Solar Thermal

LSP20+
LSPH20+
LSP400

Installation planning guide.

Lochinvar®

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	Document Control			
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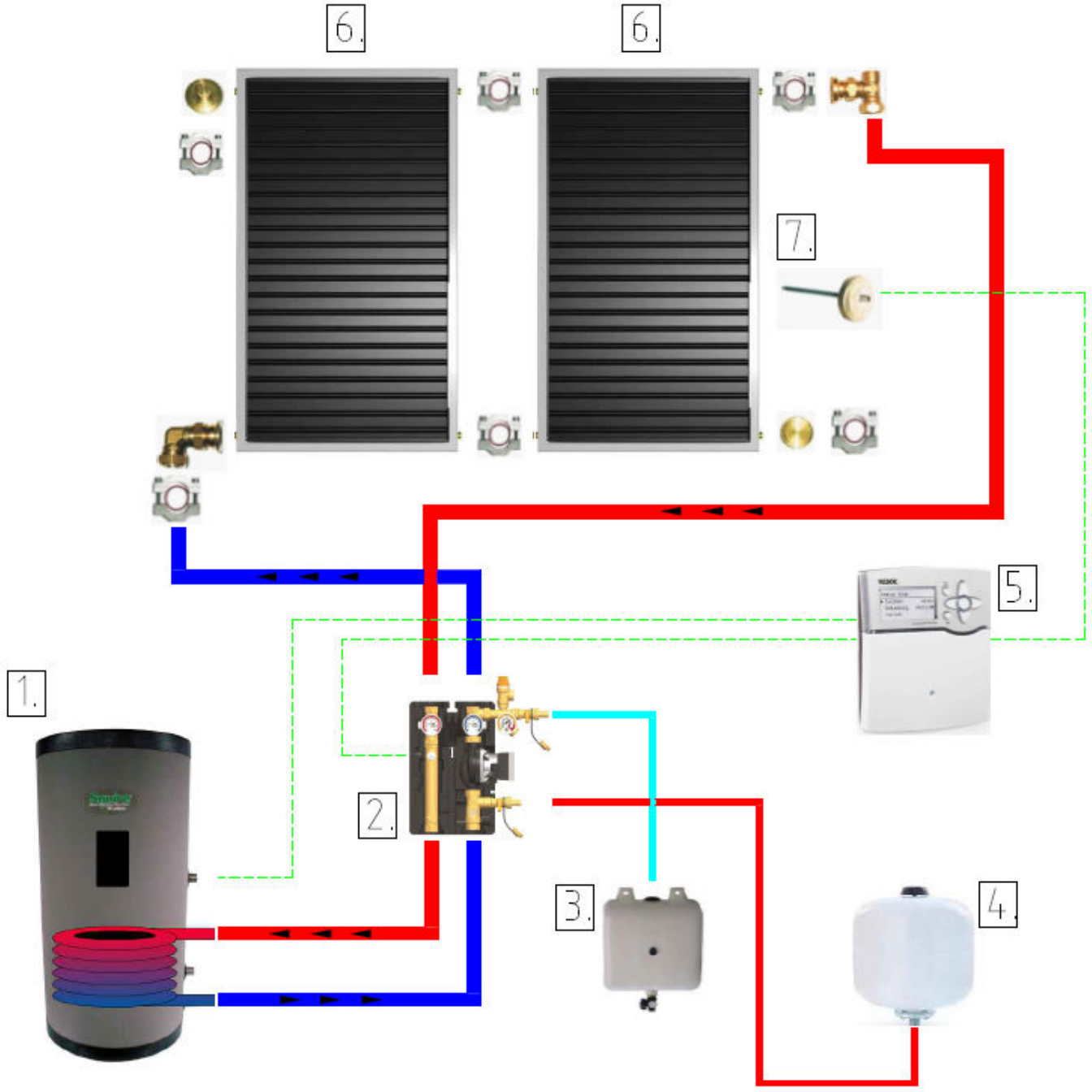
Introduction

This document includes all the basic information required for the Design team and whilst it provides detailed information it should be read in conjunction with the appliance installation manual available at www.lochinvar.ltd.uk.

Installers, this document is not intended to be an install manual before installing please read and understand the installation manual supplied with the collectors and ancillaries.

