

## How To Determine Flow Rates

The flow rate through a Runtal radiator (or series of radiators) is dependent on the length of the radiator (or combined length of the radiator series), and the design Entering Water Temperature (EWT) and the design Leaving Water Temperature (LWT).

The designer picks the design EWT and LWT. For example, he might pick 170°F as the EWT and 150°F as the LWT. The median point between these two temperatures is called the Average Water Temperature (AWT), and in this example the AWT is 160°F.

The Runtal Heating Capacity charts are based on the heating capacity per foot of radiator, based on the designer's chosen AWT, and this heating capacity per foot is expressed in units of BTUH/FT @ a given AWT. The required flow rate (GPM) is figured as follows:

$$\text{Flow Rate} = (\text{Heating Capacity/Foot} \times \text{Radiator Length}) \div [(\text{EWT} - \text{LWT}) \times 500]$$

The (EWT – LWT) is commonly referred to as the “Delta T”, or “DT”.

Therefore, our Flow Rate formula becomes:

$$\text{GPM} = (\text{BTUH/FT} \times \text{FT of Radiator}) \div (\text{DT} \times 500)$$

As an example, let's say our designer needs 445 BTUH/FT capacity, over a 10'-0" span of wall, and has chosen the design water temperatures as EWT = 170°F, and LWT = 150°F. This means our AWT is 160°F. Looking in the Runtal type “R” radiator Heating Capacity chart, we see that an R-4 radiator gives us the required 445 BTUH/FT at 160°F AWT. Therefore, the required flow rate for the 10'-0" long R-4 radiator is:

$$\text{GPM} = (445 \text{ BTUH/FT} \times 10\text{FT}) \div (20^\circ\text{F DT} \times 500) = 0.445 \text{ GPM}$$

Note that there are various combinations of EWT and LWT that can result in the same AWT. In our example above, for instance, a 180°F EWT and a 140°F LWT result in the same 160°F AWT. With Runtal's unique flattened water tube design, Delta T's of up to 60°F are possible without concern that the flow rate is too low for heat transfer (see the “Design Tips” section for more information).

As for a maximum flow rate for Runtal radiators, we recommend no more than 1.5 GPM per water tube. For our R-4 example above, this would mean a maximum flow rate of 6 GPM for an opposite end piped radiator, or 3 GPM for a same end piped radiator (see the “Design Tips” section for more information).