

EcoOnline PoolMaster_{pro}TM

14 Tube PVCn Strip Collector

Solar Pool Heating System

Installation and User Manual - Revised 5/10/2022




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1 Key Terms

This manual was written to follow guidelines and recommendations given in:

- AS 3634 - 1989 Solar heating systems for swimming pools
- 'HAZPAK' produced by the work-cover authority
- AS 3000 (2007) Sections 6.3, 6.4 & 6.5

Please take the time to read this manual before starting any work. Particular attention should be given to text contained in the following key terms.

Please note EcoOnline has a strong product safety policy; do not install products without reading safety guidelines in the manual. Please report any product safety issues or near misses to info@EcoOnline.com.au no matter how trivial.

 DANGER	Indicates a SAFETY issue that is likely to cause injury or death if the user does not follow the instructions.
 WARNING	Indicates a SAFETY issue that may cause injury or death if the user does not follow the instructions.
 CAUTION	Indicates an issue that may cause system component damage if the user does not follow the instructions.
 Read Carefully	Refers to critically important information related to the correct functioning of the system.
 Tip	Refers to useful information for the optimal operation of the system
Why? <i>Italic text is optional reading. Gives extra information and reasoning for recommendations that are non-obvious and/or counter intuitive.</i>	

2 Pre-Installation Suitability and Safety Checklist

The following outlines mandatory suitability and safety requirements for installing this solar heating system. Please read carefully, if any of the following requirements cannot be met the system should NOT be purchased or installed.



DANGER

Due to the potential of falling from heights, mounting the solar strip collectors on a roof or structure at heights should only be undertaken by a professional installer, unless you are accustomed to and confident of performing the work safely. We strongly recommend the installer invests in **roof safety guard rails and a safety harness system**, especially for DIY applications.



WARNING

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.



CAUTION

Collectors are to be used with **chlorinated (or otherwise sanitized) pool water ONLY**. Do not use collectors to heat **fresh (untreated) water** due to the potential for Legionaries bacteria build up.



CAUTION

Building regulations vary from state to state and **MUST** override any instructions supplied in this manual. It is the responsibility of the purchaser/installer to check that installations comply with any relevant state laws and regulations.

3 Warranties

EcoOnline™ offers the following Warranties

- 15 Year pro-rata Warranty on all strip collectors
- 2 year Warranty on Davey Pool Pumps
- 3 Year Warranty on Dontek and Ascon Controllers

See our Terms and Conditions page for further details: www.EcoOnline.com.au/terms-and-conditions



Read Carefully

Customer please note: **WARRANTY IS VOID** if collectors are installed:

- without a **vacuum release valve** on the return line,
- or a **non-return valve** on the solar pump outlet (with 6mm drain hole in flap),
- or **without a by-pass valve on a grossly oversized pump**,
- or **with water pH less than 7.2**,
- or **without the supplied strainer** (for systems independent of the main filter),
- or if the collectors are installed **below the water level**.

***Why?** Such installations will expose the collectors to debris build up, strong fatiguing positive/negative pressures and/or chemical attack from hot water. These situations will have detrimental effects on the collectors which will limit lifetimes.*

4 Collector Sizing Guide

An interactive collector sizing calculator and pool water temperature simulator can be found on our website at:

www.EcoOnline.com.au/pool-heating-sizing-calculator

www.EcoOnline.com.au/pool-water-temperature-simulator

4.1 A Word on Transparent Bubble Pool Covers

EcoOnline recently carried out a full pool heating loading technical study including performance data on **transparent** bubble pool covers. We found that while **transparent** pool covers produce a moderate heating effect by themselves, they produced a much larger pool temperature boost when used in conjunction with a solar pool heater due to synergistic effects. So much so that if you're running a solar pool heater and not using a pool cover you are missing out on surprisingly large temperature gains - see link below for the summaries:

www.EcoOnline.com.au/how-warm-can-a-pool-get-with-a-solar-heater-and-cover

So if you've used a pool cover before and had disappointing results, we highly recommend you try using a cover again after you install our solar pool heating system.



Read Carefully

Only highly transparent **clear and light blue** solar blankets increase water temperatures; **silver backed or non-transparent** solar blankets reject sunlight and **will substantially cool your pool** - this is irrespective of whether or not the silver side faces up or down. Non-transparent blankets are okay to use for 100% shaded pools only.

5 Pool Chemistry Compatibility Guide



CAUTION

This system is **not compatible with acidic pool/spa water (pH less than 7.2)**. Sodium Carbonate must be added to protect the system from acidic pH (<7). pH should be maintained between 7.2-7.8 for maximum system longevity.

Why? Acidic water with pH less than 7.0 has excess free H+ ions which like to bond to and hence break apart polymer carbon and silicon bonds.

6 Pump Sizing Guide

6.1 A Word on Pump Sizing Choice

The quick reference tables below outline Australian Standard pump sizing recommendations.

There is a range of pump powers one can choose from. If **thermal** system efficiency is important then choose a pump at the high end to produce a high flow rate; take care not to over-pressurize your system (see **Optimizing Collector Pressure** below). If **electrical** efficiency (COP factor) is important to you then choose a pump near the lowest power range. To help you understand the potential savings from such choices we have created an interactive pump sizing simulator which can be found on our website at:

www.econline.com.au/sizing-calculators/poolmasterpro-strip-pool-heating-pump-sizing

However, if you go with a lower power pump you'll need the following:

- A slightly larger collector area; the pump sizing calculator will let you know by how much.
- You will need to check with the pump manufacture that your chosen pump can still prime reliably at your pump height.
- We highly recommend you use a by-pass line to help your pump to prime reliably, see **Installing a By-Pass Tube or By-Pass Ball Valve** below.
- Lastly you may need to run your main filter pump in the afternoon to help mix the warm water if your pool volume turnover falls below the 50% - 75% range.

6.2 Quick Reference Solar Pump Sizing for Independent Systems

The two tables below will give you the minimum and maximum Australian Standard pump power recommendations for **independent type systems in input watts (not output watts)**, these specs should be marked on the pump.

Minimum Recommended Pump Power is Limited by Water Turn-Over Requirements			
Pool Water Volume	Minimum Recommended Flow	For 1 st Story Install (3m): Minimum Input Watts Required	For 2 nd Story Install (6m): Minimum Input Watts Required
20,000 L	50 L/min	270 Watts (0.36 HP)	350 Watts (0.47 HP)
25,000 L	63 L/min	290 Watts (0.39 HP)	370 Watts (0.50 HP)
30,000 L	75 L/min	320 Watts (0.42 HP)	400 Watts (0.53 HP)
35,000 L	88 L/min	340 Watts (0.46 HP)	420 Watts (0.56 HP)
40,000 L	100 L/min	370 Watts (0.49 HP)	450 Watts (0.60 HP)
45,000 L	113 L/min	390 Watts (0.52 HP)	470 Watts (0.63 HP)
50,000 L	125 L/min	420 Watts (0.56 HP)	500 Watts (0.67 HP)
55,000 L	138 L/min	450 Watts (0.60 HP)	530 Watts (0.71 HP)

60,000 L	150 L/min	470 Watts (0.64 HP)	560 Watts (0.75 HP)
65,000 L	163 L/min	500 Watts (0.68 HP)	590 Watts (0.79 HP)
70,000 L	175 L/min	530 Watts (0.72 HP)	620 Watts (0.83 HP)
75,000 L	188 L/min	570 Watts (0.76 HP)	660 Watts (0.88 HP)
80,000 L	200 L/min	600 Watts (0.80 HP)	690 Watts (0.93 HP)

If you don't know your pools water volume you can look it up from the table supplied below based on the total water area and average depth:

Pool Water area vs Average Depth Conversion Table									
Waters Area	Average depth								
	1.3 m	1.4 m	1.45 m	1.5 m	1.55 m	1.6 m	1.65 m	1.7 m	1.8 m
10 m ²	13000 L	14000 L	14500 L	15000 L	15500 L	16000 L	16500 L	17000 L	18000 L
15 m ²	19500 L	21000 L	21750 L	22500 L	23250 L	24000 L	24750 L	25500 L	27000 L
20 m ²	26000 L	28000 L	29000 L	30000 L	31000 L	32000 L	33000 L	34000 L	36000 L
25 m ²	32500 L	35000 L	36250 L	37500 L	38750 L	40000 L	41250 L	42500 L	45000 L
30 m ²	39000 L	42000 L	43500 L	45000 L	46500 L	48000 L	49500 L	51000 L	54000 L
35 m ²	45500 L	49000 L	50750 L	52500 L	54250 L	56000 L	57750 L	59500 L	63000 L
40 m ²	52000 L	56000 L	58000 L	60000 L	62000 L	64000 L	66000 L	68000 L	72000 L
45 m ²	58500 L	63000 L	65250 L	67500 L	69750 L	72000 L	74250 L	76500 L	81000 L
50 m ²	65000 L	70000 L	72500 L	75000 L	77500 L	80000 L	82500 L	85000 L	90000 L
55 m ²	71500 L	77000 L	79750 L	82500 L	85250 L	88000 L	90750 L	93500 L	99000 L

Maximum Recommended Pump Power is Limited by Collector Pressure			
Collectors Gross Area	Maximum Recommended Flow	For 1 st Story Install (3m): Maximum Input Watts	For 2 nd Story Install (6m): Maximum Input Watts
13 m ²	67 L/min	340 Watts (0.47 HP)	450 Watts (0.61 HP)
17 m ²	83 L/min	380 Watts (0.51 HP)	480 Watts (0.65 HP)
20 m ²	100 L/min	410 Watts (0.55 HP)	520 Watts (0.69 HP)
23 m ²	117 L/min	450 Watts (0.60 HP)	550 Watts (0.74 HP)
27 m ²	133 L/min	490 Watts (0.65 HP)	590 Watts (0.79 HP)
30 m ²	150 L/min	530 Watts (0.70 HP)	630 Watts (0.85 HP)
33 m ²	167 L/min	570 Watts (0.76 HP)	670 Watts (0.90 HP)
37 m ²	183 L/min	610 Watts (0.82 HP)	720 Watts (0.97 HP)
40 m ²	200 L/min	660 Watts (0.88 HP)	770 Watts (1.03 HP)
43 m ²	217 L/min	700 Watts (0.94 HP)	820 Watts (1.10 HP)
47 m ²	233 L/min	750 Watts (1.00 HP)	870 Watts (1.17 HP)
50 m ²	250 L/min	800 Watts (1.08 HP)	930 Watts (1.24 HP)
53 m ²	267 L/min	860 Watts (1.15HP)	980 Watts (1.32 HP)

6.3 Example Pump Sizing

For example, for a large **75,000 Litre** pool and **1st story** roof your minimum Australian Standard pump specs from the first table above are **566 Input Watts**. If you want to install a **40 m² collector** area for this pool for example, your maximum pump specs, from the second table above are **656 Input Watts**. Pumps well below the minimum specs

may not be strong enough to turn over a sufficient volume of water - while oversized pumps are more expensive to run for little extra heat gain and may need a ball valve constriction installed depending on the collector's internal pressure.