Lochinvar Solar thermal packages provide everything required except pipework and fittings, including:

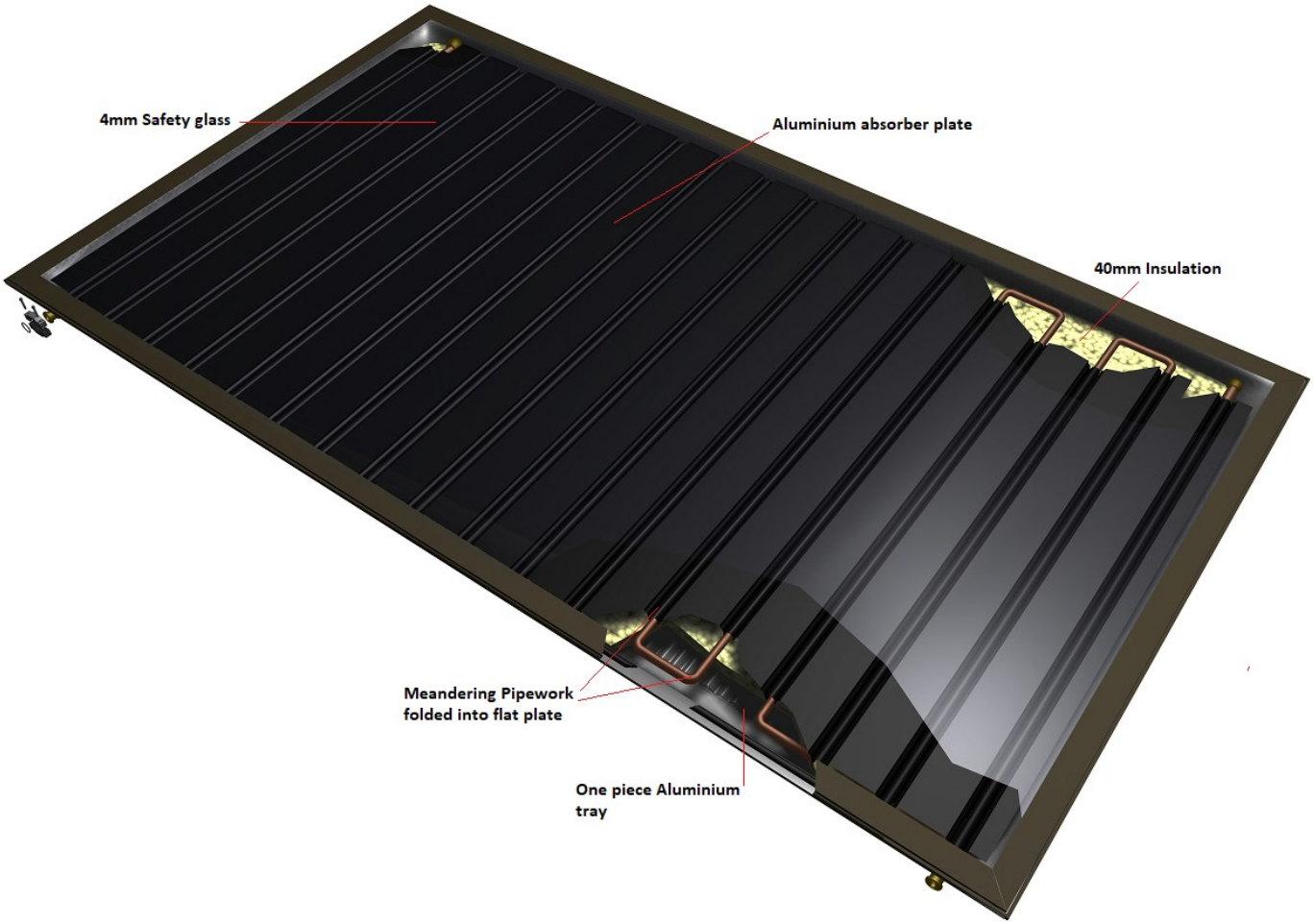
1. Solar storage vessel, single coil or twin coil
2. Solar pump station
3. Solar safety valve and collection vessel
4. Solar expansion vessel
5. Solar controller
6. Solar thermal collector with connectors and frames
7. Solar sensor



Standard features

All three Lochinvar flat plate collectors have the following standard features:

1. Toughened solar glass.
2. One piece Al/Mg tray and frame.
3. Insulation behind the plate (LSP400 model uses the vacuum for insulation).
4. Absorber with highly selective coating for low loss light-heat conversion and quick transfer of heat to the pipework behind.
5. Meandering pipework folded into the flat plate, with no welding or brazing there is no fail point. This system also increases the efficiency of the heat transfer from the plate to the pipework.
6. Quick connection clamps for easy pipework connection.



Versions available

LSP20+, this is our standard vertical flat plate collector. It can be installed in a single bank of up to ten collectors.

LSPH20+, this is a Horizontal version of our standard flat plate collector. It can be installed in a single bank of up to five collectors.

LSP400, this is our vacuum flat plate collector. As it is a flat plate vacuum collector it can be used for specialist applications such as:

- Close to the sea.
- In areas with high pollution in the air.
- When collectors need to be laid at a very low angle i.e., almost flat.
- When higher temperatures are required.
- In extreme weather areas, such as very cold or sandy areas.

