Short People Need Hotter Water

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What Are We Aiming For?

• People want the service of hot water, as efficiently as possible.
• It does not make sense to discuss efficiency until the desired service has been provided.

The delivery of hot water ends at the plumbing fixture or appliance, not at the customer’s meter
The 2 Key Services...

Hot Water Now = “Instantaneousness”
- Need hot water available before the start of each draw.
  * A tank with hot water
  * Heated pipes
- Need the source of hot water close to each fixture or appliance
- Point of Use is not about water heater size, it’s about location

Never Run Out in My Shower = “Continousness”
- Need a large enough tank or a large enough burner or element
- Or, a modest amount of both
How Long Should We Wait?

<table>
<thead>
<tr>
<th>Volume in the Pipe (ounces)</th>
<th>Minimum Time-to-Tap (seconds) at Selected Flow Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.25 gpm</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
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<td>4</td>
<td>8</td>
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<td>8</td>
<td>15</td>
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<td>60</td>
</tr>
<tr>
<td>64</td>
<td>120</td>
</tr>
<tr>
<td>128</td>
<td>240</td>
</tr>
</tbody>
</table>

ASPE Time-to-Tap Performance Criteria

- **Acceptable Performance**: ≤ 10 seconds
- **Marginal Performance**: > 10 ≤ 30 seconds
- **Unacceptable Performance**: > 30 seconds

Performance Metrics to Provide the Service of Hot Water

• **Temperature**
  – ≥ 110°F, hot enough to shower in

• **Volume-until-hot**
  – Goal is no more than 1 cup after opening tap
  – Settle for 2-3 cups, maybe 4

• **Time-to-tap**
  – Structural waste should be consistent and small
  – < 1 second, possible, but probably energy expensive
  – < 5 seconds, very buildable
  – < 10 seconds, “Acceptable” according to ASPE
The Structural Answer

**SHORT, Smooth, pipe**
Given human nature, it is our job to provide the infrastructure that supports efficient behaviors.
However, having infrastructure with minimal structural waste does not guarantee that behaviors will be efficient.
Thank You!

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