6.4 Solar Pump Sizing for Booster Systems



Read Carefully

For booster type systems you should choose a pump at or just below the minimum specs in the table above. **Why?** *The take off point for solar is already pressurized by the filter pump, hence a smaller pump should be used.*

6.5 Filter Pump Sizing for Manual Systems



Read Carefully

For manual type systems running off a main pool filter pump, please check that the filter pump is large enough to accommodate the extra load of supplying water to the collectors at the required pump height + a 1 meter pressure drop across the collector array. **Why?** *Filter pumps are geared for flow, not pump height, solar pumps are geared specifically for roof solar applications.*

7 Solar Line PVC Pipe Sizing Guide

The table below will help you choose the correct size PVC pipe for the solar lines running **to and from your roof**. **On the roof** we generally recommend 40 PVC (DN40) to match the manifolds. Coming down the roof the pipe size can then be adapted to the pipe size you have for your solar line ground run i.e. 40 PVC (DN40) or 50 PVC (DN50).

Recommended PVC Piping Sizing for Solar Pool Heating System Lines


Anticipated Flow Rate	Absolute Minimum	Ideal PVC Pipe Size	Maximum Pipe Size
70 Litres/min	20 PVC (DN20)	25 PVC (DN25)	32 PVC (DN30)
120 Litres/min	25 PVC (DN25)	32 PVC (DN30)	40 PVC (DN40)
200 Litres/min	32 PVC (DN30)	40 PVC (DN40)	50 PVC (DN50)
250 Litres/min	40 PVC (DN40)	50 PVC (DN50)	65 PVC (DN65)
400 Litres/min	50 PVC (DN50)	65 PVC (DN65)	80 PVC (DN80)
880 Litres/min	80 PVC (DN80)	100 PVC (DN100)	125 PVC (DN125)













Read Carefully

If the distance from the pool to the roof collector area is more than 10m we recommend you use the next size up PVC pipe.

8 Collector Array Components






1 × 4m ² Strip Collector Kit (number of kits depends on system purchased)				
				
1 × 25m 14 tube PVC nitrile 165mm strip role	2 × 40 PVC (DN40) PVC Manifold - 500mm x 14 Tube	28 × tube locking collars	1 × silicon tube per 4m ² kit	1 × Pipe clamp + 0.5m band for fixing per 4m ² kit

Other Essential System Components (depending on system purchased)					
					
1 × 40 PVC Vacuum breaker valve	1 × Can of silicon lubricant spray	1 × Drain Down Kit	2 × 28 locking collar for repair kit	1 × 14 joining barb repair kit	1 × In-line pressure gauge

For Manual Systems (depending on purchase)		For Independent Systems (depending on purchase)	
			
1 × 40 PVC (DN40) PVC 3-way Ball valve	1 × 40 PVC (DN40) Spring loaded non-return valve	1 × Dontek Controller	1 × 40 PVC (DN40) PVC strainer

9 Required Components (Not Supplied)

You also require some of the following extra items depending on your system. These are available in any plumbing or hardware store.

				
Appropriate PVC piping	Various PVC plumbing bits	N & P-type PVC cement & primer	Fixing screws for perforated band	Cable ties for fixing thermostat wire



CAUTION

We recommend **AS 1477 compliant PVC piping with PN9 pressure rating or greater** and matching PVC fittings be used for all collector array plumbing.

10 Required Tools

- | | | |
|----------------------------------|------------------------------------|------------------|
| - Battery powered hand drill | - Screwdriver | - Safety glasses |
| - Corking gun (for Silicon glue) | - Hack saw | - Gloves |
| - Personal Sun/UV protection | - Assorted drill bits | - Power Lead |
| - Heat Gun | - Tape measure | - Tin snips |
| - Industrial Ladder | - Needle nose pliers | - Power Lead |
| - Scissors | - Old cloth for silicon over spray | - Hammer |

11 Safety When Working at Heights



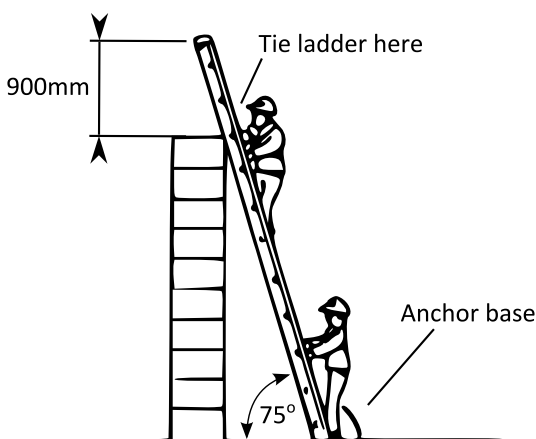
DANGER

WHEN WORKING AT HEIGHTS - SAFETY COMES FIRST. A person can easily fall off a ladder or roof and be seriously injured. For installations on a roof pitch greater than 22° and/or a double story house we strongly recommend a highly competent professional installer install your solar collector array. We strongly recommend the installer invests in **roof safety guard rails and a safety harness system**, especially for DIY applications.

The installer should always take the necessary safety precautions:

- Choose an appropriate day: cool, dry, calm and partly cloudy.
- Plan out your install: make sure you have all required components, tools and have plenty of allocated time.
- Only work at heights when you are well rested and alert.
- Never work alone, always work with at least one other person.
- Always use a safety harness or fall arrest system attached to appropriate roof anchor points.
- Wear clothes that fit well but that do not restrict movement.
- Use proper non-slip shoes.
- Use sunscreen.

11.1 Ladder Safety



The chance of a falling from a ladder should never be underestimated. Use only solid **industrial grade** ladders in good repair that have been checked for faults.

Note: even a small unexpected movement of the ladder, such as a small slip, can cause loss of balance and result in a fall.

The ladder should be placed on solid ground and should ALWAYS be securely anchored at the base and secured at the top to prevent slipping.

12 Choosing a Place to Install the Collector Array

When choosing a location for your collector array you should consider the following in order of importance:

- **Shading** - the collector array should receive no shading between the hours 10am to 4pm.
- **Direction** - collectors should preferably face **north for maximum heat collection**; however the collector array can also face any angle between East to West.
- **Wind** - the collector array should be mounted in a relatively sheltered location as much as possible.
- **Mounting elevation** - this depends on the desired seasonal heat collection. Flatter elevations (< 45°) collect more heat in the summer while installations closer to vertical (> 45°) produce more heat during spring/autumn.



Read Carefully

The collector array can face anywhere from West to East, with an optimal orientation of North for most areas. South facing orientations are generally not recommended, unless the roof pitch is quite flat < 5° for southern states and < 15° for northern states.

