McDonald Water Storage

Hot Water Storage Solutions

Calorifier

Commercial Hot Water Cylinders

Installation & Technical Manual

MADE IN BRITAIN

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Calorifier Installation & Technical Manual

Manual should be left with Calorifier or O & M manuals

Contents

1.0 Introduction 2
2.0 Bespoke Cylinders 2
3.0 Copper Shell Material 3
4.0 Heat Systems & Sources 4
5.0 Sizing Your Hot Water Storage Calorifiers 5
6.0 Connection and Ancillary Sizing 7
7.0 Installation and Commissioning 8
7.1 Installation 8
7.2 Commissioning 10
8.0 Construction Features 11
9.0 Accessories 12
9.1 Descriptions 12
9.2 Spare Parts 15
10.0 Quality Management & Standards 17
10.1 BS853 17
10.2 Pressure Equipment Directive (2014/68/EU) 17
11.0 Supply Chain Management 18
12.0 Cylinder Diagrams & Heights 19
12.1 Direct Calorifiers 19
12.2 Indirect Calorifiers 20
12.3 Horizontal Calorifiers 21
13.0 Inspection 22
14.0 Annual Maintenance 22
15.0 Annual Service Checks 22
16.0 General Notes 23

1.0 Introduction

McDonald Water Storage offer an extensive range of calorifiers to suit vented and unvented installations for commercial and industrial use. Manufactured in strict accordance to the requirements of British Standard 853 and quality plan ISO 9001, we have the ability to manufacture calorifiers to a capacity of over 3000 Litres and have a long history of manufacturing copper calorifiers tailored to the exact requirements of the project. From schools, universities, football clubs, hotels, hospitals, factories, swimming pools to offshore platforms McDonald Water Storage calorifiers and expertise have been used to meet a variety of demands in differing environments.

Our commitment to providing a knowledgeable, friendly service from conception to post-installation support, alongside our unrivalled ability to provide a bespoke calorifier package designed to your exact requirements will minimise the time and costs involved during installation.

Carrying a wide range of materials, McDonald Water Storage offer industry leading delivery times on calorifier projects, with a standard 2 Week delivery period and often quicker, calorifiers can be delivered on-time when you need it.

2.0 Bespoke Cylinders

McDonald Water Storage have an enviable position in the calorifier market for our ability to design, manufacture and supply some of the most complex and technical custom designed calorifiers for specific applications. Being able to supply products made to individual specifications not only allows for a calorifier specifically tailored to your needs but also reduces the time and costs of installation, helping to save on your overall project cost.

Technical advice and in-house expertise are readily available to ensure a suitably tailored calorifier. Our aim is to ensure that our calorifiers are made to your individual specification to ensure you get exactly what you want.

3.0 Copper Shell Material

McDonald Water Storage manufacture their calorifiers from premium grade solid copper. Copper material has been selected as the best material to use for many reasons. Tried and tested throughout the world for thousands of years, copper is a reliable and economical non-corrosive metal that is used extensively for hot water storage for its superior killing of germs, unrivalled heat conductivity, flexibility of manufacture and long-lifespan (Expected Calorifer life in excess of 25 years).

Health

Copper will eradicate MRSA, E-coli and even Avian Bird Flu in less than 5 Hours. In tests it took 34 days for E-coli 0157 to die on Stainless Steel, 4 days on brass and just 4 hours on copper. 99% of the bacterial population, introduced into a copper plumbing system, will disappear in under five hours. Copper is recommended to combat Legionella. Copper is a vital trace element in the human body and essential for good health.

Efficiency

Copper is one of the most efficient conductors of heat. It has a thermal conductivity of 401 W/mK. Compare this to Stainless Steel that is rated at 14 W/mK and you can see why copper is the material of choice. This is of vital importance when trying to get the most out of renewable technologies such as Solar and Geothermal. These require highly efficient coils to transfer their energy into hot water and copper maximises this heat transfer.

Versatility

Alongside its superior heat conductivity, copper is a strong material but can be easily formed into bends, coils and other shapes. This allows for more bespoke connections that other materials cannot provide.

Stainless Steel

In situations where a stainless steel tank is required (e.g. higher working pressures), McDonald Water Storage can offer a stainless steel option.
All our stainless steel cylinders are pickled and passivated.

4.0 Heat Systems & Sources

Heat Systems & Sources

Primary heating systems will transfer heat to the calorifier through a heat exchanger, which comes in the form of a fixed coil or removable U-Tube battery for "Indirect Units". McDonald Water Storage calorifiers are capable of working with LTHW (0-100°C), MTHW (100°C-120°C), HTHW (>120°C) and steam primary hot water heating systems, at a variety of working pressures. This should be specified before ordering.

Fixed Copper Coils

Produced from the coiling of standard or finned copper tubes, fixed copper coils are manufactured based on the recovery time requirements of the installation. Flexibility and heat conductivity of copper allows for bespoke connection heights and positions to spread heat transfer across the entire height of the calorifier. With a lower pressure drop (below 25kpa), fixed copper coils provide an ideal solution for many applications, from Boilers to Heat Pumps.
Copper coils are also ideal for getting the maximum heat transfer out of your renewable energy input, whether it be solar, heat pump etc. Multiple coils can be fitted for various heat inputs and outputs.

External PHE (PLATE*flow*)

An external Plate Heat Exchanger can be fitted to provide the heat input to a Calorifier. With or without primary controls, it can be fitted with a pump and flow restrictor to our PLATE*flow* unit. This can provide semi-instantaneous hot water, with the additional fall back of a buffer vessel and an easily maintained/replaceable external heat exchanger.

See our PLATE*flow* manual for more information.

U-Tube Type Battery

Manufactured in a bundles arrangement of finned copper tube, removable U-Tube batteries are manufactured based upon the duty requirement (kW input required to provide a set temperature rise over a set period). Bespoke bundles can be provided to deal with a range of kW duties and, connection sizes and immersed lengths. This is an older technology, which has largely been replaced by our PLATE*flow*.

5.0 Sizing Your Hot Water Storage Calorifiers

When sizing hot water storage calorifiers, it is important to determine not only the correct size but also the correct relationship between storage and recovery to enable the most efficient usage from your hot water system. Oversizing the calorifier can lead to unnecessary costs both in your calorifier cost and running of your system, while inadequate storage can lead to the system not meeting the users requirements.

For most commercial situations a storage capacity sufficient for one hour with a corresponding heater output is considered adequate for the majority of calorifier applications. However, a pattern of hot water usage can be projected based on the function of building, the activity that takes place and its population. For example, environments such as offices and schools usually operate on a 12 hour period and other buildings such as hospitals and hotels may operate over 24 hour. Where the shower demand takes up the majority of the hourly consumption efforts should be made to obtain an accurate estimate of the total usage and the timespan involved.

