Fire Hydrant Operation, Maintenance & Testing
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April 28, 2015
8th Annual Distribution Conference – Addison, IL

Acknowledgments
- Michael Simpson – CEO
- John Van Arsdel – Vice President
- Aaron Horbovetz – Project Engineer
- Randy Lusk – Regional Manager
- Owen Keenan - Project Engineer
Fire hydrants need to be

- Properly installed
- Properly operated
- Properly tested regularly
- Properly maintained

Because Fire Protection is ESSENTIAL
Fire hydrants are also essential for

- Flushing water and air from a new main connection or repair
- Getting water samples
- Checking system pressures
- Providing a temporary source of water for construction sites and other uses

Fire Hydrant Maintenance

- Fire hydrants must be operable and capable of providing adequate fire protection
- Systematic maintenance and inspection is vital
- Repairs can be scheduled pro-actively instead of reactively
- Problems can be dealt with before they become catastrophic
Fire Hydrant Maintenance

- Hydrants should be inspected on a regular basis, at least once a year, and for ISO certification
- Dry-barrel hydrants may require two inspections per year, spring and fall
- Every hydrant inspection should be documented
- Problems with a hydrant should be reported immediately

ISO Requirements

- In order for a municipality to get full credit from ISO, they must do hydrant maintenance every 6 months.
Other ISO Requirements

- Location and number.
- Physical damage or defect.
- Obstructions on or around the hydrant.
- Hydrant outlets face proper direction.
- Minimum 15" clearance between lowest outlet and ground.
- Auxiliary valve is visible.
- Condition of paint – correct color code.
- All outlets are cleaned and lubricated.

Fire Hydrant Maintenance

- During a static pressure test, do any of the nozzles, gaskets, or drainage holes indicate leakage?
- With a nozzle-cap or pumper-cap removed, and using a listening device, does the main valve leak?
- Is there any “ponding” or standing water near the base of the hydrant?
Fire Hydrant Maintenance

- What is the condition of the paint?
- Is the color correct, based on the utilities color scheme?
- Is the hydrant straight-up (plumb)? If not, does it appear that hydrant has been hit by a vehicle?
- Should bollards be installed to protect the hydrant?
- Should the hydrant be relocated away from traffic?

Painted and Color Coded
Fire Hydrant Maintenance

- Does the hydrant need to be raised, or lowered?
- Do the pumper port and nozzles face the correct direction?
- Is the soil surrounding the hydrant capable of supporting it?
- GPS location of hydrant if required.

Fire Hydrant Maintenance

- Are the nozzle/pumper threads in working condition?
- Do the nozzle/pumper ports require any maintenance or need to be replaced?
- Does the hydrant drain properly (dry-barrel)?
- Is the hydrant barrel still dry after pumping out the water and waiting a few minutes?
- Is it difficult to operate?
Fire Hydrant Maintenance

- Does it provide adequate fire-flow?
- Is the operating nut of the hydrant in good condition?
- Have the corners of the operating nut been rounded off (from people using a pipe wrench instead of a hydrant key)?
- If it appears that the hydrant has been illegally operated, should protective devices be installed to deter vandalism?

Maybe you know these kids?
Kids hate this ...

Other Reports and Documentation

- Status: Public, Private, or Non-Potable.
- Static pressure reading is taken.
- Operating stem is exercised and lubricated.
- Hydrant reflectors and markers are replaced and/or repaired.
- All debris is removed from around the hydrant.
Fire Hydrant Maintenance

- Remove one nozzle/pumper cap and, using a listening device, check for main valve leakage. Repair or schedule replacement, as necessary.
- Open hydrant fully, checking for ease of operation. Repeatedly exercise the operating stem, as needed, to remove buildup and promote better operation. If lubrication or stem replacement is required, schedule the necessary work.

- With the hydrant fully pressurized, check for leakage around the flanges, nozzles/pumpers, seals, and operating nut.
- Partially close the hydrant to open the drain outlets, and flush for 10 to 15 seconds.
Fire Hydrant Maintenance

- Completely close the hydrant, and then open it a ¼ to ½ turn to relieve the pressure on the thrust bearing or packing.
- Remove a nozzle/pumper cap, and attach a diffuser, if needed, along with a hand valve for control. Flush the hydrant to remove foreign material.

Flushing a Hydrant

- Flush hydrant until clear
Fire Hydrant Maintenance

- Close the hydrant and remove the diffuser. Place your hand over the nozzle/pumper to check for suction as the water drains out of the barrel.
- Check for hydrant leakage with a listening device.
- Remove all nozzle/pumper caps and inspect the threads. Clean and apply approved lubricant to caps and nozzles/pumpers.

Lubricating the Threads
Fire Hydrant Maintenance

- Inspect cap chains for binding and ease of movement. Unbind or replace, as necessary.
- Replace the caps and tighten them.
- Check operating nut lubrication and maintain as needed.
- Inspect breakaway flange for damage if present.
- Collect or verify GPS location of hydrant. (Very helpful when locating a hydrant under a pile of snow.)