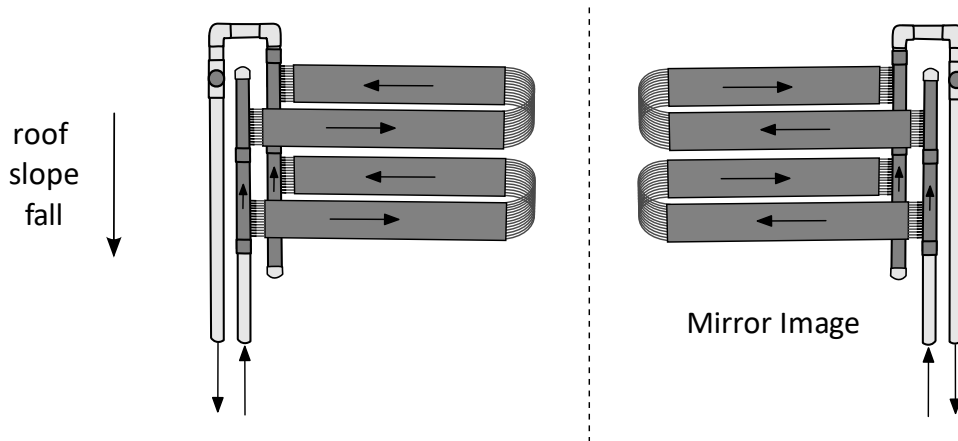
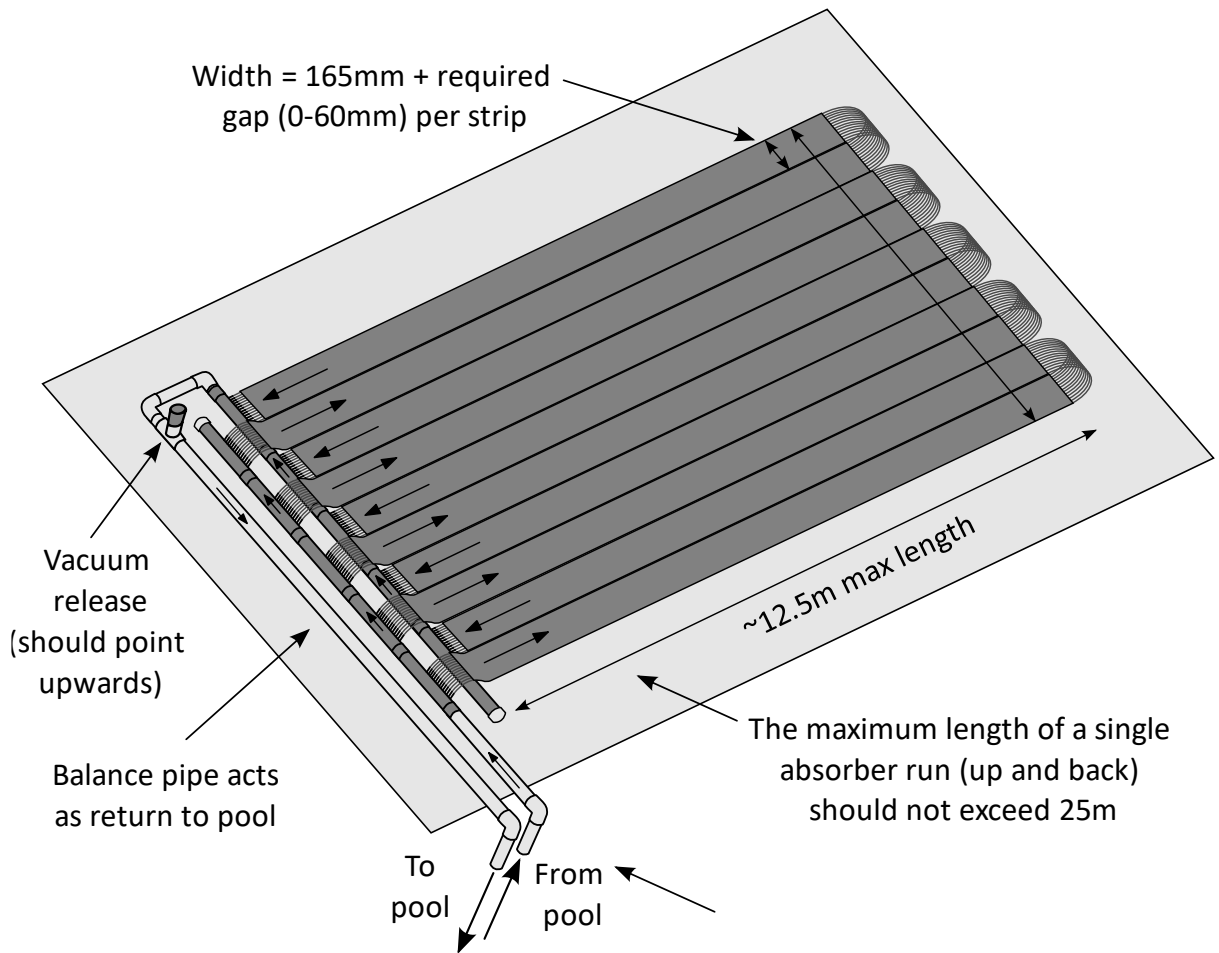
13 Collector Water Flow Configurations



CAUTION

All collector array configurations must be installed with a **vacuum release valve** on the return line and a **non-return valve** on the pump side.

13.1 Bottom Feed Basic (Square, Parallelogram or Trapezoid)

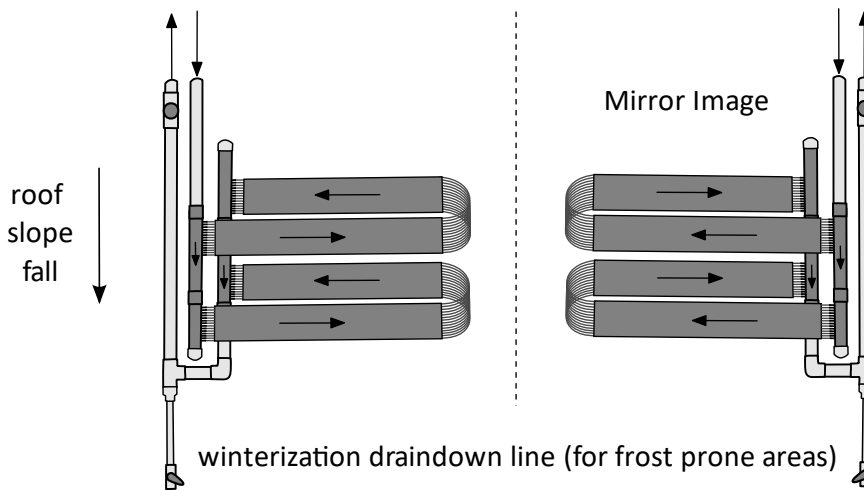
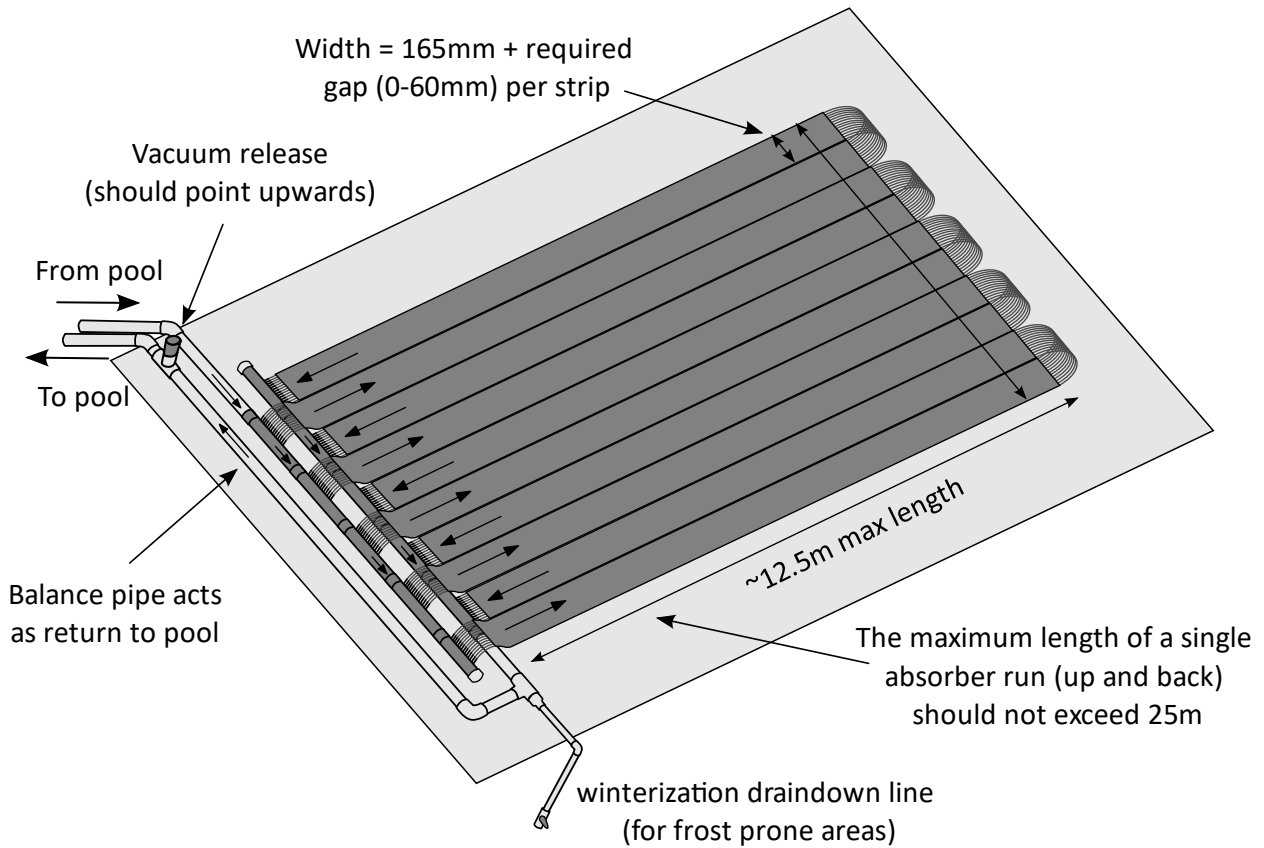


Read Carefully

As a general principle for all configurations, water flow in the manifold supply and return pipe **MUST** always flow in the same direction to achieve balanced water flow in each strip. Either up the roof for bottom feed system or down the roof for top feed systems.

Why? Without the third balance pipe water always takes the shortest path, reducing flow in the higher tube strips.