Where installation space permits additional storage volume can provide a useful reserve of hot water. If space for one hour storage volume is not available then increasing the output of the heat source could allow for the storage capacity to be reduced accordingly, for anything below 30 minutes, McDonald Water Storage PLATE*flow*, plate heat exchanger system should be considered.

Additionally, dividing the total storage demand between multiple calorifiers can also safeguard the supply and would also allow part of the system to be shut down during off peak periods or seasons.

The following guide, showing the maximum hourly demand in different commercial environments, should be utilised:

Installation	Shower	Bath	WHB		Sink		Load Factor
			Dom.	Com.	Dom.	Com.	
Factory	120		5	20	50	80	1.0
Hospital	70	60	10	20	50	80	0.7
Hotel (Average)	50	50	10	15	50	100	0.5
Hotel (Upper Class)	60	60	15	20	60	120	0.5
Offices			5	10	40	40	1.0
Restaurant				25	100	140	1.0
School	180		5	20	40	80	0.8
Sports Centre	220		5	15	40	100	1.0
University	220		5	20	40	80	0.8

Example 1	**50 Hotel (High End)**						
Background: Sizing for a 50 Bedroom Hotel with public bathrooms, cleaning, washing, cooking and bar facilities would give the following sizing:							
Shower & Bath Demand	50	x	60	=	3000	Litres	
Domestic WHBs Demand	50	x	15	=	750	Litres	
Commercial WHBs Demand	4	x	25	=	100	Litres	
Washing Machine Demand	3	x	50	=	150	Litres	
Load Factor					0.5		
Calculation	***(3000 + 750 + 100 + 150 x 0.5)***						
Maximum Hourly Demand							**2240 Litres**
Recovery Output (Per Hour)							**2240 Litres**
Calorifier Recommendation (1 Hour Recovery)							**2240 Litres**
Calorifer Recommendation (30 Min Recovery)							**1120 Litres**

Example 2	**Football Changing Room**							
Background: Sizing for 32 People to have a 6 minute shower with a 6 Litre per minute flow rate every 2 Hours while running 12 WHBS and 1 Sink, would give the following sizing:								
Shower & Bath Demand	32	x	6	x	6	=	1152	Litres
Commercial WHBs Demand	10		x	15		=	150	Litres
Commercial Sink Demand	1		x	100		=	100	Litres
Load Factor							1.0	
Calculation	***(1152 + 150 + 100 x 1.0)***							
Maximum Hourly Demand								**1400 Litres**
Calorifier Recommendation (2 Hour Recovery)								**1400 Litres**

6.0 Connection and Ancillary Sizing

Secondary Connection Sizing – Cold Feed & Flow

Where a high water demand is required over a shorter period the correct sizing of the secondary cold feed and flow connections should be factored in to ensure the peak demand in litres per second is met.

Connection Size (in)	(mm)	Peak Demand (litres per second)	Hourly Demand (litres per hour)
1"	28	0.1	150
1 1/4"	35	0.2	275
1 1/2"	42	0.3	400
2"	54	0.6	850
2 1/2"	68	1	1400
3"	72	1.5	2500
4"	96	2.5	5500

It is generally bad practice for the cold feed to be smaller than the secondary flow due to the potential for a vacuum to be created, if this is the case an anti-vacuum valve should be supplied with the unit.

Secondary Recirculation

The secondary return sizing should be factored in to allow an efficient flow rate at all points of the property but also be sized at a level that avoids excessive secondary recirculation as this can lead to increased heat loss.

Primary Connections

The size of the primary pipework is determined by the flow rate and length of run between the boiler and calorifier. Wherever possible the connection sizes on the primary pipework should not exceed 2 or 2 ½" so that the inlet velocity does not exceed tolerances.

Relief Valve Sizing

On a Vented System the Relief Valve must be sized in conjunction with the Cold Feed size.

On an Unvented System, each unit is supplied with a DN20 Pressure Relief Valve for the Cold Feed, and an additional P & T (Pressure & Temperature) Relief Valve which must be sized to match the power input to the cylinder.

Expansion Vessel Sizing

The Expansion Vessel is sized according to the capacity, cold inlet pressure and working pressure of the calorifier.

7.0 Installation and Commissioning

7.1 Installation

Installation should be carried out in accordance with current local Building Regulations and Water Byelaws.

Handling

The Calorifier should be handled with care in order to avoid any damage to valves, fittings or external pipework.

The Calorifier **must not** be lifted by any fittings or external pipework, as this can result in loosening off connections and risking possible leaks.

Lifting Lugs are provided at the top of the calorifier for lifting and movement.

Storage

The Calorifier should be mounted on level and prepared foundations.

Vertical Calorifiers can be floor mounted, provided the floor is strong enough to support the **full** weight of the unit.

Horizontal Calorifiers are supported by cradles, positioned clear of the drain connection.

Pipework

All pipework should be secured with external supports and not by the Calorifier unit itself.

Pipework should also include suitable bends or flexible joints to allow for expansion.

Access

It is essential that suitable access to all Calorifier controls (e.g. Thermostats, Immersion Heaters, Safety Valve, etc.) and inspection points (e.g. Manhole, Temperature Gauges, etc.) is possible for inspecting, servicing and maintaining the unit.

Wiring

All electrical wiring should be carried out by a qualified electrician.

Immersion Heater High-Limit stats are factory set and should **not** be altered under any circumstances other than instruction by McDonald Water Storage.

Cold Feed Components

All cold feed components (Pressure Reducing Valve, Check Valve, Safety Valve, etc.) are fitted in the correct order, as shown in the following schematics, anywhere on the cold mains supply.

Ensure that all cold feed components are installed with the flow direction pointing towards the unit, as shown in the schematics.

