

Heat Absorption

Water

Load required to heat X litres of water per second.

$$\text{Load (kW)} = \text{Volume (litres/sec)} \times \text{rise in temp. (}^{\circ}\text{C)} \times 4.19$$

Load required to heat X litres of water over X minutes.

$$\text{Load (kW)} = \frac{\text{Volume (litres)} \times \text{rise in temp. (}^{\circ}\text{C)}}{\text{Time (minutes)} \times 14.3}$$

Time required for X kW to heat X litres of water.

$$\text{Time (minutes)} = \frac{\text{Volume (litres)} \times \text{rise in temp. (}^{\circ}\text{C)}}{\text{Load (kW)} \times 14.3}$$

Note: 1kg of water = 1 litre

Air

Load required to heat X m³ of air per second.

$$\text{Load (kW)} = \text{Volume (m}^3\text{/s)} \times \text{rise in temp. (}^{\circ}\text{C)} \times 1.3$$

Other Materials (Including Oil)

Load required to heat X kg per second.

$$\text{Load(kW)} = \text{Mass (kg)} \times \text{specific heat (kJ kg}^{-1}\text{ }^{\circ}\text{C}^{-1}\text{)} \times \text{temp rise (}^{\circ}\text{C)}$$

Load required to heat X kg over X minutes.

$$\text{Load(kW)} = \frac{\text{Mass (kg)} \times \text{specific heat (kJ kg}^{-1}\text{ }^{\circ}\text{C}^{-1}\text{)} \times \text{temp rise (}^{\circ}\text{C)}}{\text{Time (minutes)} \times 60}$$

Load required for X kW to heat X kg.

$$\text{Time(min)} = \frac{\text{Mass (kg)} \times \text{specific heat (kJ kg}^{-1}\text{ }^{\circ}\text{C}^{-1}\text{)} \times \text{temp rise (}^{\circ}\text{C)}}{\text{Load (kW)} \times 60}$$

Note: Mass (kg) = Volume (litres) x density (kg/l)

Properties Of Materials

Substance	Specific Heat (kj kg ⁻¹ °C)	Density (kg l ⁻¹)	Minimum Storage Temp.	Minimum Handling Temp.
Air	0.993	0.00129	-	-
Fuel Oil - Light (E)	1.930	0.960 (Max)	7-10 °C	7-10 °C
Fuel Oil - Medium (F)	1.890	0.990 (Max)	20-25 °C	27-30 °C
Fuel Oil - Heavy (G)	1.890	0.995 (Max)	32-40 °C	38-50 °C
Water - Distilled/Tap	4.190	0.998	4 °C	4 °C
Water - Sea	3.900	1.025	4 °C	4 °C
45% Caustic Solution	3.270	1.530	10 °C	12 °C

Heat Loss

Average Heat Loss (Watts) = $2.72 \times \text{Temp } (^{\circ}\text{C})^{1.3} \times \text{Area (m}^2\text{)}$

Note: The average heat loss formula does not apply to open topped tanks where heat loss due to evaporation may occur

Heat Loss from vertical surface = 1 x average heat loss

Heat Loss from top side of horizontal surface = 1.29 x average heat loss

Heat Loss from bottom side of horizontal surface = 0.63 x average heat loss

General Heating Data

Maximum Recommended Thermostat Settings

Soft water areas or where an efficient water softener is installed: up to 82°C (180°F)

Medium hard water areas: up to 71°C (160°F)

Very hard water areas: up to 65°C (150°F)

Note: The scald temperature of water is 60°C.

Suggested Volume of Water Required for General Household Purpose

Bath: 114 litres (25 gallons) at 43°C (110°F)

Basin: 4.5 litres (1 gallon) at 43°C (110°F)

Dishwashing: 4.5 - 9 litres (1 - 2 gallons) at 43°C (110°F)

Shower: 4.5 - 9 litres per minute (1-2 gallons per minute) at 43°C (110°F)