

## Electric Hot Water Tank.

Answers to questions that I have been asked.

### Holiday cottage

When you leave your cottage in the fall, most people turn off the power, shut off the water and open a tap.

Returning in the spring, some will turn on the power, turn off the tap and turn on the water.

3 seconds after turning on the power, the top element burns out because the element must be immersed in water at all times and the top of the tank is air. Get all the air out of the pipes before turning on the power.

### Heating power in the Tank

Each standard residential electric water tank has a 3000 watt at 240V element installed. This will produce a flow of 12.5 amp. This means that the resistance in the element is  $240/12.5$  or 19.2 Ohms. With a constant resistance of 19.2 Ohms, If the voltage is 250 this will produce 3,255 Watts.

Voltage in a home is dependent on the distance from the transformer on the pole to the home and the number of residences on that transformer. The voltage can fluctuate from a high of 255 to a low of 220. Light bulbs will burn out faster at the high voltage but motors will run at a lower amperage.

1000 watts (1Kw) = 3412 BTU's So a tank with 240 Volt supply and a 3Kw element, will put out 3412 X 3.0Kw = 10,236 BTU's

Note: An electric water tank is 100% efficient. All of the heat goes into the water. Any gas water tank has some of the heat going up the chimney.

### Amperage of the standard element with varying voltages.

120 Volts = 750 Watts 6.2A Wire with #14 (white) wire & Single 15 amp breaker  
208 Volts = 2253 Watts 10.8A Wire with #14 (white) wire & Double 15 amp breaker  
240 Volts = 3000 Watts 12.5A Wire with #12 (yellow) wire & Double 20 amp breaker  
250 Volts = 3250 Watts 13.0A Wire with #12 (yellow) wire & Double 20 amp breaker

I've often wired a standard water tank with 120 volt supply to cut the amperage down. This will give you the storage capacity of the tank, but slow recovery.

If you want more hot water than the standard tank with a flip flop thermostat will put out, you can have both elements come on at the same time by replacing the top thermostat and the over temp cutout with a larger wattage cutout and a thermostat that allows separation of the top and bottom element. With this arrangement both elements can operate at the same time giving a total wattage of 6 Kw. and 20,472 BTU (at 240 Volts).

Amperage is 25. Wire with 2#10 (Orange) and 2Pole 30 amp breaker.

Older tanks had an over temp cutout that would handle the wattage and the top thermostat could be rewired to accommodate separate control.

Contact the tank manufacture for correct parts and approval

### Water pumped into a storage tank

Water weights 62.4 lbs per cubic foot. There are 1728 cubic inches in a cubic foot. If you pumped water from a well and wanted about 60 PSI from a water tank on a stand, then the tank would have to be 1728 inches off the ground (144 feet).

### BTU's

One pound of water will increase in temperature 1 deg in one hour for every BTU.

One Kw will produce 3412 BTU's

A full 40 US Gal water tank weighs 334 lbs (if converted to metric, it still weighs 334 lbs).

Raising the temperature from 50 deg to 120 deg will require –

with 750 watts 9.13 hours

with 2250 watts 3.04 hours

with 3000 watts 2.28 hours

with 3250 watts 2.10 hours

with 6000 watts 1.14 hours.

### Water Expansion.

Water expands at the rate of .000214 for each degree Fahrenheit.

If the cold water coming into the tank is at 50 deg. And is heated to 150 degrees. The added expansion is  $100 \times .000214$  or 0.0214.

For a 40 gallon tank this means that  $40 \times .0214$  or .856 of a gallon is added.

Unless you leave the cold tap dribbling or have an expansion tank, the water tank will expand to accommodate the added volume. The pressure relief valve will spring open and you could have water on the floor. If you do this often, the tank will fail or you may have a washing machine hose burst.

Pressure does not go back to the street due to the Pressure Reducing Valve (PRV). Water flows through a PRV in one direction only.

## Water Temperature

Most electric water tanks come from the factory with the thermostat's set at 150 deg. F.

The temperature is set this high so that lots of cold water must be mixed to get the desired temperature and the hot water in the tank will last a lot longer.

I turn down the temperature to 115 deg so that no cold water need be mixed and the water will not scald anyone. Also the cost of maintaining 115 deg water is considerably less than 150 deg temperature.

At a lower temperature, expansion of your tank will be reduced increasing it's life.

A standard water tank in my home has lasted for 20 years or more.

Make sure to drain out the silt at the bottom of the tank every year with a garden hose connected to the bottom tap.

## Wiring

Use a piece of 7/16 flex and an angle connector to protect the cable on top of the tank. Use #1 straps to hold it down.





Ken Young.