



First Hour Delivery

First Hour Delivery (or sometimes called first hour rating) is a term that describes the performance capability of the water heater. By definition, first hour delivery is the calculated amount of hot water a fully heated water heater can deliver in the first hour period. This means you start with a water heater that has recovered to its' thermostat setting (fully heated) and someone starts to use hot water such as in a shower. It does not mean the hot water will last for one full hour.

The Federal Government requires manufacturers to put a yellow **ENERGYGUIDE** label on the water heater. This label shows the first hour rating for the product.

A residential water heater will deliver 70% of tank capacity at the thermostat setting minus 20 degrees. What does this mean? If the thermostat is set on 120 degrees, the unit should deliver 70% of tank volume at a temperature between 100 degrees and 120 degrees.

What does 70% of tank capacity mean? It means 70% of the gallons capacity listed on the rating plate. For example:

Tank Capacity in gallons	70% rule in gallons
30	21
40	28
50	35
65	45.5
75	52.5
80	56
100	70
120	84

Why only 70% of the tank capacity? Simple, cold water is entering the heater as the hot water is being used. This cold water mixes with the hot water in the tank. Much the same as cooling off a hot beverage with a little cold water, the water heater works on the same principle.

As a hot water faucet is turned on, the dip tube, attached on the cold water inlet side of the heater, delivers the cold water at the bottom of the tank. The pressure of the incoming cold water pushes the hot water out of the tank. Once enough cold water has entered the tank and mixed with the hot water, this will cause the water to turn warm, then tepid, then cold. This is how we calculate the 70% rule. Once you have used the 70% of available hot water, the water will quickly become cold.

As hot water is being used, the thermostat(s) on the heater will demand heat and the unit will start to recover. This means it will heat water, even while hot water is being used. The recovery capabilities of a water heater are standard characteristics and are factored in with the 70% rule to determine first hour delivery.

To determine the 'ballpark' first hour delivery use the following formula:

$$\text{(tank capacity)} \times .70 + \text{(recovery)} = \text{first hour delivery}$$

For instance: You have a 40 gallon, 40,000 BTU gas water heater -

$$40 \times .7 + 36 = 64 \text{ gallons first hour delivery}$$



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You find the recovery rate in gallons per hour for your heater in the following charts. Check the rating plate of your water heater for the input in watts (electrical) or BTUs (gas).

Recovery Rates in Gallons per Hour - Electric Water Heaters

Input Wattage	Temperature Rise - Degrees Fahrenheit						
	40 ⁰	50 ⁰	60 ⁰	70 ⁰	80 ⁰	90 ⁰	100 ⁰
1,000	10	8	7	6	5	5	4
1,500	16	12	10	9	8	7	6
2,000	21	17	14	12	10	9	8
2,500	26	21	17	15	13	12	10
3,000	31	25	21	18	16	14	12
3,500	36	29	24	21	18	16	15
4,000	41	33	28	24	21	18	17
4,500	47	37	31	27	23	21	19
5,000	52	41	34	30	26	23	21
5,500	57	46	38	33	28	25	23
6,000	62	49	41	35	31	27	25
9,000	92	74	61	53	46	41	37
12,000	123	98	82	70	61	55	49

Recovery Rates in Gallons per Hour - Gas Water Heaters

Input BTU	Temperature Rise - Degrees Fahrenheit						
	40 ⁰	50 ⁰	60 ⁰	70 ⁰	80 ⁰	90 ⁰	100 ⁰
20,000	45	36	30	26	23	20	18
26,000	59	47	39	34	30	26	24
28,000	64	51	42	36	32	28	25
30,000	68	55	45	39	34	30	27
32,000	73	58	48	42	36	32	29
34,000	78	63	52	45	39	35	31
36,000	82	65	55	47	41	36	33
37,000	84	67	56	48	42	37	34
40,000	91	73	61	52	45	40	36
50,000	114	91	76	65	57	51	45
57,000	130	104	86	74	65	58	52
60,000	136	109	91	78	68	61	55
69,000	157	125	105	90	78	70	63
75,000	170	136	114	97	85	76	68



First Hour Delivery

Here are some definitions that will be helpful as we talk about first hour delivery:

Cold Inlet Temperature

The temperature of outside water coming into a water heating system. Throughout most of the U.S. this temperature is considered to be 40°F. (during the coldest months).

Draw Rate

The rate at which hot water is drawn from a water heating system, usually expressed in gallons per minute (GPM). In residential applications, this is usually restricted to a single delivery point such as a shower head.

First Hour Rating

The calculated amount of hot water a fully heated water heater can deliver in the first hour period. The output on a water heater is normally given in gallons per hour at a 100°F temperature rise. It is the quantity of water that the heater will deliver at 140°F, when the cold start temperature is 40°F. All water heaters are stamped with this output rating in gallons per hour.

Peak Period

Peak period refers to the time during the day when the water heating system experiences its greatest draw (demand). With the exception of applications that require continuous hot water draw, tests have shown that the peak period of hot water usage will occur once or twice a day in residential applications. Peak periods for commercial applications are dramatically different. By contrast, a peak period in a school gymnasium shower may occur every hour!

Recovery

Gallons of water per hour a water heater can raise the temperature of by 100°. Generally, the higher the BTU or wattage input rate, the faster the recovery rate is. Recovery rates are also a component of the *First Hour Rating*.

Temperature Rise

The difference in temperature between the desired hot water and the incoming cold water, expressed in degrees Fahrenheit. For example, the desired temperature at the faucet is 120° F and the incoming cold water is 70° F. The required temperature rise is 50° F ($120^{\circ} - 70^{\circ} = 50^{\circ}$). is the number of degrees Fahrenheit that the water must be raised either from the inlet water temperature or a pre-heat water temperature. In short, the temperature rise is the difference between existing water temperature and desired water temperature.