Sizing

Sizing a solar thermal system is dependant on many factors including:

What solar fraction is required? - this is the amount of energy as a percentage the solar thermal needs to supply to the DHW system or pool over a 12-month period, typically this is around 20% but would rarely be above 40%.

Roof space available- how much space is available to fit the solar thermal on to

Type of building and DHW usage- a building with high energy use can accommodate a larger solar input than a building with a small hot water load.

Plant room space- there may be restrictions to the size of the solar thermal vessel that would restrict the number of collectors that can be fitted.

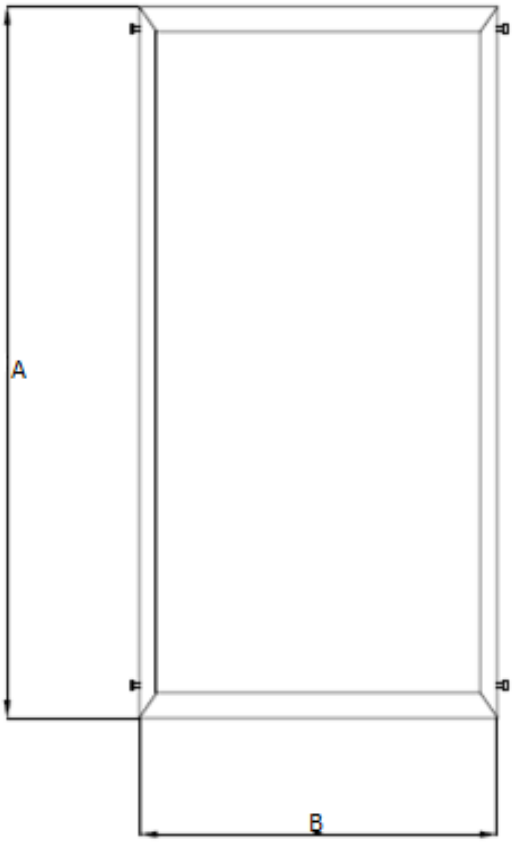
Each project should be assessed individually to design a system that is large enough to provide a useful energy input but not too large as to create overheating problems in sunnier months. Lochinvar can help with sizing your system and use the independent sizing software TSol, please contact your local area sales manager for further assistance.

Technical details

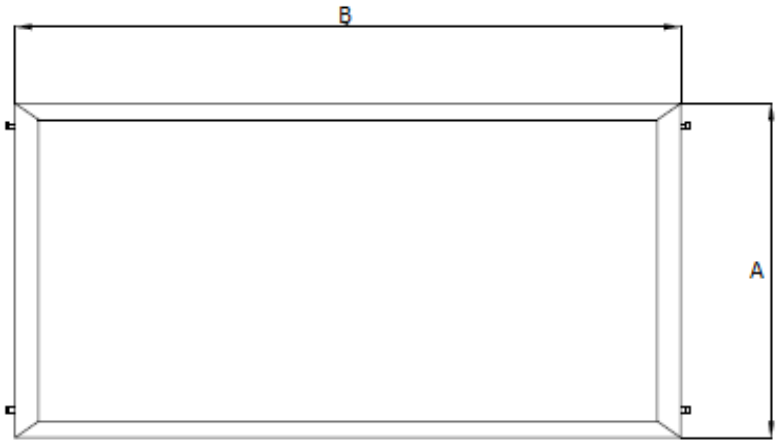
Collector Identification Reference		LSP20+ Vertical	LSP20+ Horizontal	LSP400
Efficiency no (Aperture)	%	81.49	80.63	79.33
a1a with wind, in relation to aperture	W/(m2K)	3.638	3.729	3.246
a2a with wind, in relation to aperture	W/(m2K2)	0.010	0.013	0.007
Gross surface area	m2	2.03	2.03	2.03
Aperture area	m2	1.78	1.78	1.85
Collector contents	litres	1.57	1.50	1.57
Weight (empty)	Kg	36.1	36.5	45.3
Max. working pressure	bar	6	6	6
Max. stagnation temperature	°C	196	189	224
Min / max inclination	°	15/90	15/90	5/90
4mm Safety solar glass		yes	yes	yes
Collector material		Copper	Copper	Copper
Test and approvals EN 12975, Solar Keymark ISO 9001		yes	yes	yes
Maximum Number of Panels per bank		10	5	10
Dimension A	mm	2009	1009	2009
Dimension B	mm	1009	2009	1009

