# Galveston Fire Department
# Standard Operating Procedure
# 1400.03 Hydrant Testing

## Fire Chief_____

Implementation Date**: October 2007**
Revision Date: August 2009
Review Date: August 2011

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## Flow Testing

The purpose of this standard operating guideline is to assist the members of the Galveston Fire Department in performing flow testing in the safest, most efficient and consistent manner available.

The Galveston Fire Department does hydrant flow testing so that we know what the system output is in an area during normal operating periods. This is done to ensure that we are able to provide the water needed for fire fighting operations to protect the lives and property of the citizens of Galveston.

## Definitions

Static pressure – is the normal pressure in the system, for that area, with no hydrants flowing.

Residual pressure - is the pressure that exists in the system, at the time the flow readings are taken at the flow hydrants. It is taken at the residual hydrant.

Residual hydrant – is the actual hydrant being tested. The static and residual pressures are taken from this hydrant.

Flow hydrant – is the hydrant that you take the flow pressure reading from.

Feeder lines – larger water lines that supply the smaller grid lines.

## Safety – water system and personnel

- You should never let the residual pressure drop below 20 psi, when you are flow testing hydrants. The water mains can collapse if there is not sufficient pressure in the system to maintain the weight of its surroundings. Pollutants can also be allowed to back-siphon into the water system.
- Do not lean over the top of an operating hydrant.
- Do not stand in front of capped discharges on a charged hydrant.
- Always open and close hydrants slowly, so that you do not damage the water system.
- Always take proper precautions to ensure that the water flow(s) do not flood, cause traffic problems and/or damage to any property (both public and private). To avoid causing any damage you can use either a diffuser or a 2 ½" discharge elbow from the truck.

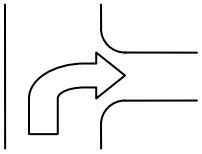
| SP | 75% | SP | 75% | SP | 75% | SP | 75% | SP | 75% | SP | 75% | SP | 75% | SP | 75% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 70 | 53 | 65 | 49 | 60 | 45 | 55 | 41 | 50 | 38 | 45 | 34 | 40 | 30 | 35 | 26 |
| 69 | 52 | 64 | 48 | 59 | 44 | 54 | 41 | 49 | 37 | 44 | 33 | 39 | 29 | 34 | 26 |
| 68 | 51 | 63 | 47 | 58 | 44 | 53 | 40 | 48 | 36 | 43 | 32 | 38 | 29 | 33 | 25 |
| 67 | 50 | 62 | 47 | 57 | 43 | 52 | 39 | 47 | 35 | 42 | 32 | 37 | 28 | 32 | 24 |
| 66 | 50 | 61 | 46 | 56 | 42 | 51 | 38 | 46 | 35 | 41 | 31 | 36 | 27 | 31 | 23 |

SP - Static Pressure 75% - 75% of SP

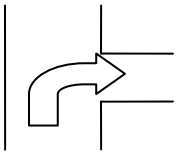
## Procedure

- We will be following NFPA 291 (2007 edition) for flow testing hydrants.
- Always notify the water department prior to flow testing.
- Always flow test when the system is under normal demand.
- Flow testing is just measuring the amount of water it takes to have a measurable reduction of the pressure in the system.
- The measurable reduction in pressure between the static and residual pressures should be at least 25% to have an accurate reading of the flow.
- Normal conditions require opening 1 or 2 hydrants to reach the 25%, but sometimes you need to open as many as 8.
- Select the hydrants that will be used for testing. The flow hydrants should be between the residual hydrant and the feeder lines.
- Place the pressure gauge on a 2 ½" discharge on the residual hydrant and open the hydrant.
- Record the pressure gauge reading onto the hydrant worksheet as the static pressure (SP).
- Find the corresponding % (75% of the SP) from the chart on the worksheet.
- The coefficients should be checked and documented, from the discharge orifices of the flow hydrants.

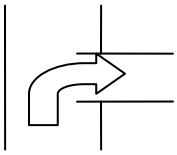
## Hydrant discharge coefficients



**0.9**



**0.8**



**0.7**

- Open the first flow hydrant and record the new reading on the pressure gauge as residual pressure1(RP1).
- Compare RP1with the %, continue opening the flow hydrants until the % is greater than the RP.
- Record the flow pressure(s) (FP(s)) once the RP is less than the %.
- If it took 3 flow hydrants to get the 25+% drop required, then record those 3 flow pressures.
- It is not necessary to record any FP's until the 25+% drop is reached.
- Close all hydrants slowly

## Pitot tube operation

- Always try to use the 2 ½" discharge to take flow pressures. These readings will be more accurate, because it is less likely to have any air in the discharging water stream. It might be difficult to take hand held pitot readings from the 2 ½ discharge on hydrants with higher flow pressures. For these cases you should use the steamer discharge.
- When using a pitot tube to measure flow pressure you should
    - Place the pitot tube orifice in the center of the stream ½ the diameter of the discharge opening away from the opening. Example: for a 2 ½ inch discharge the pitot tube orifice should be 1 ¼ inches away from the discharge.
    - The air chamber should be keep higher, so that the air can be evacuated from the device.
    - Keep the pitot tube at a right angle to the flow of the discharge stream.
    - Evacuate the air and take a reading from the gauge.
    - Document the flow pressure, size of the outlet and the coefficient of the outlet.

Hydrant testing fill able form

- This form is in the hydrant testing folder in the fire folder in the shared folders. Address is shared/fire/hydrant testing.
- Enter the information from your hydrant worksheet and the fill able form will calculate the results needed.
- Print this form and attach with worksheet.
- Turn paperwork into Battalion Chief.

The formulas that are used in the fill able form are:

- For discharge volume

  GPM = 29.84*C*D^2 * P ^1/2 = Q

  Where:

  C = coefficient of discharge

  D^2 = the diameter squared

  P^1/2 = the square root of the discharge pressure

- For discharge volume available at 20 psi

  GPM = Qtotal * (H1/H2) ^.54

  Where:

  Qtotal = total GPM flowing at test time

  H1 = Pressure drop to the residual pressure = SP - 20

  H2 = Pressure drop during test = SP – RP