Hot Water Distribution Problems

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Russ Horner
Water Management, Inc.
We know that when low flow faucets and showers are installed in Single Family Homes the wait time for hot water increases significantly.
To learn more about hot water wait times in single family homes contact:

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Pipes cool down much faster at lower flow rates.
To solve the problem with long wait times in single family homes, contact:

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ACT Inc. D'MAND Systems

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www.gothotwater.com
ACT D’Mand Kontrol System is an innovative pump that when installed under the fixture furthest from your water heater, sets up a recirculation system.
EXISTING HOMES
STANDARD PLUMBING

D'MAND Kontrols®
System installs at
the furthest fixture
from the water heater.
Commercial properties all have recirculation pumps, but some still experience problems with hot water distribution.
There are 4 Rules for Diagnosing Hot Water Distribution Problems:

1. The ASPE pressure differential Rule
2. The Proper recirculation piping Rule
3. The Return temperature Rule
4. The 80/20 water balancing Rule
Rule #1

Check the water pressure on the hot side and on the cold side. If the water pressures are more than 10% off you need to figure out the cause.
Example #1: Apartment community (314 units) in Tucson AZ. Cold water is provided off of main trunk line and hot water is provided from secondary lines.
Example #2: Apartment community in Gaithersburg, MD (831 units) with centralized hot water.
Large 8” check valve had failed and was reducing the pressure for the cold water make-up by 32 psi (33%).
If you break this rule – Crossover can occur.

Crossover can occur at faucets if flow rate is below 1.0gpm or at showers if the flow rate is below 2.0gpm.
Popular flow rates of Faucet aerators. Neoperl makes 3 different streams that are available in many different flow rates.

<table>
<thead>
<tr>
<th>Flow Rate</th>
<th>Image 1</th>
<th>Image 2</th>
<th>Image 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.35 gpm</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
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<tr>
<td>0.5 gpm</td>
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<tr>
<td>1.0 gpm</td>
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<td>1.2 gpm</td>
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<td>1.8 gpm</td>
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<td>✓</td>
<td>✗</td>
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<tr>
<td>2.2 gpm</td>
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Crossover can also occur if a water fixture is faulty. One such fixture is the MIXET® tub and shower valve. These valves can develop a wear pattern which allows hot and cold water to cross over even in the off position.
A replacement stem is available that features a quadruple seal gasket to seal the eroded areas of the valve body that are allowing the water to crossover.

Over time the brass body deteriorates and channels develop allowing water to pass around the hard plastic stem.

Mixet Tub Shower Valve
Return line in boiler room has connections to the storage tank and also to the water returning to the building.

Make sure that the return line is plumbed into the mixing valve so that water can circulate properly.

Rule #2
This 7 year old Westin located in Northern Virginia near our Nation’s Capital experienced long wait times for hot water especially after the Westin Heavenly Showerheads were installed.
The Westin Dulles

Before

After
The Westin is an 8 story, 315 room hotel in VA. In 2014 the dual style Speakman showerheads were replaced with the Heavenly showerhead from Kohler. Flow rate was reduced by > 50%.
By November of 2014 the property was experiencing a major issue with hot water. By January of 2015 guest complaints were at an all time high. The water saving showerheads were blamed.
By mistake all of the recirculating water was being redirected back to the storage tanks and not to cold inlet of the mixing valve. Once this was corrected, the problem was solved.
Rule #3

Charlotte, North Carolina – 176 rooms

Make sure the return temperature of all of the risers is the same. For this building the temperature in the return line for the risers furthest from the mechanical room were the same as the ambient air.
Return line temperature should be within $10^\circ$ of the supply line temperature.
For the first few risers we found that the Supply temperature was 125° and the return line temperature 118.6°. Delta T of less than 7 degrees is good. This was not the case of the risers towards the middle and end of the building.
The risers furthest away from the mechanical room had little to no recirculation so we had to force the water to the risers furthest from the mechanical room.

Risers furthest from mechanical room

Risers closest to mechanical room

The Path of Least Resistance
To force water to the risers towards the back of the building, the hot water recirculation system needs to be balanced.
To balance a hot water recirculation system, it is critical that the end of each riser have a ball valve or a “CircuitSetter” on it.

Be sure that the valves on the first 80% of the risers are not open more than 20% of the way.
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