Table 2 Technical data table

Dimensions



LSP20+ and LSP400



LSPH20+

Table 3 Dimensions

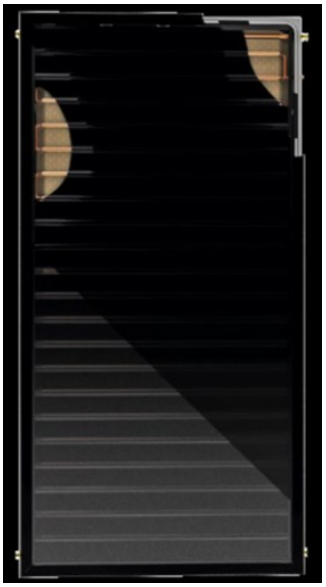
Planning

Choosing the correct solar thermal collector

The type of collector chosen will depend on many factors, Lochinvar have three types available all with different features:

LSP20+

This is our standard vertical flat plate collector, and the most popular. It is a versatile collector and can be fitted at any angle between 15° and 90°. It can be fitted on sloping roofs, flat roofs or vertically on a wall. The stagnation temperature is low allowing the collector to be fitted on projects where there may be extended periods without any hot water demand such as schools.



LSP20+

LSPH20+

LSP400

LSPH20+

This is our standard horizontal flat plate collector and is generally used where a lower profile is required on the roof. It is a versatile collector and can be fitted at any angle between 15° and 90°. It can be fitted on sloping roofs, flat roofs or vertically on a wall. The stagnation temperature is low allowing the collector to be fitted on projects where there may be extended periods without any hot water demand such as schools.

LSP400

The LSP400 collector is our vacuum flat plate model, it is a specialist collector for use in areas where the LSP20+ would not be suitable, such as sloping roofs with a low pitch, the unit can be laid as low as 5° with Lochinvar approval Or in highly contaminated areas such as near the sea or in heavily polluted industrial areas. Due to the vacuum the collector flat plate would not be corroded by a saltwater environment or industrial pollution. Due the vacuum heat loss is also much lower and depending upon the vacuum given to the collector it can also be used on projects that require higher operating temperatures.

Collector banks and arrays

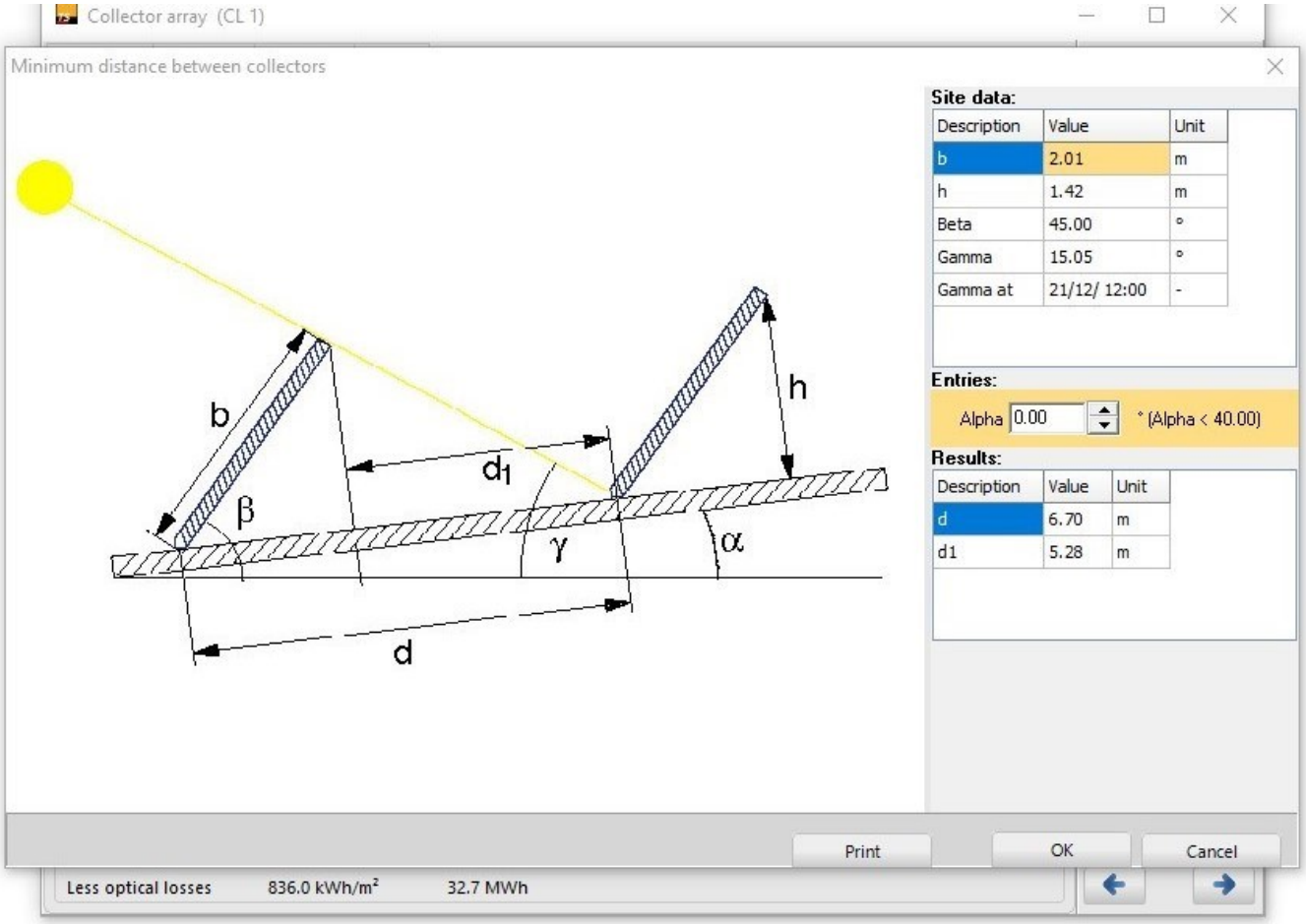
Generally, the collectors will be installed in banks, the maximum number of collectors that can be fitted within a single bank is:

