velocity, the orifice in the pitot tube is held downstream approximately one-half the diameter of the hydrant outlet or nozzle opening, and in the center of the stream. (See Figure 6.3) Diffusers shall have pitot tubes for sampling water from the center of the stream.

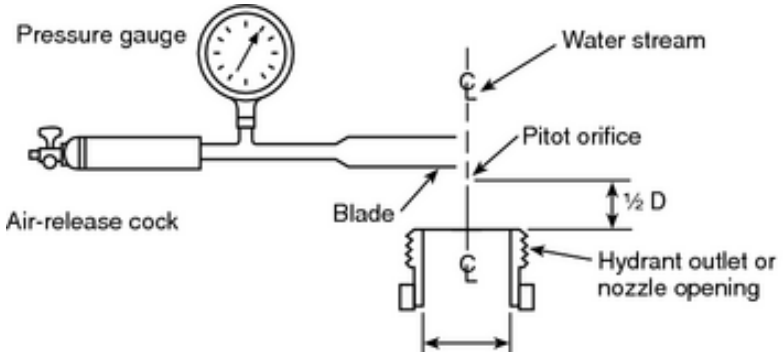
(4) The center line of the orifice should be at right angles to the plane of the face of the hydrant outlet.

(5) The air chamber on the pitot tube should be kept elevated.

(6) Opening additional hydrant outlets will aid in controlling the pitot reading in rare instances of extremely high pressure with no pressure drop.

(7) Hydrant valves shall be wide open to minimize problems with underground drain valves, and to give a more streamlined flow and a more accurate pitot reading.

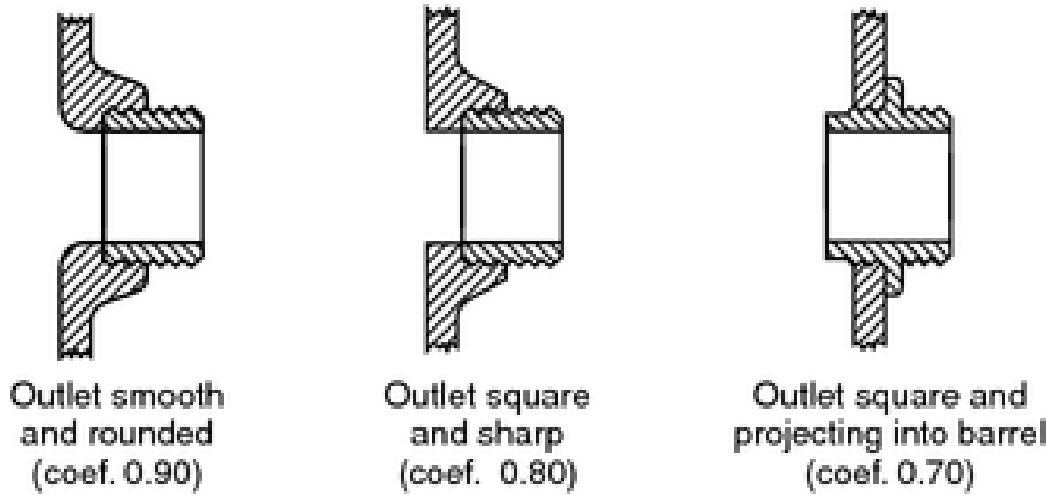
**FIGURE 6.3 Pitot Tube Position.**




**7. Determination of Discharge.**

**7.1** At the hydrants used for flow during the test, the discharges from the open ports are determined from measurements of the diameter of the outlets flowed, the pitot pressure (velocity head) of the streams as indicated by the pitot gauge readings, and the coefficient of the outlet being flowed as determined from Figure 7.1.

**FIGURE 7.1 Three General Types of Hydrant Outlets and Their Coefficients of Discharge.**




**7.2** The formula used to compute the discharge, Q, in gpm from these measurements is as follows:
where:
c = coefficient of discharge (see Equation 7.2)

$$Q = 29.84cd^2\sqrt{p}$$

d = diameter of the outlet in inches
p = pitot pressure (velocity head) in psi

**8. Use of Pumper Outlets.**

**8.1** If it is necessary to use a pumper outlet, the use of pumper outlet(s) shall require prior approval by the *fire code official*.

