## Why Balance a Hot Water Flow and Return Pipework System

For hot water systems containing a hot water flow and return pipework a hot water balancing valve provides a thermal balance to ensure a constant return flow / temperature and to limit the hot water return to the hot water plant to achieve the design flows / temperatures.

## If the hot water balancing valves are not sized correctly then:-

- The size of the water pumps and pipework are required to be increased to ensure that the hot water flows to all parts of the building.
- Increase pump sizing requires more energy / power consumption.
- Is the hot water plant adequate to meet the design temperatures needed to serve the building occupants.
- Damage and possible damage to the hot water pipework system by pitting corrosion or cavitation erosion.
- The occupants of a building are not receiving an adequate hot water supply pressure or temperature at their tap.

## AS/NZS 3500.4 Plumbing and Drainage - Part 4 (Heated Water Services)

The above Australian Standard provides the Deemed to Satisfy solutions for compliance with the Australian National Construction Code (NCC) Volume Three noting the main requirements being:-

- The minimum discharge temperature from a hot water apparatus shall not be less than 60°C with a return temperature not less than 55°C at a maximum velocity of 1.0m/s.
- Balancing valves shall be used in a hot water flow and return system controlling the temperature and flow rate serving the return branch pipework.
- Commissioning.

## **Balancing Valve Types**

Consideration is required to be made if the required balancing valve will be used for either a low rise shopping centre, medium or high rise building.

## There are basically two different types of balancing valves:-

## **Manual Balancing Valves and**

## Automatic with two different types:-

- Constant Flow Balancing Valve
- Thermostatic Balancing Valve

## **Overview of Manual Balancing Valves**

Manual balancing values are pressure dependant, designed with a constant flow and sized and balanced to its daily design requirements. These are usually provided for simple small buildings such as for shopping centres.

Inside the manual balancing valve there is a device inserted into the flow path passageway that either decreases or increases the flow through the valve.

### Advantages

They are cheaper to install being able to handle higher flow rates.

Manual balancing valves work as a constant flow system, they don't have any moving parts giving them a longer service life of up to 50 years.

#### Disadvantages

The commissioning of the hot water system requires an understanding and knowledge of the system together with specialised balancing equipment otherwise there may be a long commissioning time especially if there are multiple rises within the building.

The hot water flow and return pipework flow rates are required to be calculated and used in commissioning of the system otherwise it will be a trial-and-error exercise.

At low water flows the system may be difficult to balance.

Increasing the flow rate for a manual or automatic pump to avheive a balanced hot water system normally doesn't balance the hot water flow rates throughout hot water system.

Manual balancing values requires that a minimum pipework length be provided both on the upstream and downstream sides of the value for laminar flow through the value.

Any changes, additions or modifications to the hot water system requires a rebalancing of the hot water system to be carried out.

## **Overview of Automatic Balancing Valves**

## **Constant Flow Balancing Valves**

Constant flow balancing valves designed to maintain an automatic balancing by means of a cartridge that maintains a constant flow even under fluctuating pressure conditions by dynamically adjusting the flow rate.

The automatic balancing of this value is generally used with low rise buildings with a pressure range of generally between 350kPa to 600kPa.

#### Advantages

There are minimal costs associated with commissioning the hot water system as the valves are automatically flow controlled providing a set and forget valve.

If the hot water system requires major modifications or additions, then a new flow rate cartridge can be inserted into the valve to achieve the new flow rate required.

Constant flow balancing valves work well in conjunction with variable speed hot water circulation pumps.

Constant flow balancing valves do not require a minimum pipework length be provided both on the upstream and downstream sides of the valve for laminar flow through the valve.

## Disadvantages

Constant flow balancing valves are required to be designed upfront in accordance with the hot water system design flow rates.

As a constant flow balancing valve contains a internal moving cartridge, impurities in the water such as high or low PH levels can affect the cartridge by reducing the valves lifespan.

## **Thermostatic Balancing Valves**

Thermostatic balancing valves designed to maintain an automatic balancing by means of a cartridge that maintains a constant temperature even under fluctuating temperature conditions by dynamically adjusting the flow rate.

The thermostatic balancing of this value is generally used with medium to high rise buildings where the temperature is required adjusted and not the pressure as per the constant flow balancing value.

## Advantages

These values are efficient by achieving automatic system temperature balancing preventing water stagnation.

There are minimal costs associated with commissioning the hot water system as the valves is automatically temperature controlled providing a set and forget valve.

Hot water temperature spikes are eliminated while allowing continuous circulation of hot water throughout the hot water system.

If the hot water system requires additions, then a new temperature cartridge can be inserted into valve to achieve the new temperature design rates.

Thermostatic balancing valves work well in conjunction with variable speed hot water circulation pumps.

Thermostatic balancing values do not require a minimum pipework length be provided both on the upstream and downstream sides of the value for laminar flow through the value.

## Disadvantages

Temperature balancing valves are required to be designed upfront in accordance with the hot water system design temperature requirements.

As a temperature balancing valve contains an internal moving cartridge, impurities in the water such as high or low PH levels can affect the cartridge by reducing the valves lifespan.

# Conclusion

The results of a balanced hot water system using either a manual or automatic balancing valve is to ensure the following benefits:-

- That there is sufficient hot water to the building's occupants so that hot water is available when a user turns on a tap reducing water usage.
- Sufficient and correct water flow to the hot plant / equipment.
- Designed flow rates through the distribution pipework.
- Energy conservation savings and ongoing maintenance cost savings.
- Lower capital costs.

Finally, is the hot water system performing to its optimum performance in the way the hydraulic design consultant intended.

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