Fire Hydrant Maintenance

- Notify the Utility personnel and Fire Dept. personnel immediately of inoperable hydrants needing repair or replacement. Get stakeholder buy-in.
Single Hydrant Testing

- NOT Recognized by AWWA as a valid test
- NOT Recognized by NFPA as a valid test
- NOT recognized by ISO as a valid test

Fire Flow Testing

<table>
<thead>
<tr>
<th>NFPA Ratings</th>
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</thead>
<tbody>
<tr>
<td><strong>Color</strong></td>
</tr>
<tr>
<td>Blue</td>
</tr>
<tr>
<td>Green</td>
</tr>
<tr>
<td>Orange</td>
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<tr>
<td>Red</td>
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- Involves a minimum of two hydrants on any test.
- #1 Flow Hydrant #2 Residual Hydrant
Fire Flow Testing

- **Testing**
  - You are testing main capacity
  - Dead ends
  - Looped Areas (2 or 3 feeds)
  - Distances
  - 2.5 Diffuser or Hose Monster

Preparation

- Plan your area
- Decide which hydrant will be your *residual hydrant* and which will be your *flow hydrant*
- **Direction of flow**
Equipment Needed

- 2.5” Static Caps
- Gauges
- Hydrant Wrenches
- Diffusers (2.5”-4”)
- Diffuser Pitot Tubes
- Gate Valve for Diffuser
- Hose Monster (4.5”)
- Landscape Protection
- Record Keeping Supplies
- Steel Brush
- Thread Grease (Food Grade)

Care of Equipment

- Inspect equipment daily
- Test the gauges daily
- Very expensive, treat it like your own
Steps for Residual Hydrant

- Remove all caps off of ports
- Apply grease to threads of nozzles
- Replace pumper port
- Replace cap not being utilized for test
- Open hydrant slightly to vent air
- Once vented, open hydrant a little more, purging hydrant leg
- Shut hydrant down

Steps for Residual Hydrant

- Install pressure gauge
- "Charge" hydrant – open fully
- Take static reading (Pressure during typical demands with no hydrants flowing)
- Signal to partner you are ready for the flow hydrant to be opened
- After "flow hydrant opens", watch gauge
Steps for Residual Hydrant

- Take residual reading (Pressure measured while flow hydrant is open)
- Recommended drops
- NFPA 291 - 25%
- AWWA-M17 – 10psi
- As long as good flow is obtained from flow hydrant, less than 10psi is good
- Accurate gauges are more important
- Tell partner readings (static and residual)
- Replace remaining cap

Steps for Flow Hydrant

- Remove all caps off of ports
- Replace pumper port
- Install pressure gauge
- Install gate valve onto remaining nozzle
- Install diffuser onto gate valve
- Open gate valve fully
- Close “bleeder” valve on diffuser to keep debris out of it
- Open hydrant slowly
- Once water is clean, close gate valve
- Record Data (Be consistent)
Steps for Flow Hydrant

- Once data is gathered notify partner that you are ready
- Wait for partner to get “static reading”
- Open gate valve SLOWLY
- Take reading

Close gate valve SLOWLY to shut hydrant down
- Relieve pressure
- One flow hydrant is usually good for 3-4 tests
- Make sure hydrant drains and seats properly
Example of Flow Data

- $P_s$ (Static) = 140 psi
- $P_r$ (residual) = 125 psi
- $P_p$ (Pitot pressure) = 120
- $C_d$ (coefficient) (.9)
- $D$ (diameter) (2.5)
Flow Hydrant Equation

- $Q_r = 29.83 \times C_d \times D^2 \times \sqrt{P_p}$
- $Q_r$ = Actual Flow (gpm) Flow hydrant
- $C_d$ = Coefficient (found on the diffuser)
- $D$ = Diameter (opening in inches)
- $P_p$ = Pitot Pressure (from flow hydrant)

- $Q_r = 29.83 \times 0.9 \times (2.5)^2 \times \sqrt{120}$
- $Q_r = 29.83 \times 0.9 \times 6.25 \times 10.95$
- $Q_r = 1837$ gpm

Fire Flow Equation

- $Q_f = Q_r \times \{(P_s - 20)/(P_s - P_r)\}^{0.54}$ (Raise to the 0.54 power)

- $Q_f$ = Fire flow in gpm at 20 psi
- $Q_r$ = Actual flow in gpm from previous equation
- $P_s$ = Static
- $P_r$ = Residual

Hmm...
Fire Flow Equation

- \( Q_f = 1837 \times \{(140-20)/(140-125)\} \) (Raise to the .54 power)
- \( Q_f = 1837 \times (120/15) \) (Raise to the .54 power)
- \( Q_f = 1837 \times (8) \) (Raise to the .54 power)
- \( Q_f = 1837 \times 3.07375 \)
- \( Q_f = 5647 \) gpm flow at 20 psi

Safety while Flowing

- Check areas
- Landscaping
- If damage is unavoidable – Relocate
Safety while Flowing

- Open and close ALL hydrants slowly
- Traffic
- Children

What’s this data used for?

- Other than giving you a migraine....
What’s this Data used for?

- Water System Modeling
- Water System Hydraulics
- Fighting Fires
- New Construction
- NFPA Ratings

What’s this Data used for?

- ISO (Insurance Services Office)
- The lower the I.S.O. rating on a scale of 1 to 10, the better the insurance rates
- The I.S.O. reviews 3 areas primarily
  - The Fire Department
  - The City water main & hydrant capabilities
  - 9-1-1 dispatch & paging services.
Why do we fire flow test?

- Fire-flow testing is aimed not only at “Best Management Practices”, but to help identify hydrant issues, closed valve issues (from main breaks service work shutdowns, etc.), and to keep the flow testing history up to date.

Fire Flow Recommendations

- ISO recommends fire flow testing every 5 years or whenever hydraulic conditions change.
- NFPA states that you must perform inspection, maintenance and flushing annually as well as fire flow testing every 5 years or whenever hydraulic conditions change.
- AWWA’s “Best Management Practices” believes that it is a good practice to conduct fire flow testing whenever hydraulic conditions change.
- We recommend that you develop criteria that best suits your Utilities’ needs, yet at least meets AWWA, ISO and NFPA recommendations.
Additional Information

Detailed procedures for the installation, operation, testing and maintenance of fire hydrants can be found in the AWWA M17 – ‘Installation, Field Testing, and Maintenance of Fire Hydrants’

QUESTIONS?
Please contact todd.schaefer@mesimpson.com

THANK YOU