**8.2** For pumper outlets, the approximate discharge can be computed in accordance with Equation 7.2

**9. Determination of Discharge.**

**9.1** If additional hydrants are used (flowed) to control the residual pressure drop, the discharges from the additional outlet(s) is not added to the total flow calculation.

**9.2** The formula that is generally used to compute the discharge at the specified residual pressure or for any desired pressure drop is Equation 9.2:

$$Q_R = Q_F \times \frac{h_r^{0.54}}{h_f^{0.54}}$$

where:

$Q_R$ = flow predicted at desired residual pressure

$Q_F$ = total flow measured during test

$h_r$ = pressure drop to desired residual pressure

$h_f$ = pressure drop measured during test

**9.3** In this equation, any units of discharge or pressure drop may be used as long as the same units are used for each value of the same variable.

**9.4** In other words, if $Q_R$ is expressed in gpm, $Q_F$ must be in gpm, and if $h_r$ is expressed in psi, $h_f$ must be expressed in psi.

**9.5** These are the units that are normally used in applying Equation 9.2 to fire flow test computations.

**10. Data Sheet.**

**10.1** The data secured during the testing of hydrants for uniform marking can be valuable for other purposes.

**10.2** With this in mind, it is suggested that the form shown in Figure 10.2 or a similar form be used to record information that is taken and the form(s) used shall be submitted to the *fire code official*. Contact the Fire Marshal's Office for the most up to date form.

**10.3** The back of the form should include a location sketch or on a separate form and the form(s) used shall be submitted to the *fire code official*.

**10.4** Results of the flow test should be indicated on a hydraulic graph, such as the one shown in Figure 10.4.

**FIGURE 10.2 Sample Report of a Hydrant Flow Test.**

# CITY OF CIBOLO
# FIRE FLOW TEST FORM

L. Perry
Fire Marshal

" City of Choice "

P. O. Box 826 • 204 Loop 539 West Cibolo, Texas 78108 • 210-566-7008 • Fax 210-566-5758

Date: _____
Time: _____

Project Name: _____
Address: _____

Test By: _____
Conducted By: _____ Signature: _____

Water Purveyor: _____ Signature: _____
Water Supplied By: _____

DATA

| FLOW HYDRANTS(S) | Hyd # F1 | Hyd # F2 | Hyd # F3 |
|---|---|---|---|
| Size Opening: | 2.5 | 2.5 | |
| Coefficient: | | | |
| Pitot Reading: | | | |
| GPM: | | | |

Total Flow During Test: _____ GPM

Static Reading: _____ PSI Residual: _____ PSI Hyd #

Results: At 20 PSI Residual _____ GPM Water Main Size: _____

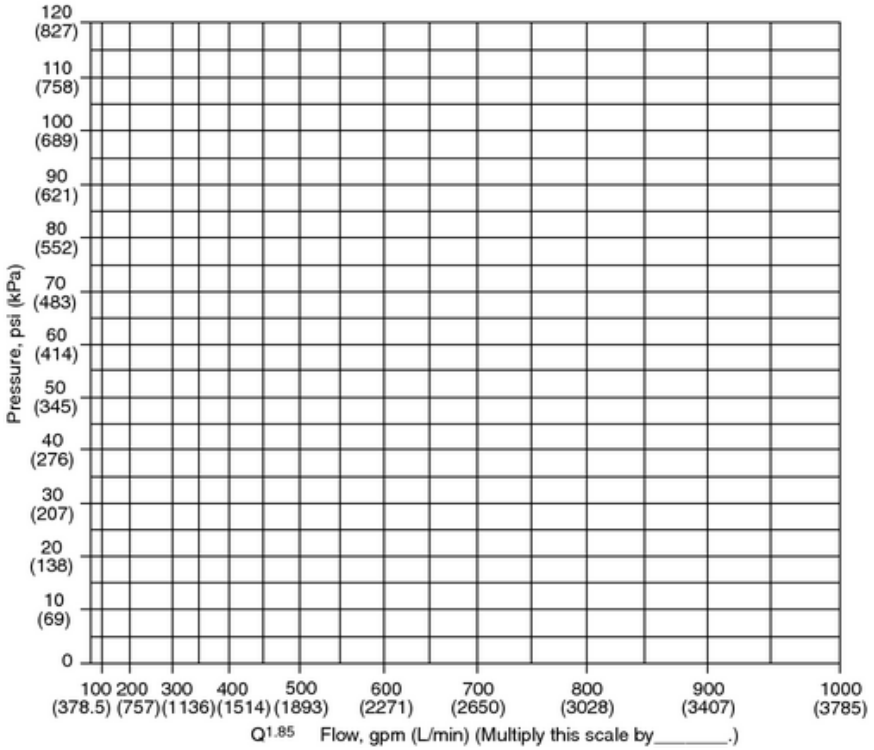
Estimated Consumption: _____ Gal. Flow Duration (minutes): _____