- LSP20+ Ten
- LSPH20+ Five
- LSP400 Ten

Fitting the collectors in banks larger than this will result in unsatisfactory performance as the pressure drop across the bank will be too high.

There is no restriction in the maximum number of banks that can be fitted in a single project.

There must be space between each bank to allow for future maintenance and allow space for the pipework to be installed and inspected, generally this will require 1000mm side to side and top to bottom. When using A frames, it is important to allow enough space between each bank when one is sited behind another to prevent shading from the bank in front. As can be seen from the calculation below when using 45° A frames on a south facing roof the ideal spacing is over 5000mm to prevent shading in winter.



Choosing the correct frame type

Regardless of collector type chosen there are generally 2 types of frames available:

On roof frame is used for any type of sloping roof and is a lightweight aluminium frame designed to be fitted directly to the roof, the actual roof fixings used will depend on the roof type. For example, metal standing seam roofs will require specialist fixings supplied by the roof manufacturer. This frame type can also be used to fix the solar collectors to a vertical wall.

If the slope of the roof is low this can affect the efficiency of the collector, upstands are available to increase the angle of the solar collector compared to the roof.

Metal roof with upstand

On roof frame vertical wall fixing

A frame, which is used on flat roofs to give the collector a better angle. Three versions are available 30°,45° and 60°.

Roof fixing

It is important at an early stage to decide how the collectors will be fastened to the roof, architects and a structural engineer will need to be involved to ensure the roof can take the stresses imposed on it by the collector array. Often ballast is seen as an easier option, but the actual amount of ballast required can be as high as 450kg per collector! A structural engineer will be required to calculate the ballast required and to ensure the roof can accommodate this additional weight.

Pipework Sizing and construction

The solar flow and return pipe must only use one of the following types of pipework:

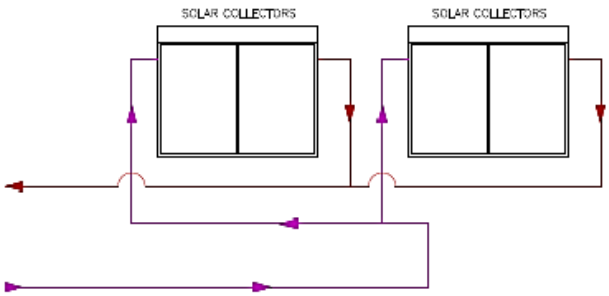
- Copper pipe using solar rated press fit fittings.
- Copper pipe using brazed fittings.
- Copper pipe using mechanical fittings, extra care needs to be used when using these systems as the constant expansion and contraction can easily create leaks after a relatively short period of time if not correctly fitted.
- Screwed galvanised pipework.

Copper pipework using solder fittings must not be used under any circumstances.
There are available specialist solar pipe systems which are semi flexible and pre-insulated, Lochinvar does not recommend the use of such systems due to their high pressure drop.

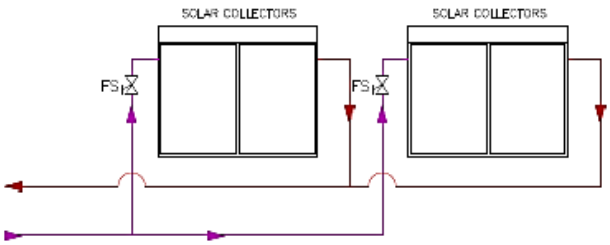
All pipework should be insulated with at least 100mm, and any areas external to the building must also be rodent and bird proof to prevent the insulation being damaged.

Pipework should be sized based on a flow rate of 1litre/min per collector.

Interconnecting pipework must be installed using a reverse return arrangement, and if the bank sizes are not all the same size flow setters must be used on each bank.



EQUAL PANELS IN BANKS. THE BANKS BALANCED USING THE TICHELMANN PRINCIPLE



UNEQUAL PANELS IN BANKS. THE FLOW SETTERS ARE USED TO BALANCE THE BANKS.