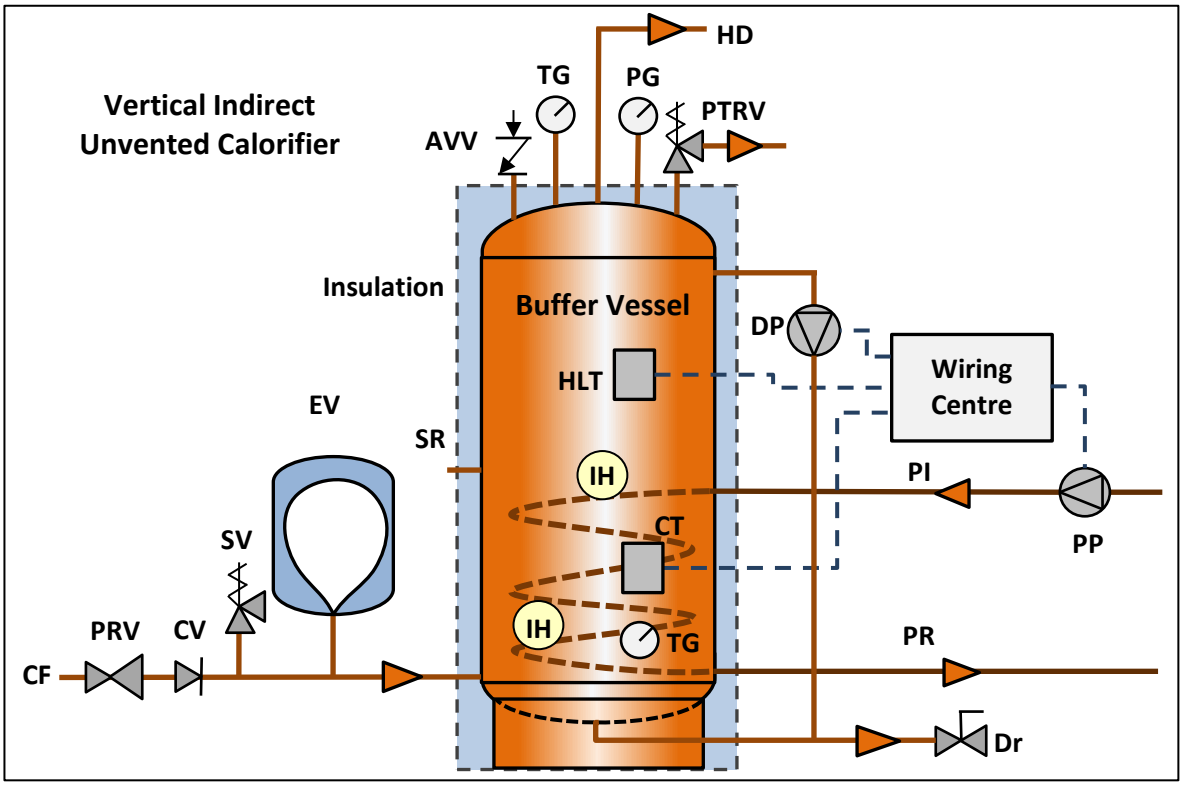
The **Pressure Reducing Valve** and **Check Valve** do not require to be sited close to the unit. If more convenient they may be sited where the cold mains supply enters the premises.

Operation

The Calorifier should be properly flushed through with clean water prior to operation.

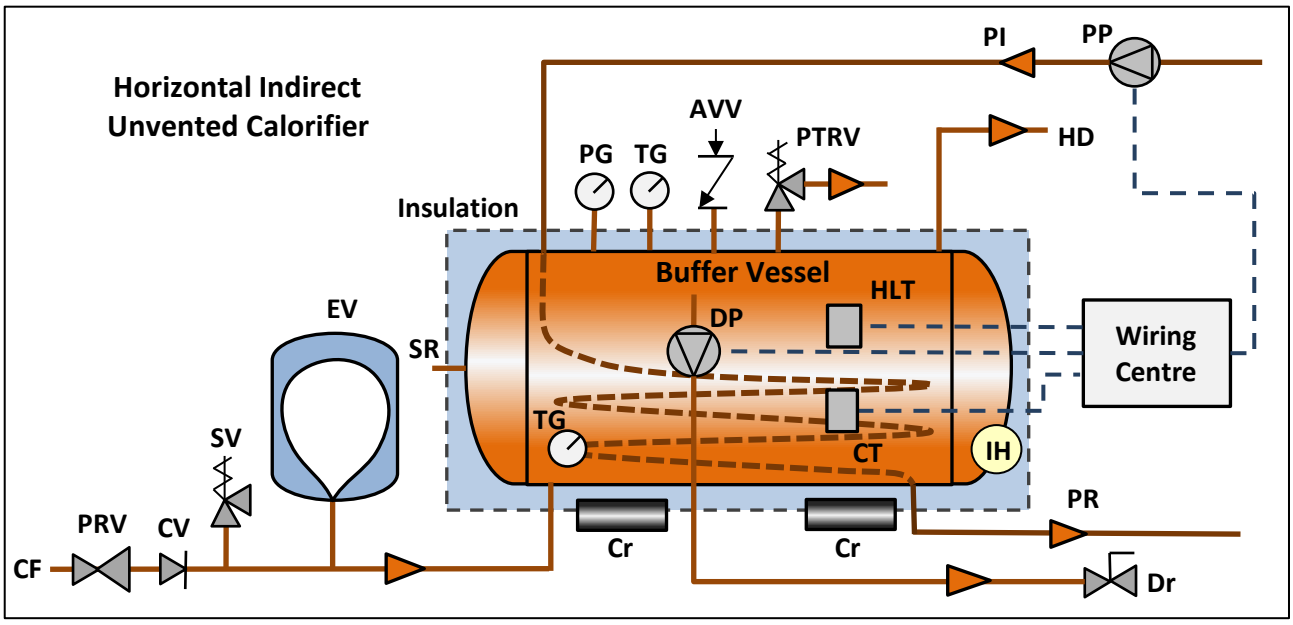
Schematics

Below are example installation schematics for both a Vertical and Horizontal Unvented Calorifier (both indirectly heated).



LEGEND

AVV	Anti-Vacuum Valve	**IH**	Immersion Heater
CF	Cold Feed	**PG**	Pressure Gauge
Cr	Cradle	**PI**	Primary Flow Inlet
CT	Control Thermostat	**PP**	Primary Pump
CV	Check Valve	**PR**	Primary Flow Return
DP	De-Stratification Pump	**PRV**	Pressure Reducing Valve
Dr	Drain	**PTRV**	Pressure/Temperature Relief Valve
EV	Expansion Vessel	**SR**	Secondary Return
HD	Hot Draw	**SV**	Safety Valve
HLT	High-Limit Thermostat	**TG**	Temperature Gauge



7.2 Commissioning

Filling

Before following instructions, ensure that all fittings are in place and tightened.

i) Check the Drain valve is closed
ii) Open the furthest tap from the Calorifier
iii) Open the valve on the cold water supply to fill the tank and allow entrapped air to escape. When water issues from the tap, allow the water to run for a few minutes to flush any dirt and extraneous material.
iv) Open successive hot taps to purge any remaining air from the system. When satisfied that the system is free of air, close the taps.
v) Check all connections for any leaks and rectify as necessary.