Remarks: _____

Map

City of Cibolo Water Flow Test Report Form Revised 13 December 2013

**FIGURE 10.4 Sample Graph Sheet.**




**10.5** When the tests are complete, the forms should be filed for future reference by interested parties.

**20. Marking of Hydrants**

**20.1 Classification of Hydrants.** Hydrants should be classified in accordance with their rated capacities based upon actual flow as follows:

(1) Class AA — Rated capacity of 1500 gpm (5680 L/min) or greater
(2) Class A — Rated capacity of 1000–1499 gpm (3785–5675 L/min)
(3) Class B — Rated capacity of 500–999 gpm (1900–3780 L/min)
(4) Class C — Rated capacity of less than 500 gpm (1900 L/min)
(5) Class D — Rated capacity of less than 250 gpm (950 L/min) is considered nonfunctioning.

**20.2 Marking of Hydrants.**

**20.2.1 Public and Private Hydrants.**

**20.2.1.1 Public Hydrants.** All new and existing public hydrants the hydrant barrels are to be red in color. Marking on all new and existing public hydrants or any device having the appearance of a fire hydrant on or adjacent to fire apparatus access roads shall be in accordance with Section 20 and Section 20.2.1.3 through 20.2.1.8.

**20.2.1.2 Private Hydrants.** All new and existing private hydrants the hydrant barrels shall be painted chrome yellow, to distinguish them from public hydrants. Marking on all new and existing private hydrants or any device having the appearance of a fire hydrant on or adjacent to fire apparatus access roads shall be in accordance with Section 20.1 and Section 20.2.1.3 through 20.2.1.8.

**20.2.1.3** All new and existing tops (bonnets) and nozzle caps shall be painted with the following capacity-indicating color scheme to provide simplicity and consistency with colors used in signal work for safety, danger, and intermediate condition:

(1) Class AA — Light blue
(2) Class A — Green
(3) Class B — Orange
(4) Class C — Red
(5) Class D — Black

**20.2.1.4** For rapid identification at night, it is recommended that the capacity colors be of a reflective-type paint or have reflective (ground or crushed crystals and/or similar) material added to the finish.

**20.2.1.5** Hydrants rated at less than 25 psi shall have the rated pressure stenciled in black or a contrasting color on the hydrant top (bonnet).

**20.2.1.6** In addition to the painted top and nozzle caps, it can be advantageous to stencil the rated capacity of high-volume hydrants on the top (bonnet).

**20.2.1.7** The classification and marking of hydrants provided for in this Section anticipate determination based on individual flow test.

**20.2.1.8** Where a group of hydrants can be used at the time of a fire, some special marking designating group-flow capacity may be desirable.

**20.2.2 Permanently Inoperative Hydrants.** Public and private fire hydrants or any device having the appearance of a fire hydrant that are permanently inoperative or unusable shall be replaced as soon as reasonably possible.

**20.2.3 Temporarily Inoperative Hydrants.** Public and private fire hydrants or any device having the appearance of a fire hydrant that are temporarily inoperative or unusable should be wrapped or otherwise provided with temporary indication of their condition and repaired or replaced as soon as reasonably possible.

**20.2.4 Flush Hydrants.** Location markers for new and existing flush hydrants should carry the same background color as stated above for class indication, with such other data stenciled thereon as deemed necessary.