13.2 Top Feed Basic (Square, Parallelogram or Trapezoid)

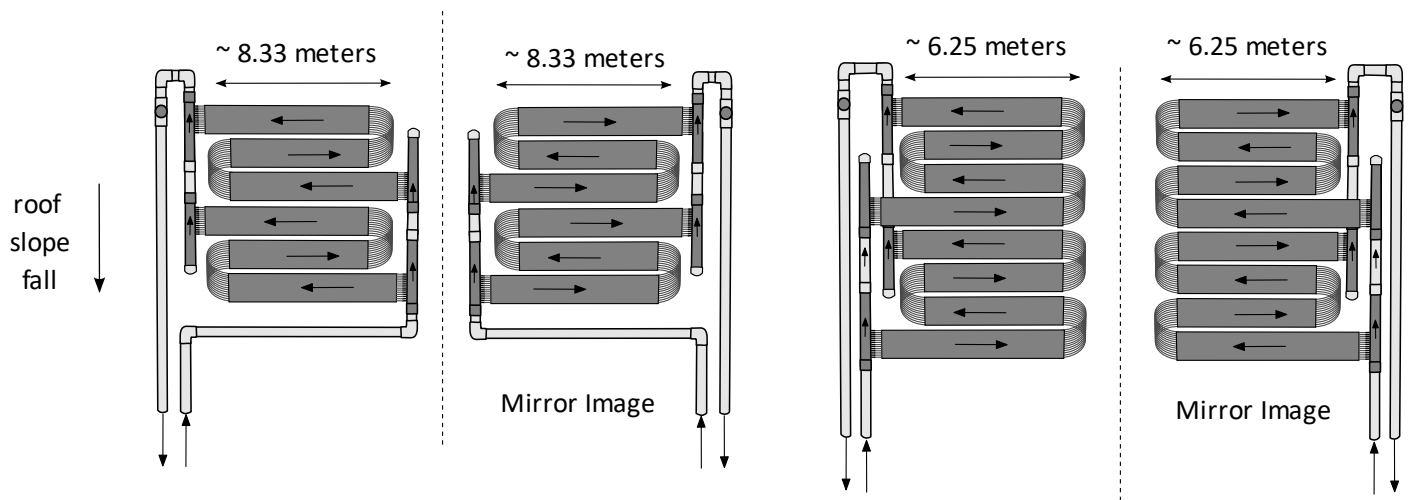


Read Carefully

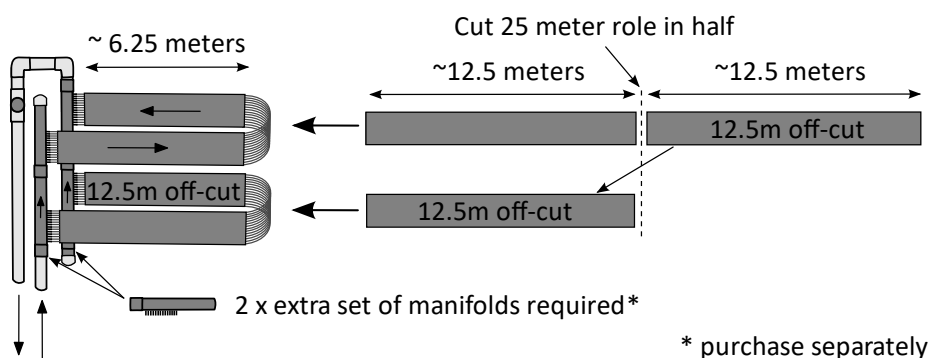
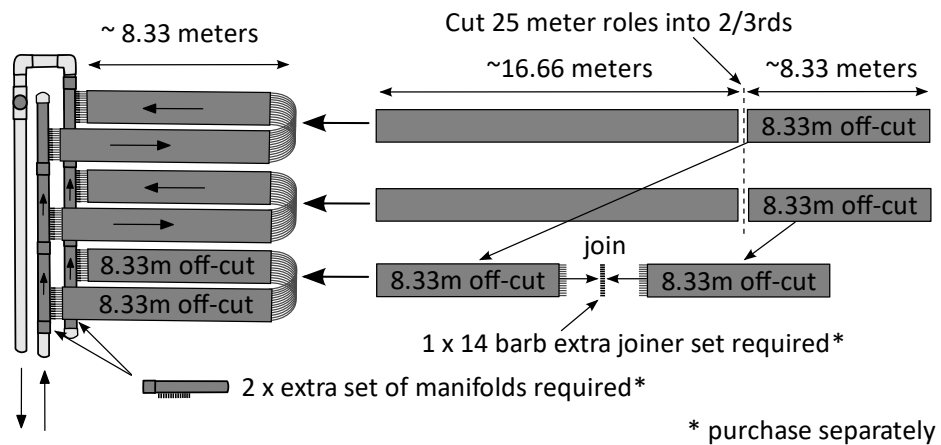
Top feed configurations should operate at lower pressure of 50 kPa max, and are not recommended for areas subject to freezing conditions overnight.

Why? *It is impossible for the water to drain full from a top feed system. Freezing conditions with excess water inside piping can lead to PVC pipes cracking.*

13.3 Narrow Roof Space Multi-Loop Configuration



13.4 Narrow Roof Space Extra Manifolds Configuration



13.5 Other Custom Narrow Roof Space Extra Manifolds Configurations

Up and back loops - manifold on one side array		
Array Length	Manifold Count* (per role)	Array Width** (per role)
8.33 m	3 (1 extra required)	525 mm
6.25 m	4 (2 extra required)	700 mm
5.0 m	5 (3 extra required)	875 mm
4.167 m	6 (4 extra required)	1050 mm
3.571 m	7 (5 extra required)	1225 mm
3.125 m	8 (6 extra required)	1400 mm

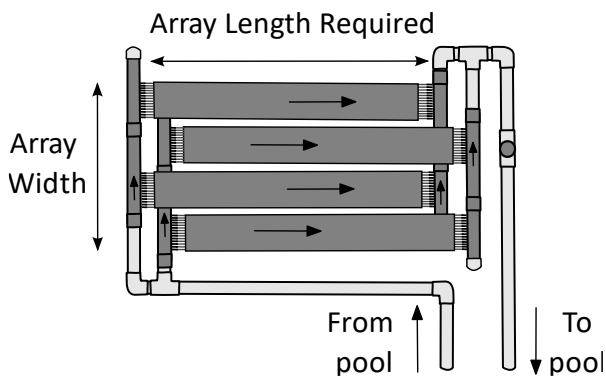


Read Carefully

The extra manifold configuration is recommended over the multi-loop configuration due to the extra flow, however you will need to purchase extra pairs of manifolds and extra joiner sets (if required).

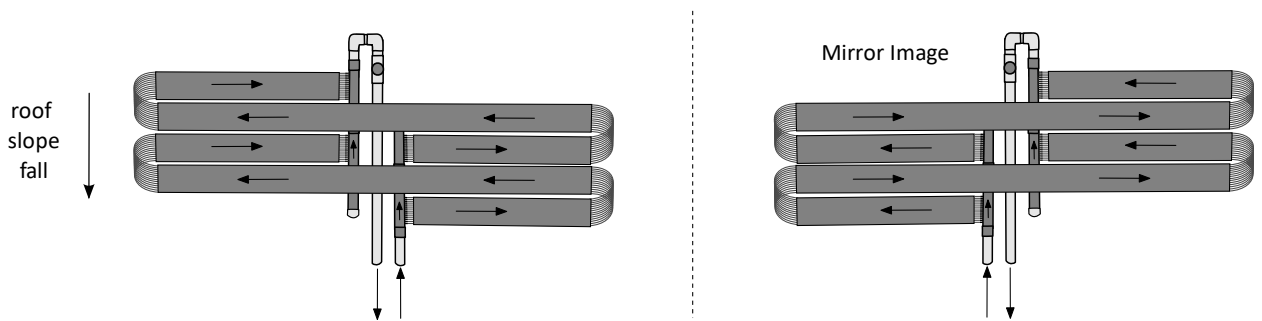
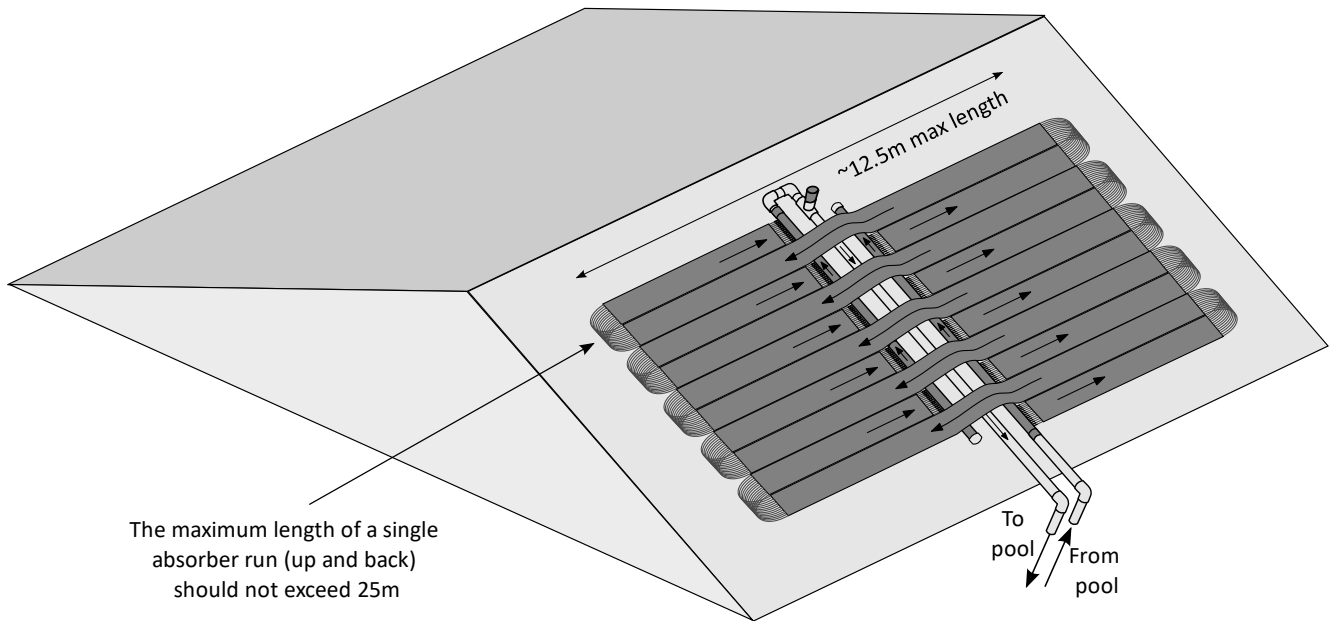
Why? The extra flow from increasing the manifold count improves system efficiency as well as lowering back pressure on the pump and collector tubes.