Safety Valves

i) Manually open, for a few seconds, the Pressure & Temperature Relief Valve, situated on the top of the Calorifier. Check that the discharged water runs freely away through the discharge pipework.
ii) Repeat for the Safety Valve, fitted onto the Cold Water Supply

Direct Units

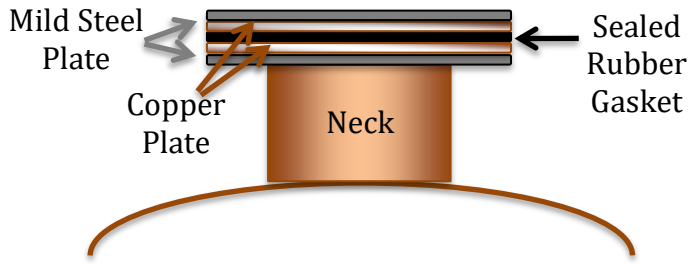
i) Switch on the electrical supply to the immersion heater(s) and allow the Calorifier to heat up.
ii) Check that the control thermostat operates correctly.
iii) Check that no water discharges from either the Safety Valve or the Pressure and Temperature Relief Valve during the heating cycle.

Indirect Units

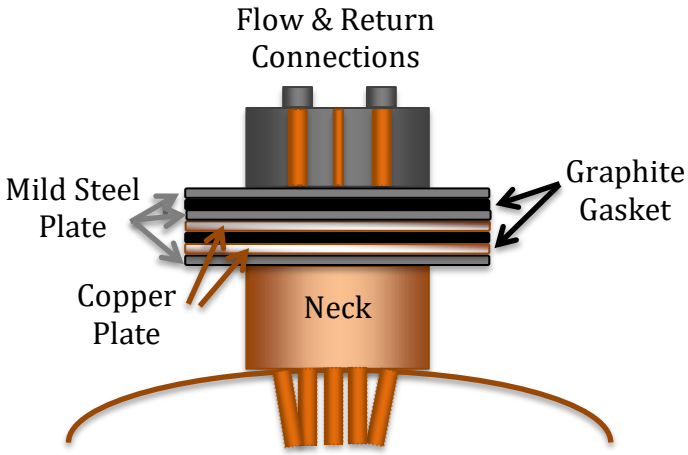
i) Fill the indirect (primary) circuit in accordance with the boiler manufacturers commissioning instructions. To ensure the primary coil in the Calorifier is filled, manually open the motorised valve until the filling sequence is completed.
ii) When the primary circuit is full release the valve to its normal position.
iii) Switch on the boiler.
iv) Allow the cylinder to heat up and check that the control thermostat and the motorised valve operate correctly.
v) Check that no water is discharged from either the Safety Valve or the Pressure and Temperature Relief Valve during the heating cycle.

8.0 Construction Features

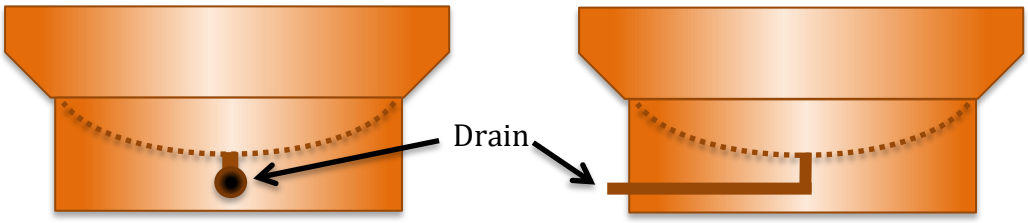
Inspection Manhole



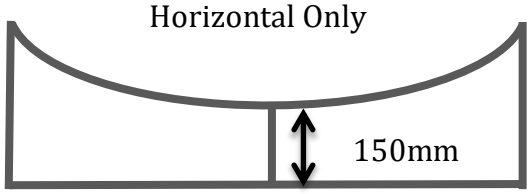
U-TUBE BATTERY



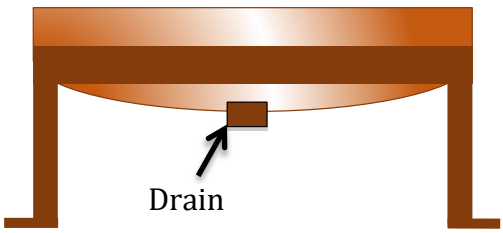
Ringstand



Cradles



Legs



9.0 Accessories

9.1 Descriptions

Pressure & Temperature Relief Valves

Pressure and Temperature Relief Valves are used on Calorifier Shells to control and protect the system from pressure and excessive temperatures. Protection is provided by a mechanical thermostat, which will cause the valve to discharge a sufficient amount of hot water to prevent the pressure and/or temperature from exceeding their predetermined values.

Safety Valve

A Safety Valve is designed to automatically discharge water from the secondary circuit when a set pressure is exceeded protecting the working pressure of the Calorifier. The safety valve features a full lift feature that will allow for sufficient discharge capacity for the Calorifier.

De-Stratification Pump

The water temperature at the bottom of a calorifier can become tepid under certain conditions. To avoid legionella bacteria from forming, the De-stratification Pump pumps hot water from the top of the calorifier through to the bottom of the calorifier at set intervals to ensure the full capacity of the calorifier reaches a minimum temperature of 60°C.

Anti-Vacuum Valve

Anti-Vacuum Valves are designed to prevent a vacuum forming within a calorifier where there is potential for the draw off rate to exceed the incoming flow rate. Under normal working conditions, the Anti-Vacuum Valve is held closed by the working pressure and when a vacuum condition exists the suction will open the valve and allow air to flow through, equalising the pressure within the Calorifier.

Gauges

Pressure Gauge

The 100mm Pressure Gauge provides a pressure reading from 0-7 Bar of working pressure in the top of the calorifier through a probe placed through a ½" boss.

Temperature Gauge

The 100mm Temperature Gauge provides a temperature reading from 0 – 120°C for the temperature at the top and bottom of the calorifier through a ½" boss.

Cold Water Control Pack

Pressure Reducing Valve

Pressure Reducing Valves are used to control the incoming water supply to the calorifier, protecting the calorifier against damage caused by excessive pressure from the supply.

Check Valve

Check Valve is a one way valve that allows water to flow in only one direction. The Check Valve is installed to prevent backflow of hot water to the cold mains supply.

Immersion Heaters

Immersion Heaters are designed to heat the water within a calorifier directly to the temperatures set by their built in control and high limit thermostats through an electric heating element.

Screw-in and Bolted Flange types available.

Heavy Duty WR Immersion Heaters are also available.

Thermostats

Placed into the calorifier through a ½" boss and pocket, the Control Thermostat acts as an independent control device where a thermostat probe gives a temperature reading for different functions.