Solar vessel sizing

The solar system storage vessel can be either a pre-heat, twin coil or HSV thermal store. Regardless of type however they must all be sized the same way to ensure the maximum efficiency is achieved by the solar system. When sizing the solar storage system there are two factors to consider:

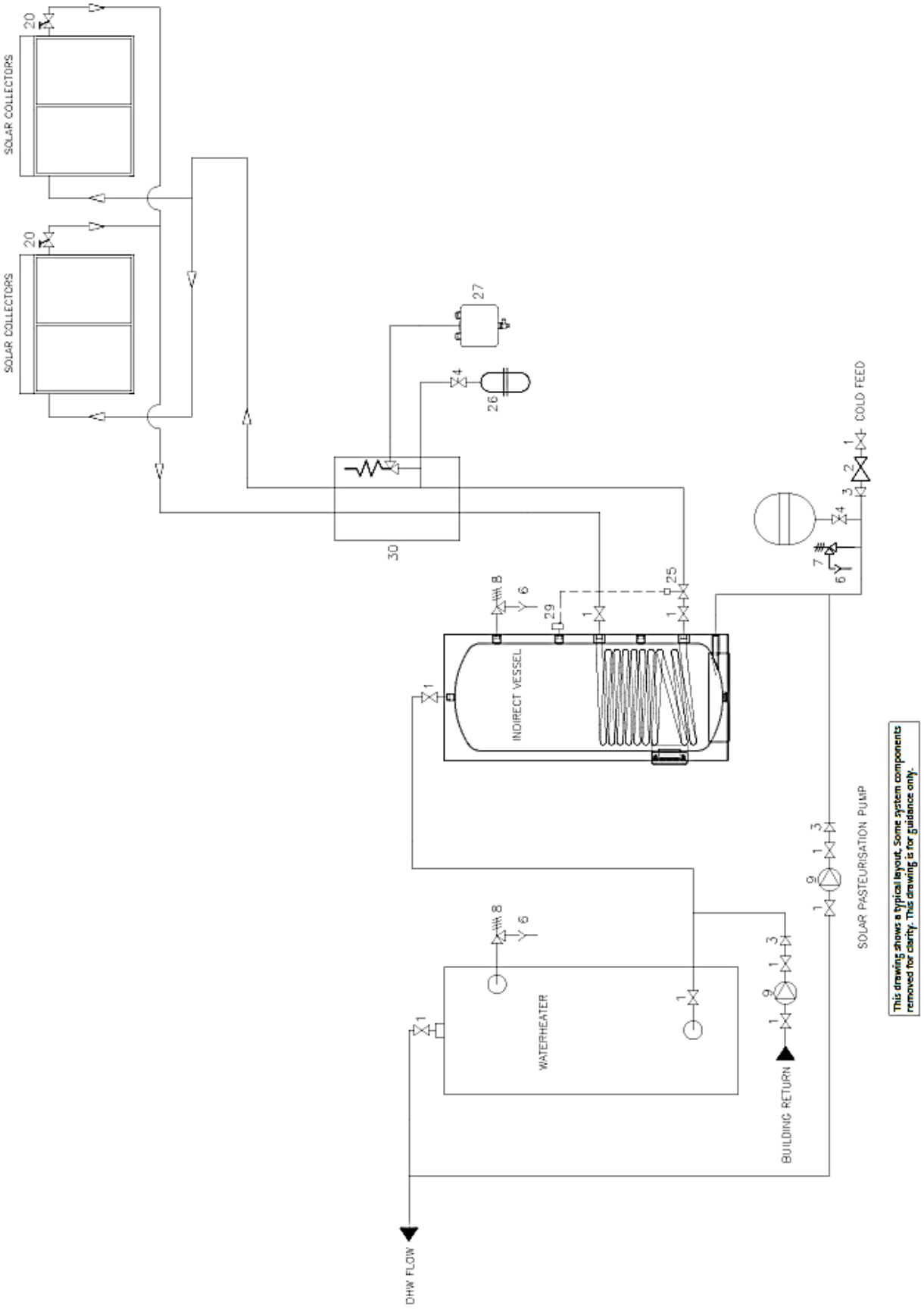
1. Amount of solar storage volume available
    a. This should be calculated on a minimum of 50 litres per collector in the array.
2. The size of the vessel coil
    a. This should be sized on 0.36m2 per collector in the array.

Sizing example, pre heat.
A solar array of 10no LSP20+ collectors require a solar storage volume of 10 x 50 =500Litres and a coil of 10 x 0.36 =3.6m2. The coil size is very important and often vessels will not have a large enough coil fitted so specialist solar vessels should be used.