13.6 Double Manifold High Flow Narrow Roof Space Configuration

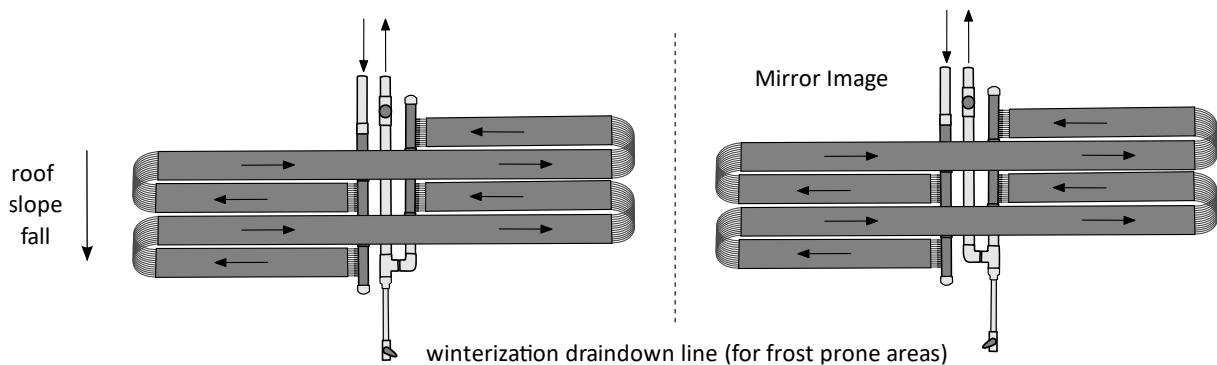


Straight strips runs - manifolds on both sides		
Array Length	Manifold Count* (per role)	Array Width** (per role)
12.5 m	4 (2 extra required)	350 mm
8.33 m	6 (4 extra required)	525 mm
6.25 m	8 (6 extra required)	700 mm
5.0 m	10 (8 extra required)	875 mm
4.167 m	12 (10 extra required)	1050 mm

13.7 Bottom Feed Overlap (Square, Parallelogram or Trapezoid)



13.8 Top Feed Overlap (Square, Parallelogram or Trapezoid Layout)

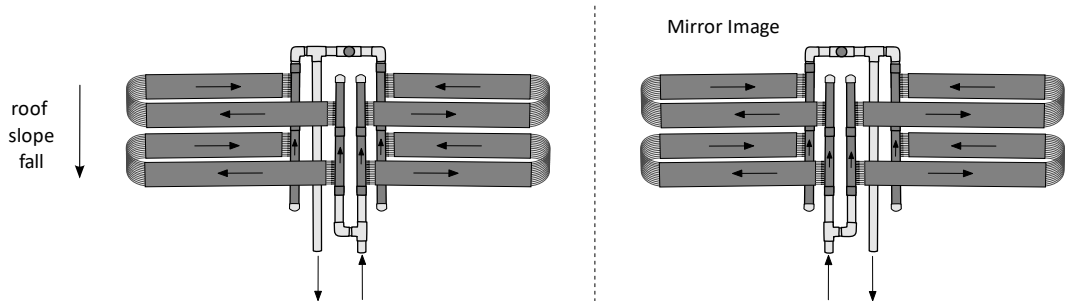
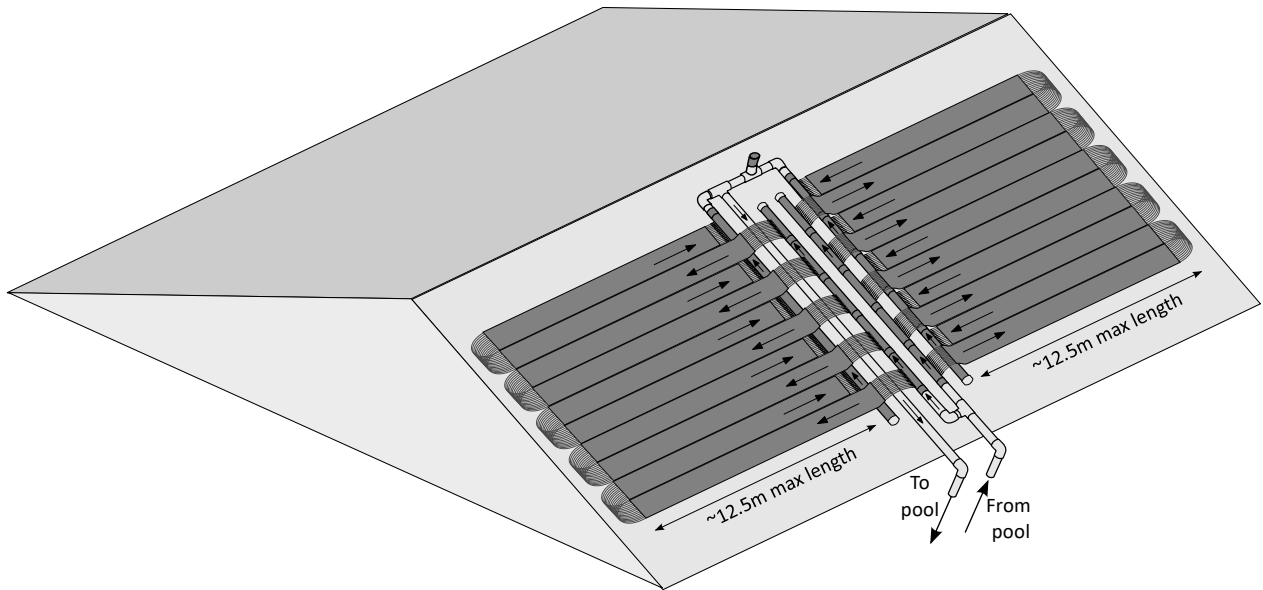


Read Carefully

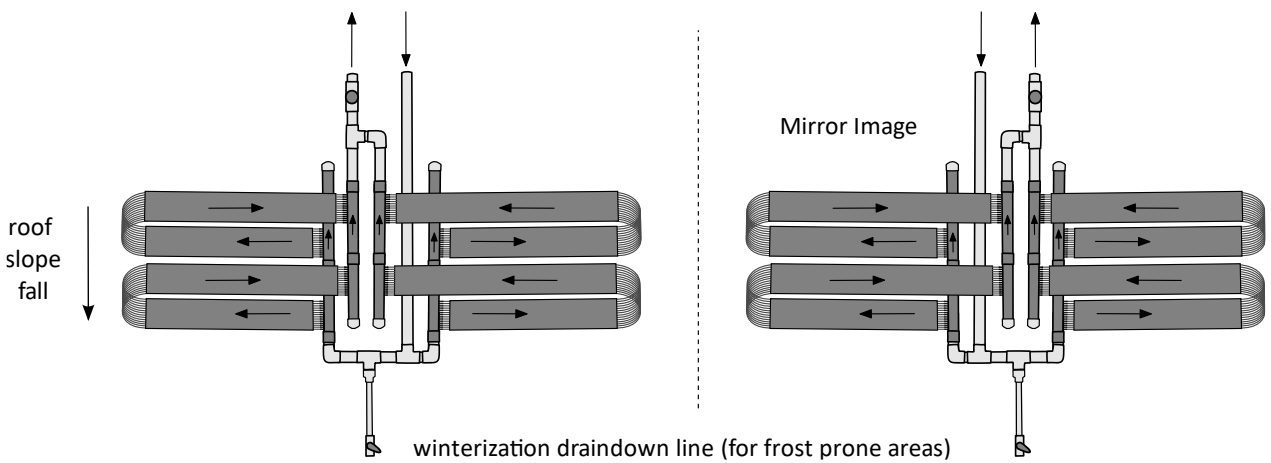
Top feed configurations should operate at lower pressure of 50 kPa max, and are not recommended for areas subject to freezing conditions overnight.

Why? It is impossible for the water to drain full from a top feed system. Freezing conditions with excess water inside piping can lead to PVC pipes cracking.

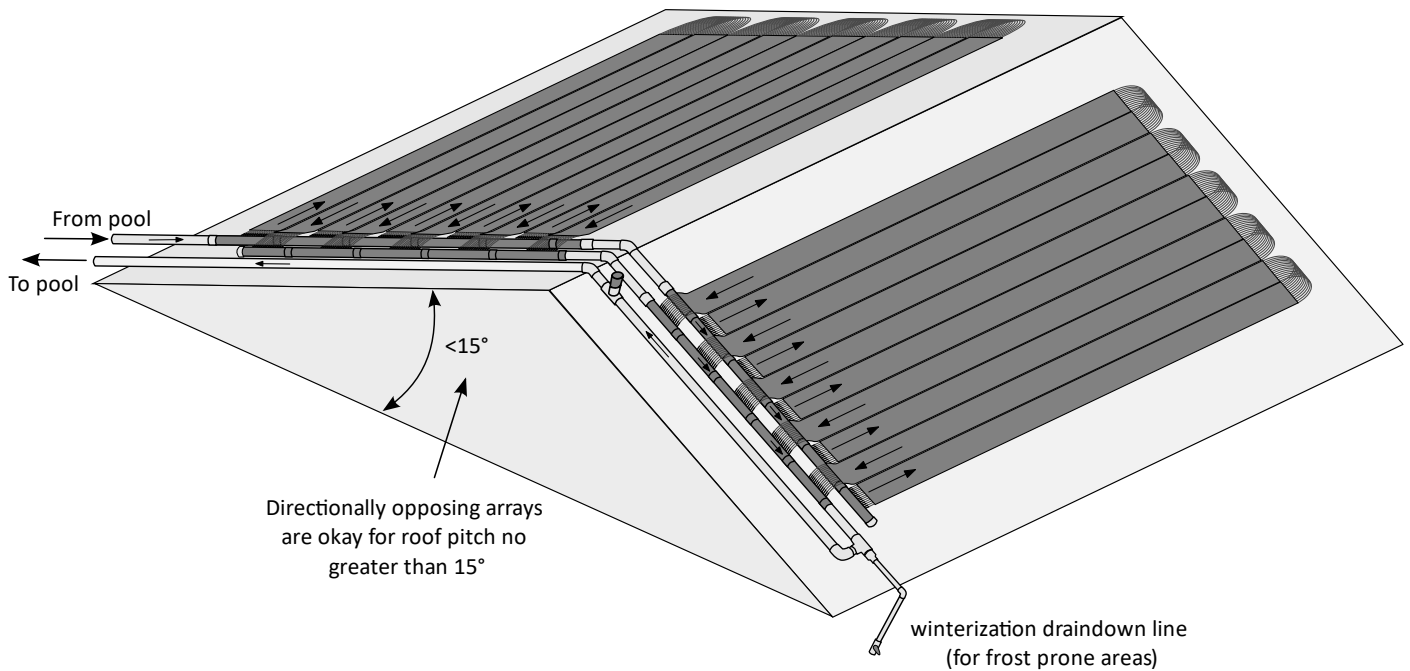
13.9 Bottom Feed Butterfly (for long 25m collector arrays)