Control Thermostat

Ensures the relevant heat source switches on in the event that the calorifier drops below a set temperature.

High Limit Thermostat

Ensures the relevant heat source switches off in the event that the calorifier overheats.

Expansion Vessels

Potable Expansion Vessels are used to absorb the increase in pressure, caused by thermal expansion within a cylinder as it heats up.

Flow Through Vessels are also available. These allow for continuous water flow through the bladder of the expansion vessel, which helps minimise stagnation and avoid legionella risk.

9.2 Spare Parts

The following table lists all the spare parts (and codes) available to purchase, with additional information provided.

Follow the link; https://www.mcdonaldwaterstorage.com/store/spares

Or phone the office on **(01592) 611123**

Safety Valve	DN20 Safety Valve 3.5 Bar	***WCSV35***	
	DN20 Safety Valve 4.5 Bar	***WCSV45***	
De-Stratification Pump	½" De-Stratification Pump	***WCDP***	
Anti-Vacuum Valves	22mm Anti-Vacuum Valve	***WUAVV***	
	1" Anti-Vacuum Valve	***WUAVV1***	
Gauges	½" Pressure Gauge	***WCPG***	
	½" Temperature Gauge (Vertical Probe)	***WCTG***	
	½" Temperature Gauge (Horizontal Probe)	***WCTGS***	

Cold Water Control Packs	35mm Connections Incl. Pressure Reducing Valve & Check Valve	***WUCWCP3***	
	1 ½" Connections Incl. Pressure Reducing Valve, Pressure Gauge & Check Valve	***WUCWCP4***	
	2" Connections Incl. Pressure Reducing Valve & Check Valve	***WUCWCP5***	
Immersion Heaters	6kW Immersion Heater	***WIH6***	
	9kW Immersion Heater	***WIH9***	
	6kW Heavy Duty WR IH	***WIH6WR***	
	9kW Heavy Duty WR IH	***WIH9WR***	
	12kW Heavy Duty WR IH	***WIH12WR***	
Thermostats	Control Thermostat	***WNCT***	
	High Limit Thermostat	***WNHLT***	
Potable Expansion Vessels	50 Litre Expansion Vessel	***WU50EV***	
	100 Litre Expansion Vessel	***WU100EV***	
	200 Litre Expansion Vessel	***WU200EV***	
	300 Litre Expansion Vessel	***WU300EV***	

10.0 Quality Management & Standards

At McDonald Water Storage, our commitment to providing a consistent delivery of calorifiers to the highest quality and fit for purpose is ensured by following the quality management programme ISO 9001:2015.

10.1 BS853

Our calorifiers are manufactured strictly in accordance with the requirements of BS 853, which ensure they meet all current Health and Safety Legislation.

Our calorifiers are subject to a two stage testing process where shell material is initially air tested for leaks and subsequently placed on a hydraulic test at 1.5 times the maximum working pressure of the calorifier, with a minimum of 6 hours of testing our calorifiers are tested 12 times longer than the BS 853 requirements for the highest reliability.

All calorifiers are manufactured with full traceability of material and assembly with each material and item used in manufacturing our calorifiers individually recorded alongside the date of manufacture. Each stage of assembly and the individual operator who completes each process is recorded to provide a full manufacturing record.

All work and input into a calorifier is checked at all stages from its design, costing, issuing and manufacture to ensure the highest product quality is provided. During manufacture a 3 stage inspection process is in place at assembly, testing and final inspection once insulated to ensure our calorifier accurately reflects your requirements.

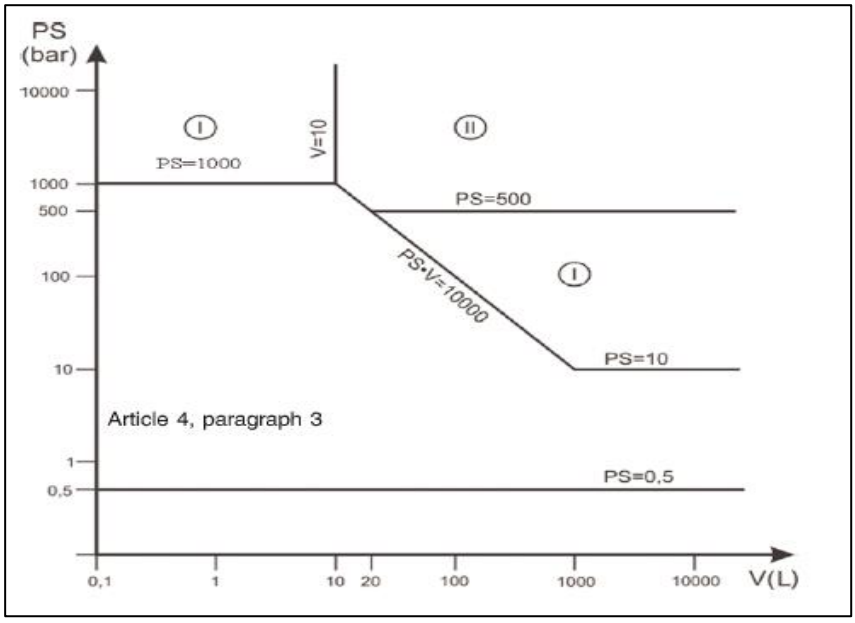
10.2 Pressure Equipment Directive (2014/68/EU)

As of June 2015, calorifiers need to meet the mandatory requirements of the Pressure Equipment Directive 2014/68/EU (PED).

The majority of fluids used within our calorifiers (i.e. water, steam etc.) are classified as Group 2 Fluids, and thus follow the rules below:

1. Where the maximum design pressure (Bar) multiplied by the calorifier volume (Litres) is less than 10,000, or the design pressure is less than 10 bar, the calorifier must comply with the SEP (Sound Engineering Practice) and not carry the CE mark.

2. Calorifiers which fall outside the previous parameters must carry the CE mark.



The above graph (taken from Annex II Table 4 of the PED) demonstrates the previous rules for Vessels for Group 2 liquids. "Article 4, Paragraph 3" refers to design compliance with the SEP (Sound Engineering Practice).

11.0 Supply Chain Management

Under quality management programme ISO 9001:2015, all suppliers of materials for use with our commercial systems are subject to continuous assessment and a formal annual review to ensure the highest service is supplied. Monthly quality management meetings also review all quality issues in an effort to provide continuous improvement to maintain our quality position within the market.