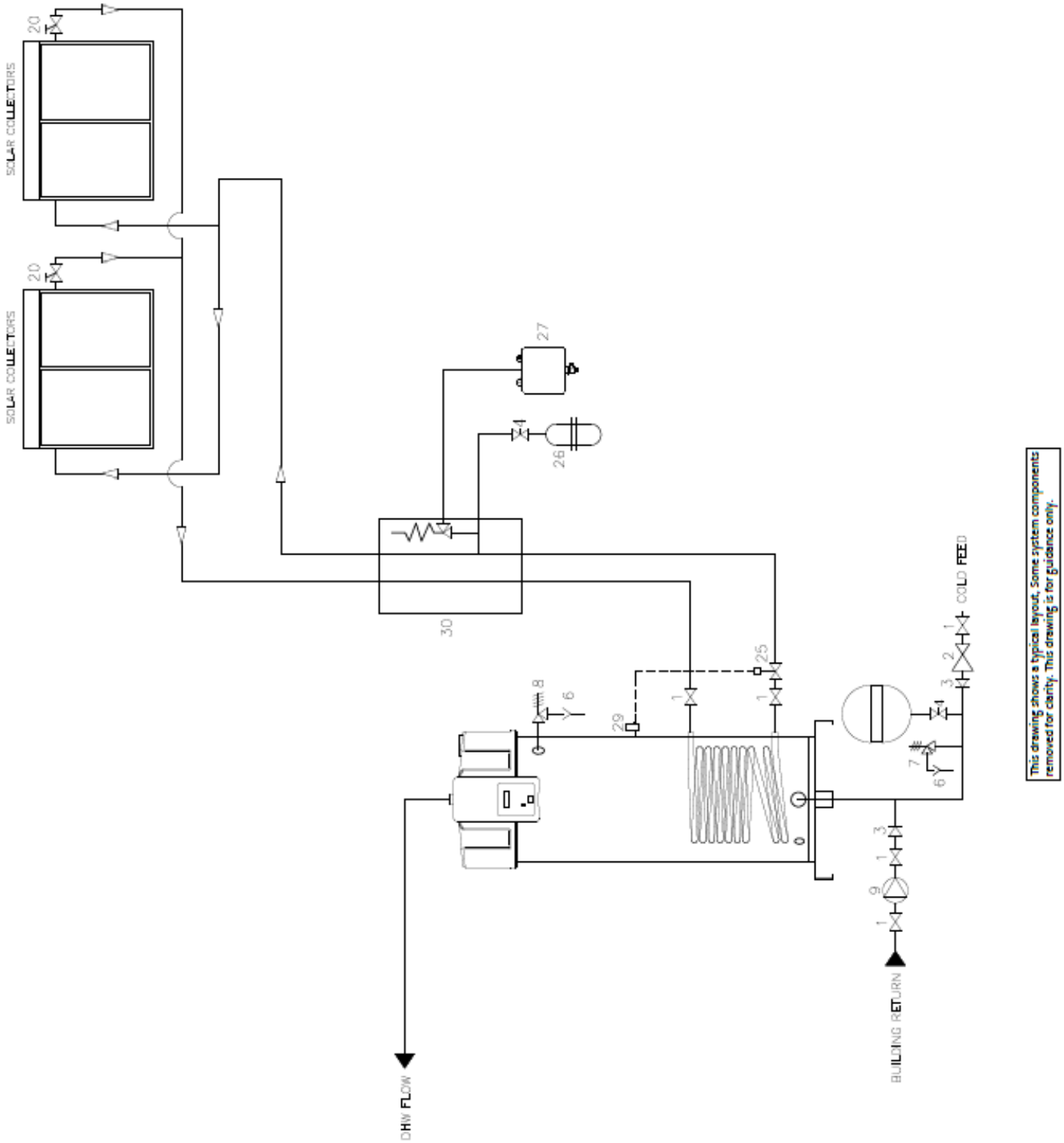
Sizing example 2, twin coil.
A solar array of 10no LSP20+ collectors require a solar storage volume of 10 x 50 =500Litres and a coil of 10 x 0.36 =3.6m2. In this case whilst the storage size for the solar is still 500litres a twin coil vessel of at least 1000 litres will be required as the top half of the vessel will be kept hot by a boiler and so will not be available for solar storage.

Standard installation schematics

This section contains various standard schematics showing the concept installation options for Solar thermal. These drawings must not be used for detailed design but can be built upon by the design team to produce their own installations drawings.