13.10 Top Feed Butterfly (for long 25m collector arrays)



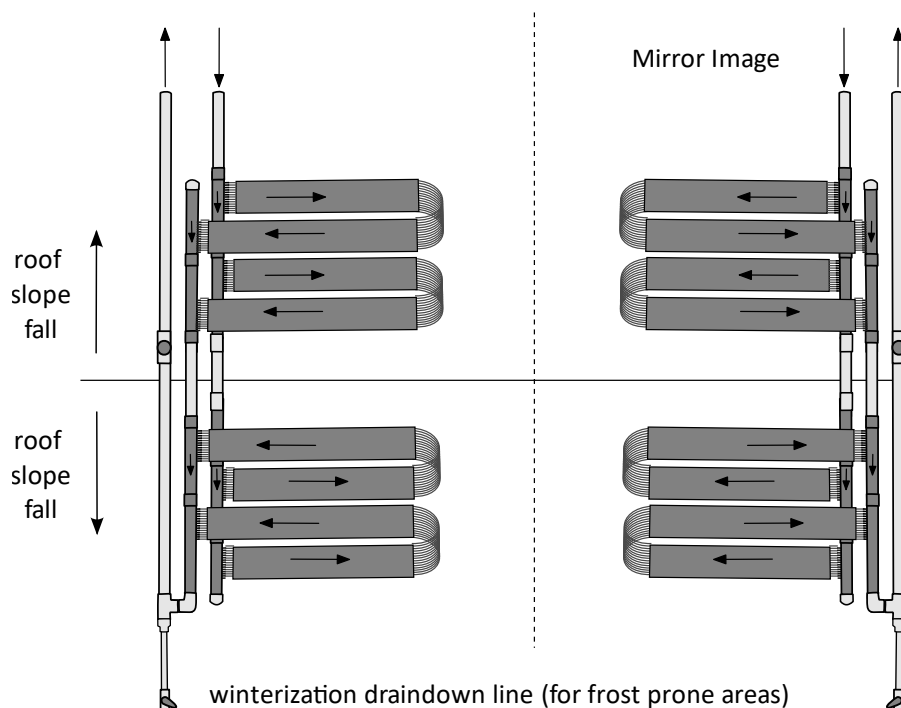
13.11 Multi-Directional Opposing Bottom and Top Feed Arrays



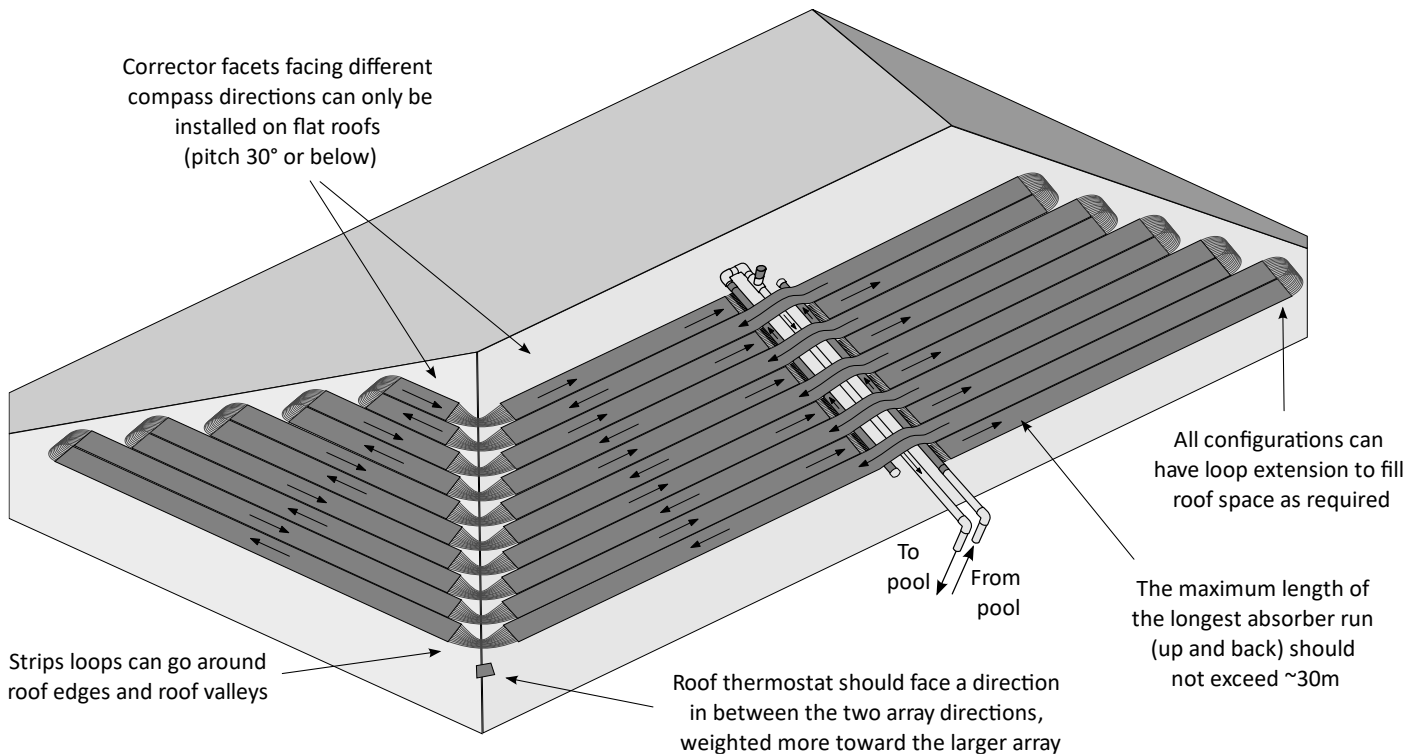
Read Carefully

Collector arrays that face opposing compass directions are not recommended unless the roof pitch is less than $\sim 15^\circ$. In this case the temperature sensor should be installed at an angle that is an average of the two collector array directions. Installations with a purely south facing facet are still not recommended for southern areas of Australia.

Why? Depending on the location of the roof sensor the controller could turn the system on with one bank of collectors in full shade.