12.0 Cylinder Diagrams & Heights

12.1 Direct Calorifiers

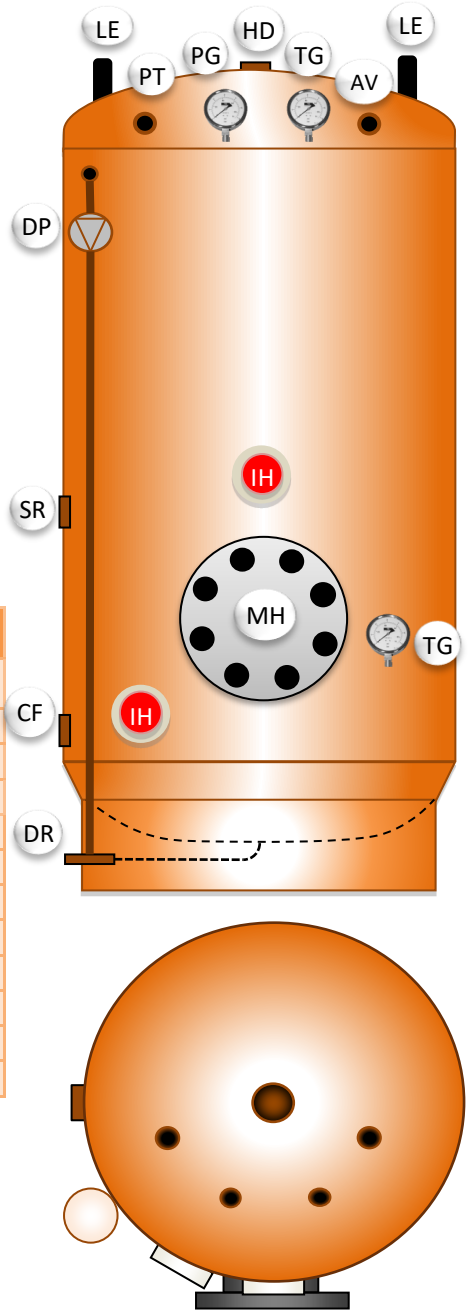
Direct Calorifiers are most suitable for installations where the main or only heat source to a property is an electrical supply and the storage requirements will be met by an immersion heater.
McDonald Water Storage use a wide range of immersion heaters from light domestic usage to heavy industrial usage, to provide a wide range of direct calorifiers suitable for your storage or capacity needs.

Mandatory

Code		Key
CF	Cold Feed	✓
HD	Hot Draw	✓
IH	Immersion Heater	✓
SR	Secondary Return	✓
DR	Drain	✓
PT	P & T Relief Valve	✓

Optional

Code		Key
DP	De-stratification Pump	O
PG	Pressure Gauge	O
AV	Anti-Vacuum Valve	O
LE	Lifting Eyes	O
TG	Temperature Gauge	O
MH	Inspection Manhole	O



Product Code	MCDD400	MCDD450	MCDD500	MCDD550	MCDD600	MCDD700	MCDD800	MCDD900	MCDD1000	MCDD1200	MCD1500	MCDD1800	MCDD2000	MCDD2500	MCDD3000
Capacity (Litres)	**400**	**450**	**500**	**550**	**600**	**700**	**800**	**900**	**1000**	**1200**	**1500**	**1800**	**2000**	**2500**	**3000**
Shell Height	**1650**	**1800**	**2000**	**2200**	**1850**	**2150**	**1950**	**2200**	**2200**	**2050**	**2000**	**2400**	**1950**	**2450**	**2300**
Height + Stand	**1750**	**1900**	**2100**	**2300**	**1950**	**2250**	**2050**	**2300**	**2300**	**2150**	**2100**	**2500**	**2050**	**2550**	**2400**
Shell Diameter	**600**	**600**	**600**	**600**	**675**	**675**	**750**	**750**	**800**	**900**	**1050**	**1050**	**1200**	**1200**	**1350**
Drain	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Secondary Return	1030	1130	1230	1330	1145	1245	1080	1180	1180	1200	1200	1390	1190	1390	1390
Cold Feed	330	330	330	330	345	345	380	380	380	390	390	390	390	390	390
De-Strat (Upper)	1550	1700	1900	2100	1735	2035	1800	2050	2050	1890	1840	2240	1790	2290	2140
Manhole Centre	500	500	500	500	515	515	550	550	600	610	660	660	660	660	660
Temp. Gauge	550	550	550	550	565	565	600	600	620	660	670	670	670	670	670
Lower IHB	450	450	450	450	465	465	500	500	500	510	510	510	510	510	510
Upper IHB	1030	1130	1230	1330	1145	1245	1080	1180	1180	1200	1200	1390	1190	1390	1390

*28mm Primary and Secondary Conns up to 600 Litre, then 1 ½" as standard for 600L and above.
** Heights indicate standard centre heights from ground for each of the connections, bespoke heights available upon request.
*** CAD Sketches available from the website: https://www.mcdonaldwaterstorage.com/hot-water-cylinders-cad-files

12.2 Indirect Calorifiers

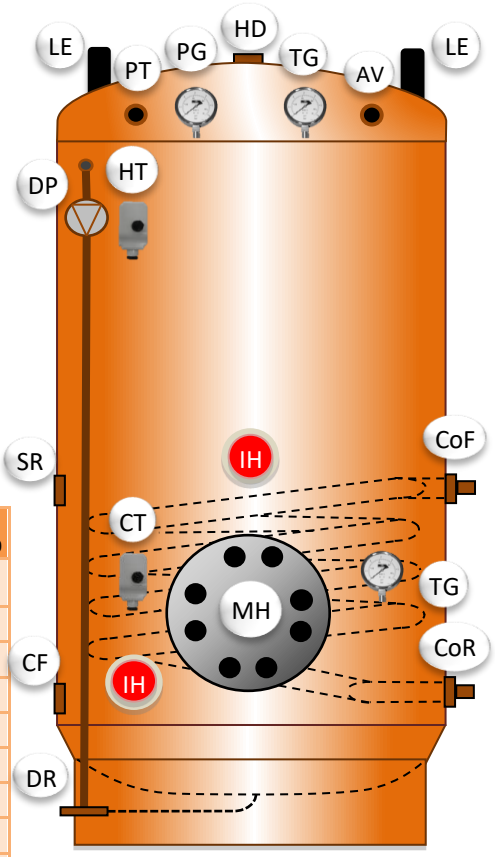
Indirect Calorifiers are most suitable for installations where the main heat source will be from a remote supply and the calorifier will be heated indirectly through a heat exchanger. McDonald Water Storage have a wide range of Indirect Calorifiers suitable for low, medium, high temperature water to water and steam to water heat exchangers. Our range of batteries and fixed coils for primary system heat exchangers are available at a variety of capacities, working pressures and recoveries.