Drawing 9 Standard solar pre-heat system



Drawing 10 Solar with EcoCharger Hybrid gas fired water heater

Installation assistance

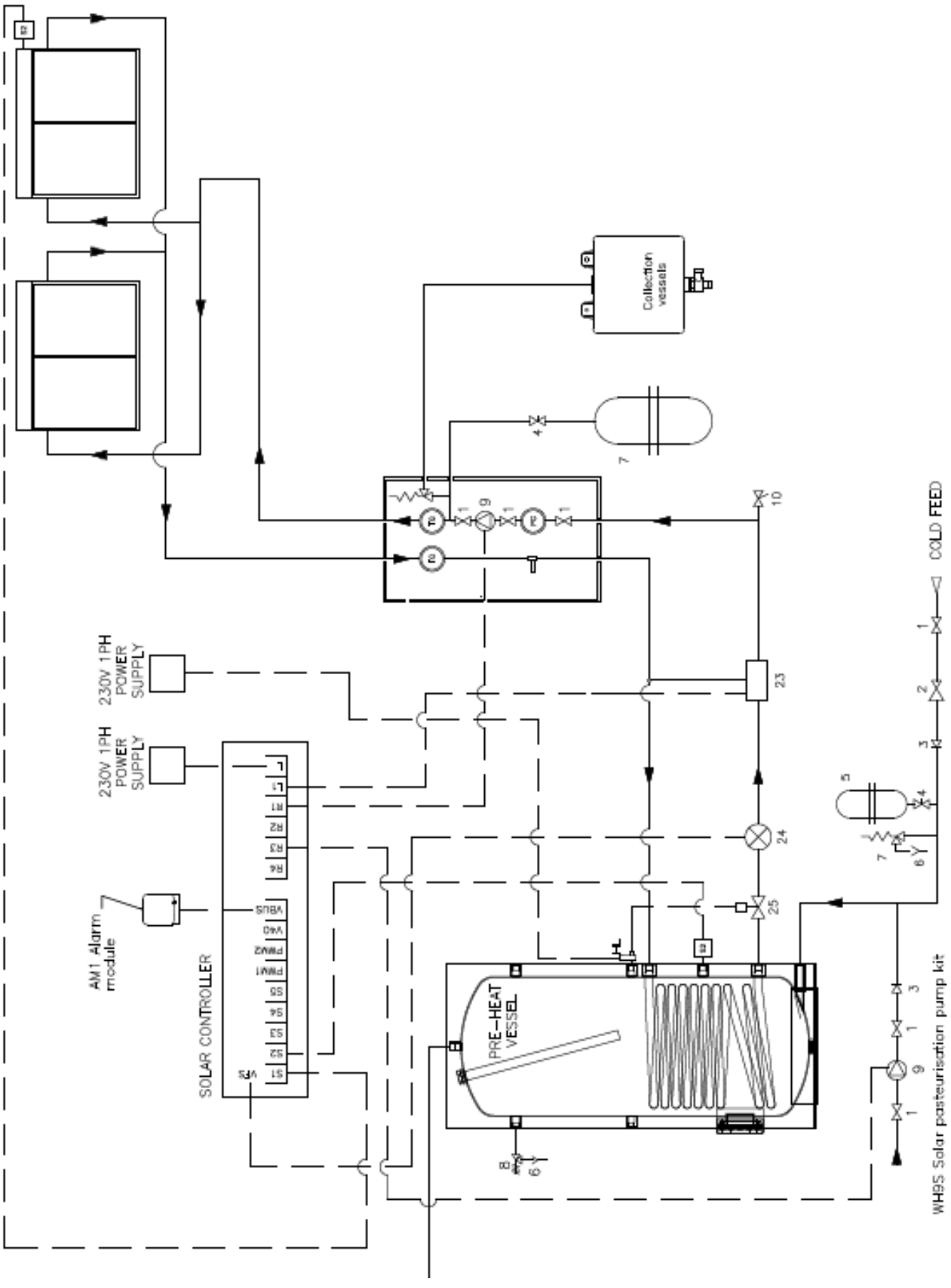
Included in the cost of every Solar thermal pack is the use of the Lochinvar Project Engineer. This helps ensure the units are installed correctly and the end user has the assurance the unit has been commissioned by the manufacturer. After orders are placed a Project Engineer will contact the installer and offer:

1. Initial pre-start visit to ensure the installer has all the required information to install the units and has the Project Engineer contact details for telephone and email support during the construction phase.
    a. This visit covers flow rates, Location of equipment, wiring/controls, integration with other equipment and any other questions the installers may have.
2. A second visit during installation to make sure everything is OK.
    a. This visit will review the progress and check everything is going ok, answer any further questions relating to the install – at this stage it is also good to meet the controls/BMS team.
3. A pre-commissioning visit to ensure all installation work is complete prior to the Lochinvar commissioning engineer visit.
    a. On this visit we will complete the pre-com sheet ensure all works are complete and plan in a commissioning date.
4. If commissioning is chosen, we will fill and commission the system providing a full report on completion.

Electrical Connections

All components require a separate 230v supply, see individual components technical documents for further information.

The drawing below shows a typical electrical scheme for a solar pre-heat system.



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