

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, its 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?

Volume in the Pipe (ounces)	<u>Minimum</u> Time-to-Tap (seconds) at Selected Flow Rates					
	0.25 gpm	0.5 gpm	1 gpm	1.5 gpm	2 gpm	2.5 gpm
2	4	1.9	0.9	0.6	0.5	0.4
4	8	4	1.9	1.3	0.9	0.8
8	15	8	4	2.5	1.9	1.5
16	30	15	8	5	4	3
24	45	23	11	8	6	5
32	60	30	15	10	8	6
64	120	60	30	20	15	12
128	240	120	60	40	30	24

ASPE Time-to-Tap Performance Criteria

	Acceptable Performance	≤ 10 seconds
	Marginal Performance	> 10 ≤ 30 seconds
	Unacceptable Performance	> 30 seconds

Source: Domestic Water Heating Design Manual – 2nd Edition, ASPE, 2003, page 234

Performance Metrics to Provide the Service of Hot Water

- **Temperature**
 - $\geq 110\text{F}$, 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*, - **Right** **pipe** **sized**

**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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