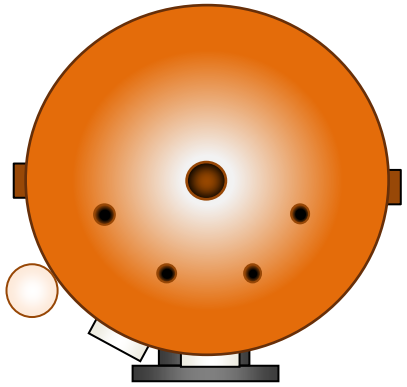
Mandatory

Code		Key
CF	Cold Feed	✓
HD	Hot Draw	✓
CoF	Coil Flow	✓
CoR	Coil Return	✓
CT	Control Stat	✓
HT	High Limit Stat	✓
IH	Immersion Heater	✓
SR	Secondary Return	✓
DR	Drain	✓
PT	P & T Relief Valve	✓

Optional

Code		Key
DP	De-stratification Pump	O
PG	Pressure Gauge	O
AV	Anti-Vacuum Valve	O
LE	Lifting Eyes	O
TG	Temperature Gauge	O
MH	Inspection Manhole	O



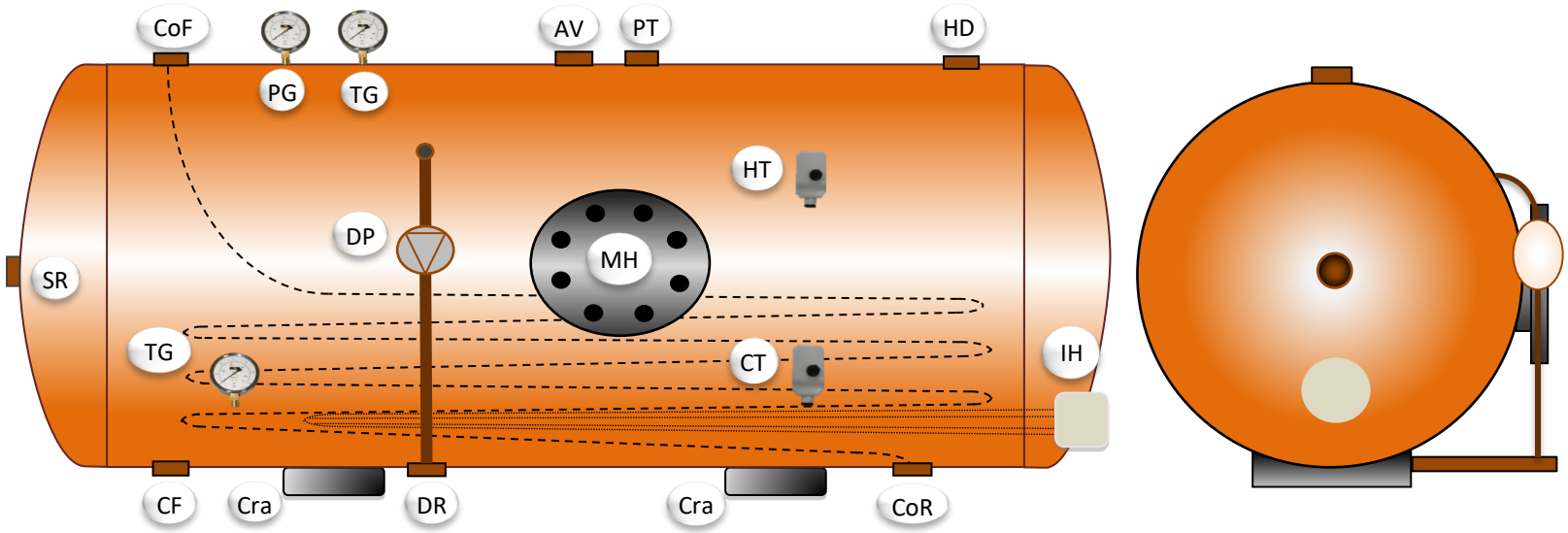


Product Code	MCDI400	MCDI450	MCDI500	MCDI550	MCDI600	MCDI700	MCDI800	MCDI900	MCDI1000	MCDI1200	MCDI1500	MCDI1800	MCDI2000	MCDI2500	MCDI3000
Capacity (Litres)	**400**	**450**	**500**	**550**	**600**	**700**	**800**	**900**	**1000**	**1200**	**1500**	**1800**	**2000**	**2500**	**3000**
Shell Height	**1650**	**1800**	**2000**	**2200**	**1850**	**2150**	**1950**	**2200**	**2200**	**2050**	**2000**	**2400**	**1950**	**2450**	**2300**
Height + Stand	**1750**	**1900**	**2100**	**2300**	**1950**	**2250**	**2050**	**2300**	**2300**	**2150**	**2100**	**2500**	**2050**	**2550**	**2400**
Shell Diameter	**600**	**600**	**600**	**600**	**675**	**675**	**750**	**750**	**800**	**900**	**1050**	**1050**	**1200**	**1200**	**1350**
Drain	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Secondary Return	1030	1130	1230	1330	1145	1245	1080	1180	1180	1200	1200	1390	1190	1390	1390
Cold Feed	330	330	330	330	345	345	380	380	380	390	390	390	390	390	390
Coil Flow	930	1030	1130	1230	1045	1145	980	1080	1080	1090	1090	1290	1090	1290	1170
Coil Return	330	330	330	330	345	345	380	380	380	390	390	390	390	390	390
Control Stat	550	550	550	550	565	565	600	600	620	660	670	670	670	670	670
High Limit Stat	1470	1620	1820	2020	1655	1955	1720	1970	1970	1810	1760	2160	1710	2210	2060
De-Strat (Upper)	1550	1700	1900	2100	1735	2035	1800	2050	2050	1890	1840	2240	1790	2290	2140
Manhole Centre	500	500	500	500	515	515	550	550	600	610	660	660	660	660	660
Temp. Gauge	550	550	550	550	565	565	500	600	620	660	670	670	670	670	670
Lower IHB	450	450	450	450	465	465	500	500	500	510	510	510	510	510	510
Upper IHB	1030	1130	1230	1330	1145	1245	1080	1180	1180	1200	1200	1390	1190	1390	1390

*28mm Primary and Secondary Conns up to 600 Litre, then 1 ½" as standard for 600L and above.
** Heights indicate standard centre heights from ground for each of the connections, bespoke heights available upon request.
*** CAD Sketches available from the website: https://www.mcdonaldwaterstorage.com/hot-water-cylinders-cad-files

12.3 Horizontal Calorifiers

Horizontal Calorifiers are ideal for installation spaces where height is limited. Stabilised on a set of cradles, many of the calorifier connections are based on the top of the cylinder to provide a reduced height.