13.12 Multi-Directional Curve Around Arrays

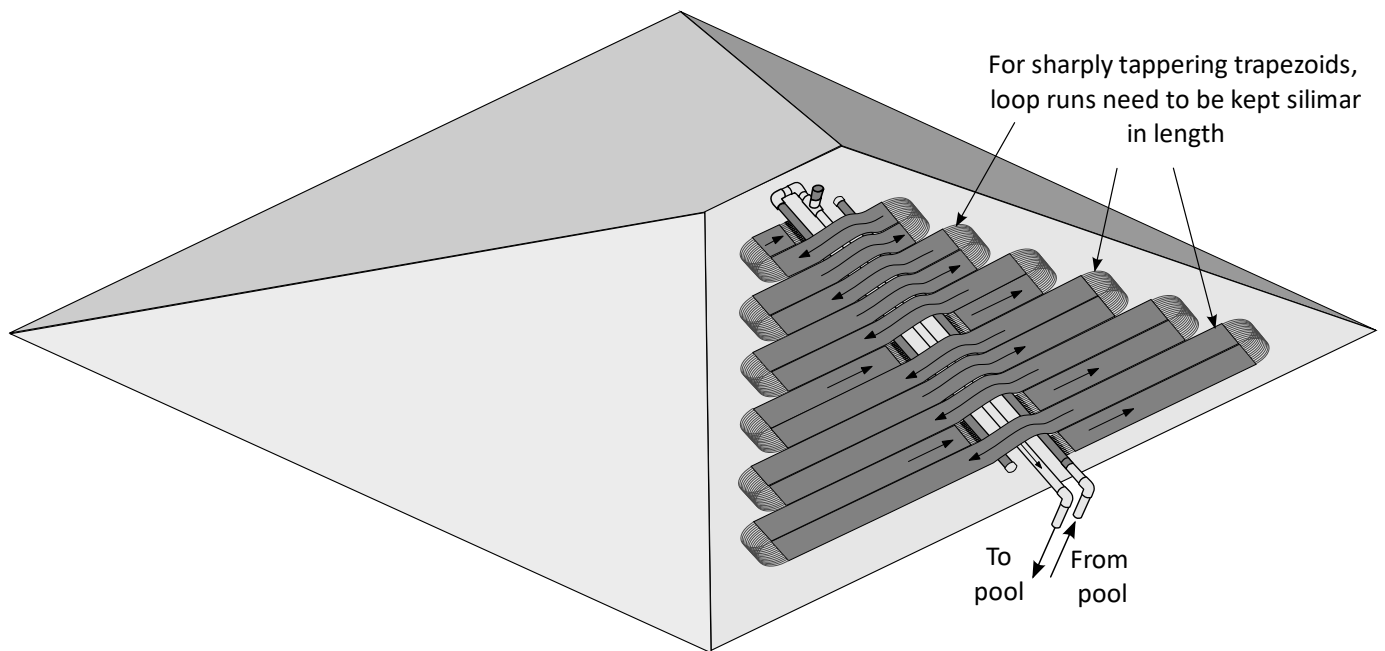


Read Carefully

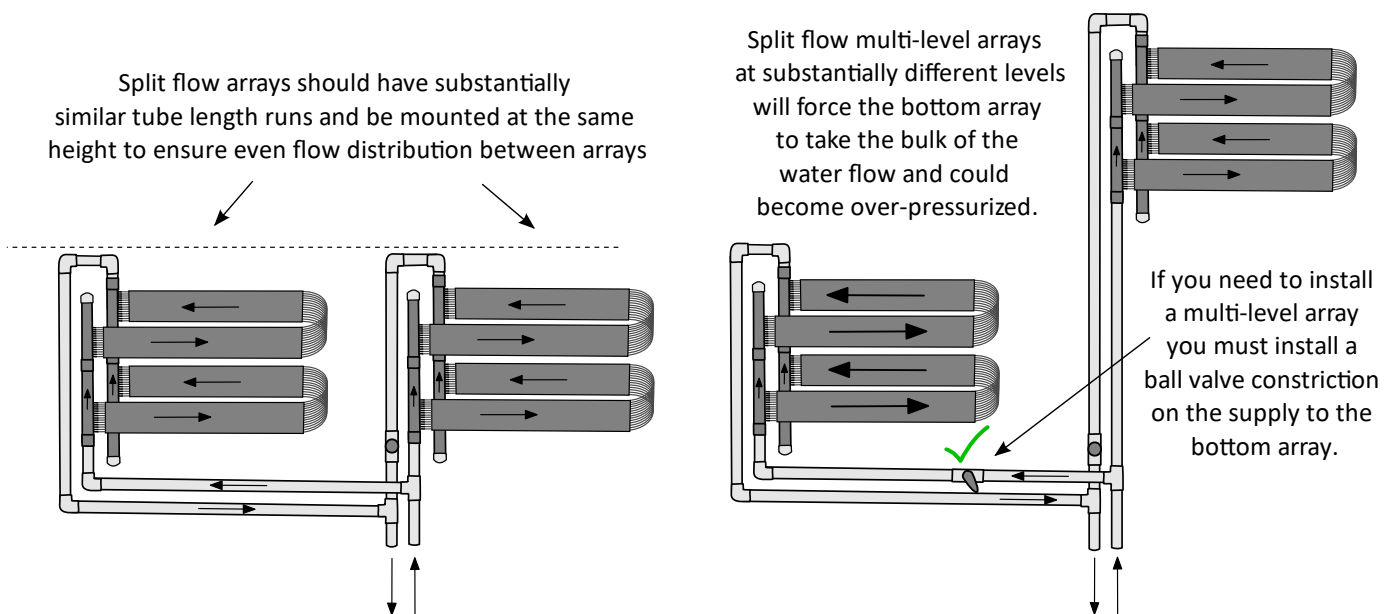
Collector facets facing different compass directions should only be installed on flat roofs with pitch **no more than 30°**. In this case the temperature sensor should be installed facing an angle that is an average of the two collector facet compass directions, preferably weighted toward the compass direction of the larger area facet.

Why? Depending on the location of the roof sensor the controller could turn the system on with one bank of collectors in full shade.

13.13 Sharply Tapering Trapezoid Arrays



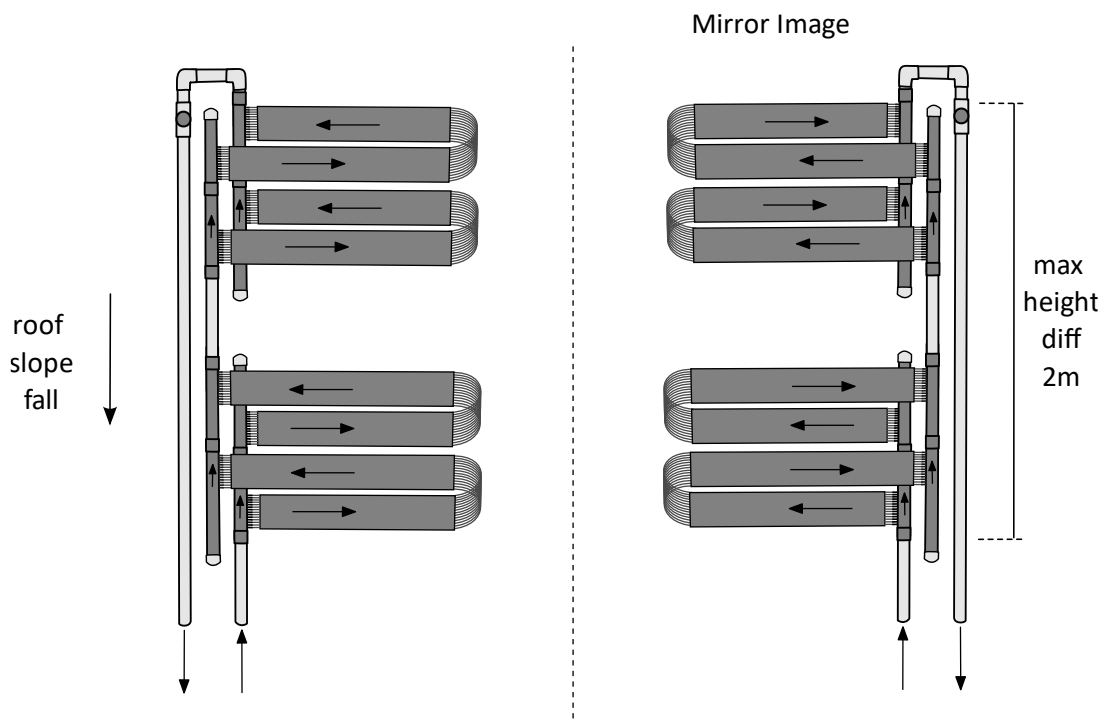
13.14 Bottom Feed In-Parallel Split Arrays (For Multi-Level Split Arrays)



Read Carefully

An "in parallel" configuration is recommended for installing two different arrays on any differing or similar levels. For split flow multi-level arrays at substantially different heights (>1m), a ball valve constriction **MUST** be installed to limit flow to the collector array installed at the lower level.

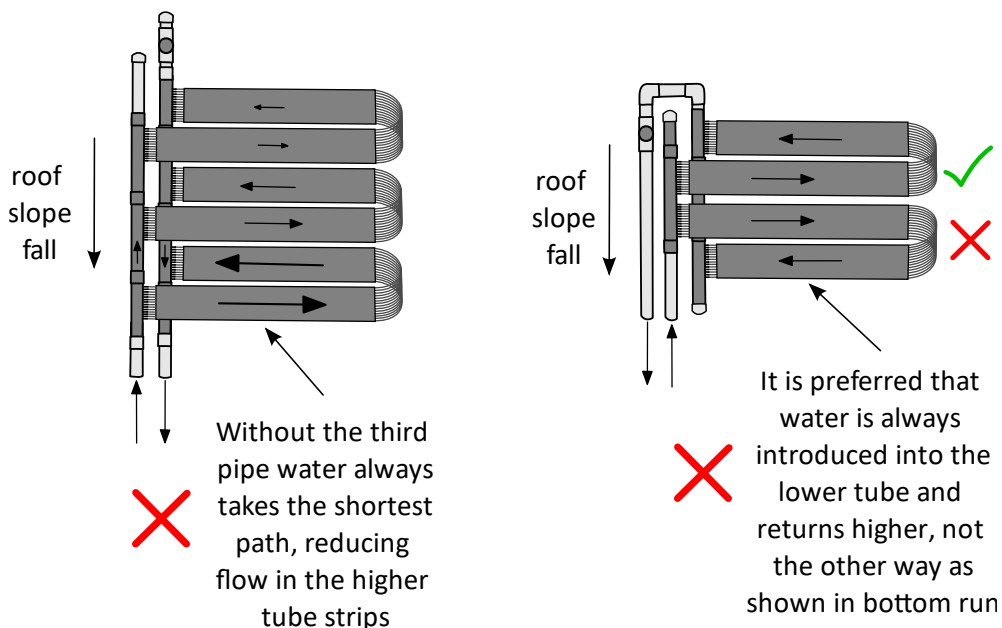
13.15 Bottom Feed In-Series Split Arrays (Low Pitch Roof Only)

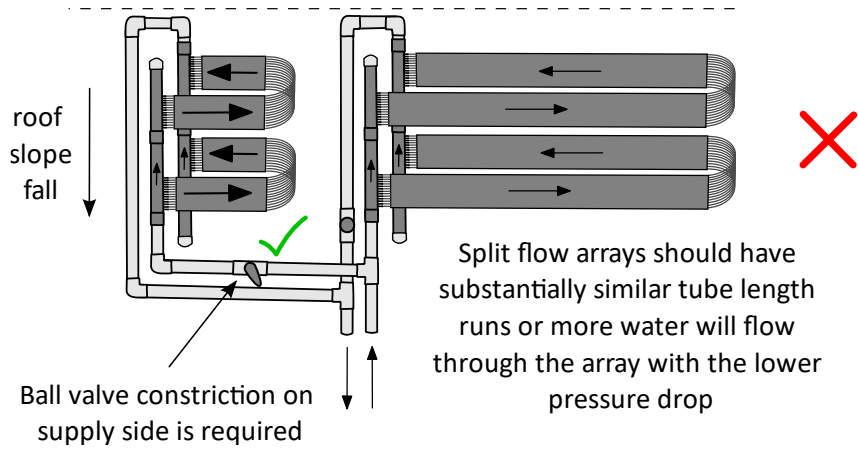
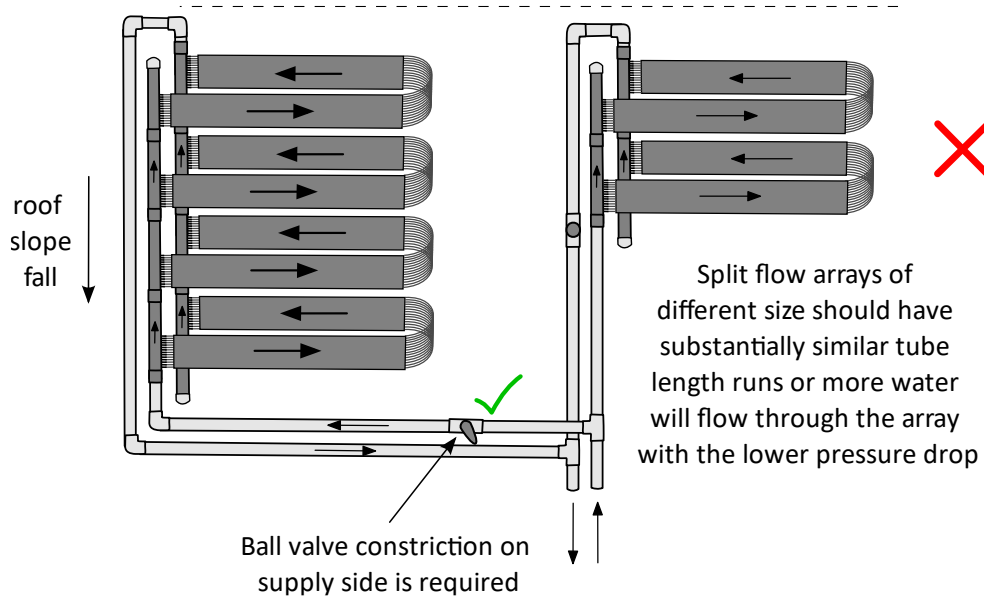


