



Heater System Guide



1) Define system to be heated (type of material to be heated, liquid, solid or gas; weight or gallons; flow rate if applicable; change in temperature, ΔT , [delta "T"]; specific heat of material to be heated; heat-up time required; tank/container/vessel weight; insulated/non insulated tank etc.)

[Process Application Index.pdf](#)

[Guide for Selecting Heaters.pdf](#)



2) Calculate heater wattage required (Allow for contingency factors
See formulas below)

To determine KW required for liquids and solids the following formulas apply:

$$KW = \frac{W \times C \times \Delta T}{3412 \times \text{hours}}$$

KW = Kilowatts

W = Weight of material in lbs.

C = Specific heat of material

ΔT = Change in temperature, °F (final temp. minus initial temp.)

3412 = Conversion factor, Btu to kWh

Hrs = Heat-up time, in hours (i.e. time required to reach set-point)

For **flowing water** use the formula A) below:

$$\text{A) } KW = \text{GPM} \times \Delta T \times .16$$

GPM = Gallons per minute
 ΔT = Change in temperature, °F

For **heating water in tanks or vessels** use fomula B) below:

$$\text{B) } KW = \frac{\text{Gallons of water} \times \Delta T (\text{°F})}{325 \times \text{Heat-up Time (hours)}}$$



3) Determine appropriate heater watt density for material being heated see [Watt Density Value Chart.pdf](#)



4) Determine suitable sheath material
[Corrision Resistance of Different Materials.pdf](#)



5) Select appropriate heater type
[Guide for Selecting Heaters.pdf](#)
[NPH PRODUCT POSTER.pdf](#)

Heater Determination Guide



Provide enough wattage with some contingency to allow for line voltage fluctuations and other variables – Add a factor of 20%



Make sure heater sheath watt densities do not exceed maximums recommended for material heated see chart below
[Watt Density Value Chart.pdf](#)



Make sure heater sheath temperatures are well under maximums allowed
[Properties of Metals and NonMetallic Solids.pdf](#)



Use lower operating voltages where choices are available (Regulate voltage as close as possible to rated voltage. Do not exceed 110% of rated voltage.)
http://www.nphheaters.com/tool_box/ohms_law_calculator.htm



Protect against: Physical damage, termination contamination (including moisture), corrosion, and other conditions that could damage heater or other system components. Include an appropriate terminal housing
[Immersion Heaters-Installation, Operation and Maintenance Instructions.pdf](#)



Make sure suitable operating temperature control is included in the final system http://www.nphheaters.com/technical/din_letter.htm

[Sensor Placement In A Thermal System.doc](#)



Make sure overheat safety device is included in the final system [Immersion Heaters-Installation, Operation and Maintenance Instructions.pdf](#)



Install electrical wiring to all electrical standards and codes

[Electrical Data and Wiring Diagrams.pdf](#)



Make sure design construction and manufacture comply with Canadian Standards Association, CSA; Underwriters Labs (UL) or other regulations as required by specific application

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