Product Code	MCDI400H	MCDI450H	MCDI500H	MCDI550H	MCDI600H	MCDI700H	MCDI800H	MCDI900H	MCDI1000H	MCDI1200H	MCDI1500H	MCDI1800H	MCDI2000H	MCDI2500H	MCDI3000H
Capacity (Litres)	**400**	**450**	**500**	**550**	**600**	**700**	**800**	**900**	**1000**	**1200**	**1500**	**1800**	**2000**	**2500**	**3000**
Shell Length	**1650**	**1800**	**2000**	**2200**	**1850**	**2150**	**1950**	**2200**	**2200**	**2050**	**2000**	**2400**	**1950**	**2450**	**2300**
Shell Diameter	**600**	**600**	**600**	**600**	**675**	**675**	**750**	**750**	**800**	**900**	**1050**	**1050**	**1200**	**1200**	**1350**
Drain	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Secondary Return	500	500	500	500	537	537	575	575	600	650	725	725	800	800	875
Cold Feed	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Coil Flow	850	850	850	850	925	925	1000	1000	1050	1150	1300	1300	1450	1450	1600
Coil Return	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Control Stat	400	400	400	400	430	430	480	480	500	520	550	550	600	600	650
High-Limit Stat	700	700	700	700	720	720	780	780	850	900	1000	1000	1075	1075	1150
De-Strat (Upper)	750	750	750	750	825	825	900	900	950	1050	1200	1200	1350	1350	1500
Manhole Centre	500	500	500	500	537	537	575	575	600	650	725	725	800	800	875
Temp. Gauge	500	500	500	500	537	537	575	575	600	650	725	725	800	800	875
IHB	325	325	325	325	360	360	400	400	400	400	400	400	400	400	400

Mandatory

Code		Key
CF	Cold Feed	✓
HD	Hot Draw Off	✓
CoF	Coil Flow	✓
CoR	Coil Return	✓
Cra	Cradle	✓
CT	Control Stat	✓
HT	High Limit Stat	✓
IH	Immersion Heater	✓
SR	Secondary Return	✓
DR	Drain	✓
PT	P & T Relief Valve	✓

Optional

Code		Key
DP	De-stratification Pump	O
PG	Pressure Gauge	O
AVV	Anti-Vacuum Valve	O
LE	Lifting Eyes	O
TG	Temperature Gauge	O
MH	Inspection Manhole	O

*28mm Primary and Secondary Conns up to 600 Litre, then 1 ½" as standard for 600L and above.

** Heights indicate standard centre heights from ground for each of the connections, bespoke heights available upon request.

*** CAD Sketches available from the website: https://www.mcdonaldwaterstorage.com/hot-water-cylinders-cad-files

13.0 Inspection

Regular inspection of the cylinder can indicate maintenance requirements, for instance deposits of scale, debris or corrosive products on the heater will indicate the need for prompt treatment. Ensure to isolate the cylinder and drain the shell before attempting to remove bolts or equipment.

If a manhole or end cover is fitted, important information can be obtained by removing this. Double tube heaters and coils are not normally withdrawn for cleaning but treated whilst within the cylinder.

14.0 Annual Maintenance

In the case of an unvented model, the cylinder should be serviced at least once a year by a competent operative. However, please note, unvented hot water storage systems over 500 litres capacity will generally be bespoke designs for specific projects and as such standard unvented servicing is not applicable. Where this is the case, the unvented hot water storage system should be designed to the safety requirements and serviced by an appropriately qualified engineer.

Failure to maintain this system in accordance with these instructions will invalidate the manufacturer's warranty. A maintenance record should be kept on file or with the cylinder, and we would recommend a service programme is arranged on installation.

15.0 Annual Service Checks

Expansion Relief Valve – manually open either by the lever or twist cap and check that the water is discharged and runs clearly through the Tundish and out at the final discharge point. Ensure that the valve reseats/re-seals itself.

Pressure & Temperature Relief Valve - repeat the above procedure. Ensure that the valve re-seats/re-seals itself.

Strainer (if applicable) - any strainer should be checked in areas where there may be a high level of solids in the water supply. Turn off mains at stopcock. There will be a small amount of residual water in the pipework, remove the cartridge from Pressure Reducing Valve, clean Strainer and replace.

Expansion Vessel - Check Pressure via the valve under the black cap on top of the vessel, while a hot tap is running. Ensure pressure is as per product specification. Vessel can be re-charged if required by closing the mains stopcock and open a hot outlet. Connect a pump with gauge to the air inlet on top of the vessel and charge to the same as the Pressure Reducing Valve.

Discharge from either of the relief valves indicates a malfunction in the system and must be investigated immediately.

Overheated Hot Water Discharge - In the unlikely event of overheated (90°C) water being discharged, the heat source i.e. the immersion heaters or the heating boiler should be switched off immediately and a competent operative called out. Ensure that the discharge of hot water or steam at the Tundish or final discharge point causes no danger and is not likely to injure anyone.

- **DO NOT SHUT OFF THE COLD WATER SUPPLY TO THE UNIT**
- **DO NOT RE-USE UNTIL CHECKED AND REPAIRED**
- **ENSURE COMPONENTS ARE ISOLATED FROM ELECTRICITY BEFORE INVESTIGATION**

Once cold water has entered the unit and displaced the over heated water thus cooling it, check the thermostat and energy cut out in the

a) Immersion Heater
b) Thermostat
c) Boiler

Identify the faulty component and replace with the correct component as supplied by the manufacturer and ensure that it works before re-commissioning the system.

If water is occasionally being discharged as the water is heated, this would be likely to indicate that the Expansion Vessel needs recharged. In the event of it occurring, switch off all power supplies to the cylinder, re-charge the expansion vessel.

If water is continually being discharged, firstly check with a gauge that the pressure allowed through the Pressure Reducing Valve does not exceed the setting as per product specification. If it does exceed, remove the filter and thoroughly clean. If this does not solve the problem, a replacement should be ordered. Next, check the charge in the expansion vessel and recharge if required. If the pressure is okay, check which valve is discharging and replace.

16.0 General Notes

It is recommended that a set of gaskets be carried for use when the unit is stripped down for insurance inspection, or cleaning.

Maintenance of the pump and other ancillary equipment should be carried out in accordance with the instructions supplied for these items by their respective manufacturers.

Check the thermostats every 12 months to ensure they are controlling the temperature in the cylinder correctly.

McDonald Water Storage

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hot water association
CHARTER MEMBER

The HWA Charter Statement requires that all members adhere to the following:

- To supply fit for purpose products clearly and honestly described
- To supply products that meet or exceed appropriate standards and building and water regulations
- To provide pre and post technical support
- To provide clear and concise warranty details to customers