**Hot Water Systems Work**

* **Hot Water Requirements:**

For a residential building, hot water may be supplied to all plumbing fixtures and equipment used for bathing, washing, cleansing, laundry and culinary purposes. For a nonresidential building, hot water may be supplied for bathing and washing purposes.

* Domestic hot water use varies widely depending upon a number of factors including how many people live in the building and the age of those people.
* Hot water demand varies with each individual living habit, but 15-20 gallon per person per day is a conservative estimate.
* Three primary usage of hot water in domestic needs is in bathroom, kitchen and laundry.
* Frequently, higher-temperature hot water must be blended with cold or cooler-temperature water to obtain a desired mixed water temperature.
* Having controls on a hot water generator is very important to ensure a safe and sufficient volume of hot water at the desired temperature. The control components for water heaters differ depending on the type of heater and the manufacturer, and acceptable outlet temperature varia­tions differ as well.

**Classification of Water**

Water is a compound of hydrogen and oxygen. When we burn natural gas (a hydrocarbon, CH4) dihydrogen monoxide (H2O, i.e. water) and carbon dioxide (CO2) are obtained as combustion products. Pure water is a transparent, tasteless liquid which can be found in three physical states: solid (ice), liquid (water) or gas (steam or vapour). At atmospheric pressure, between 0 to 100◦C, water is a liquid. At 0◦C, water changes to ice with an immediate expansion in volume of 10%. At 100◦C, it changes to steam, its volume expanding some 1600 times. To convert water back to its constituent elements, an electric current needs to be passed through the liquid. Rain water is usually contaminated with gases or chemicals which it absorbed as it fell. When rainwater reaches the ground it dissolves any soluble salts. Depending on which salts the water contains it may be classified as hard or soft.

**Soft water**

This is water which is free from dissolved calcium salts. Naturally occurring soft water is slightly acidic due to absorbed gases such as CO2. Soft water tends to be more pleasant for washing in but has the major disadvantage of corroding pipework, lead pipes in particular.

**Hard water**

This is water which has fallen on, and filtered through chalk or limestone from which it dissolves small amounts of calcium and magnesium salts. The water may be either permanently or temporarily hard.

***Permanent hardness*** This is the result of water containing calcium or magnesium sulphates. Boiling has no effect on permanent hardness.

***Temporary hardness*** This is the result of the water containing calcium or magnesium hydrogen carbonates. The CO2 dissolved in rainwater can attack limestone or chalk and convert the calcium carbonate and magnesium carbonate in the rock to soluble hydrogen carbonates. This temporary hardness can be removed by boiling the water; as a result CO2 escapes into the air and calcium carbonate is precipitated as scale.