Read Carefully

An “in series” configuration can be installed when you need to split an array. However note, for this configuration the bottom array will receive much greater pressure. Depending on the height of the top array and the pump size, this could over-pressurize the bottom array. We recommend this array is used only if the height difference between the two arrays is no more than 2m.

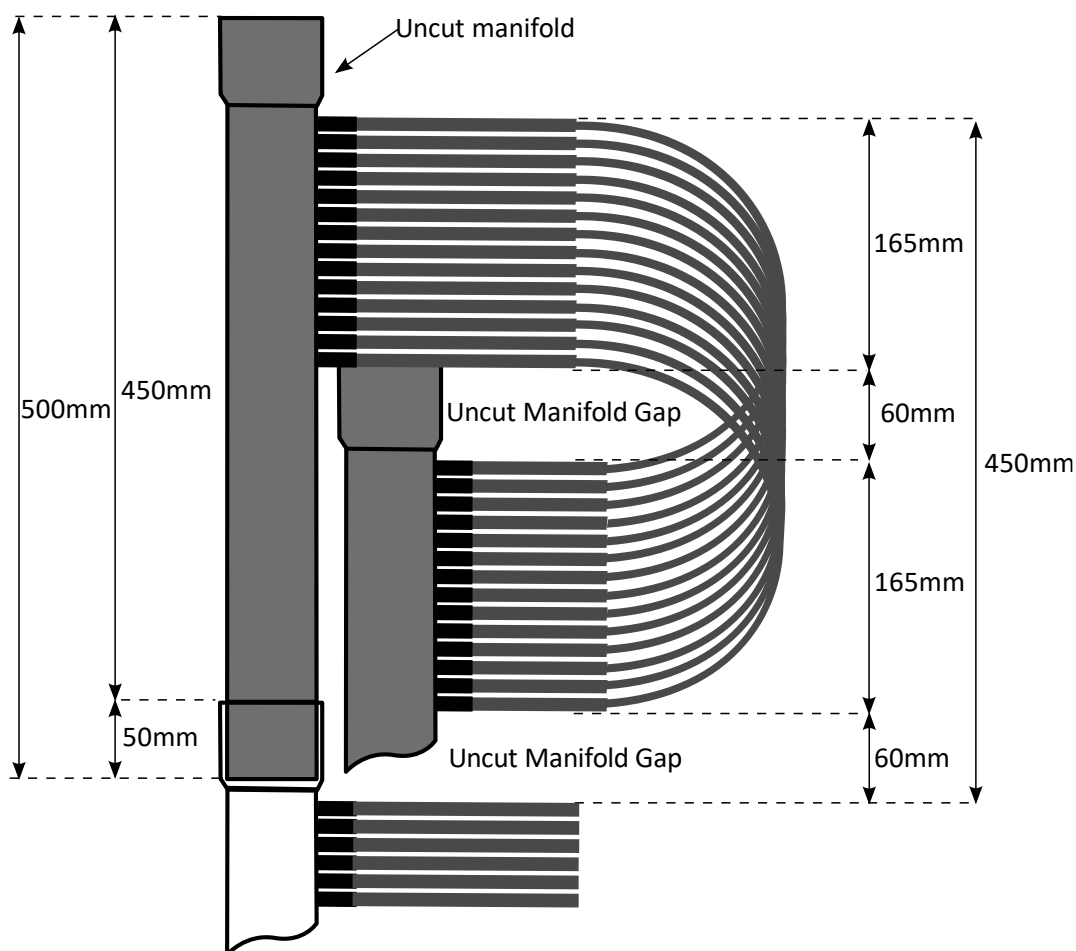
13.16 Plumbing Configurations Not Recommend





14 Adjusting Strip Spacing by Cutting Manifold

For installations where the manifold assembly runs square up/down the roof slope, the spacing between collector strips will need to be adjusted by cutting the manifold length to suit tile spacing, or other spacing requirements.



Manifold Length	Required Gap Between Strips
500mm (uncut)	60mm
480mm (2 nd notch)	50mm
460mm (4 th notch)	40mm
440mm (6 th notch)	30mm
420mm (8 th notch)	20mm
400mm (10 th notch)	10mm (minimum gap)

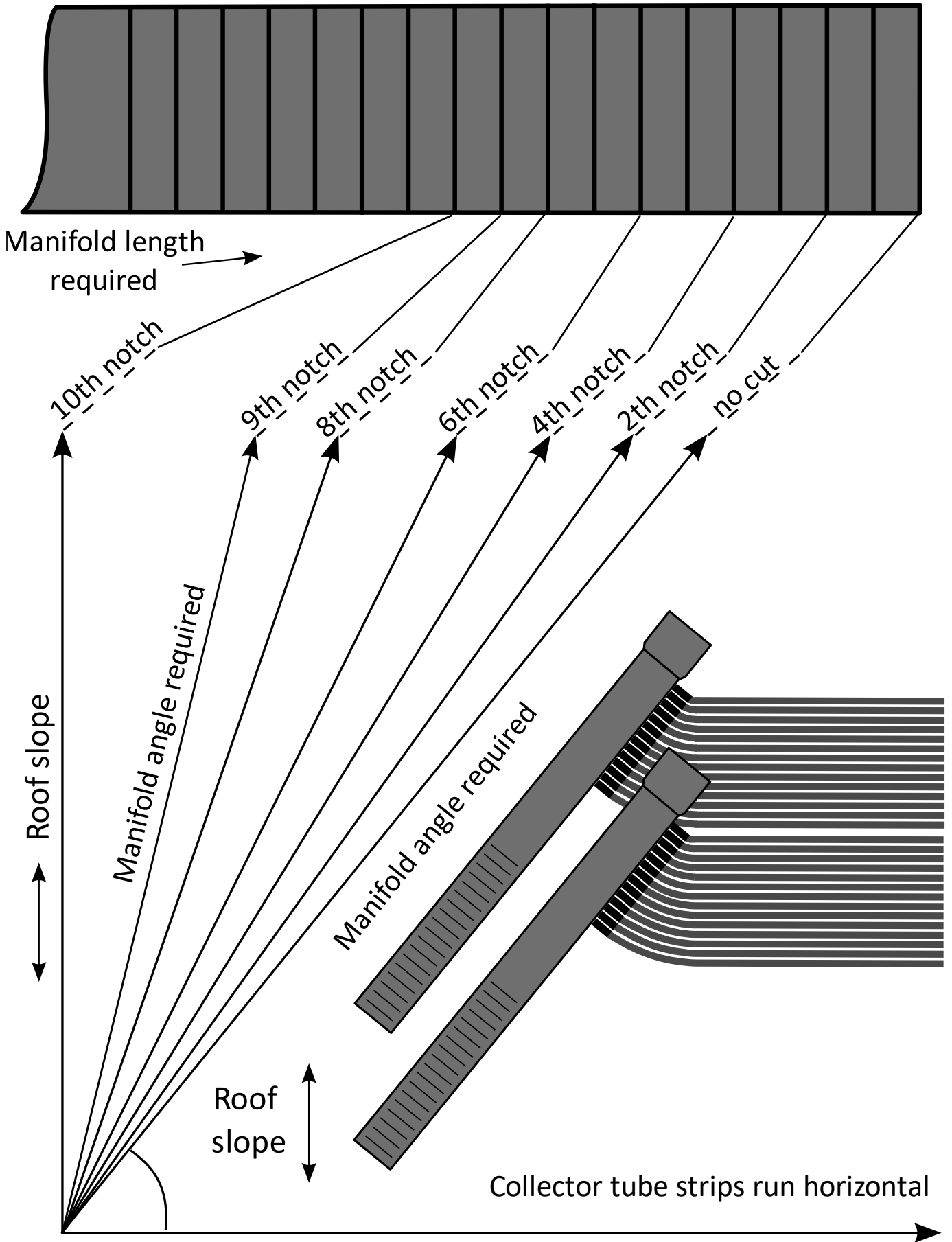
15 Adjusting Strip Spacing for Angled Manifold Runs

For installations where the manifold assembly needs to run **at an angle to the slope of the roof**, the spacing between collector strips will depend on the manifold angle and manifold length. The template on the next page shows the manifold length required for **10mm strip spacing** at a required manifold angle.



Tip

Glue a couple of manifolds first and then check the length on the roof. Length may need to be adjusted for subsequent manifold additions.



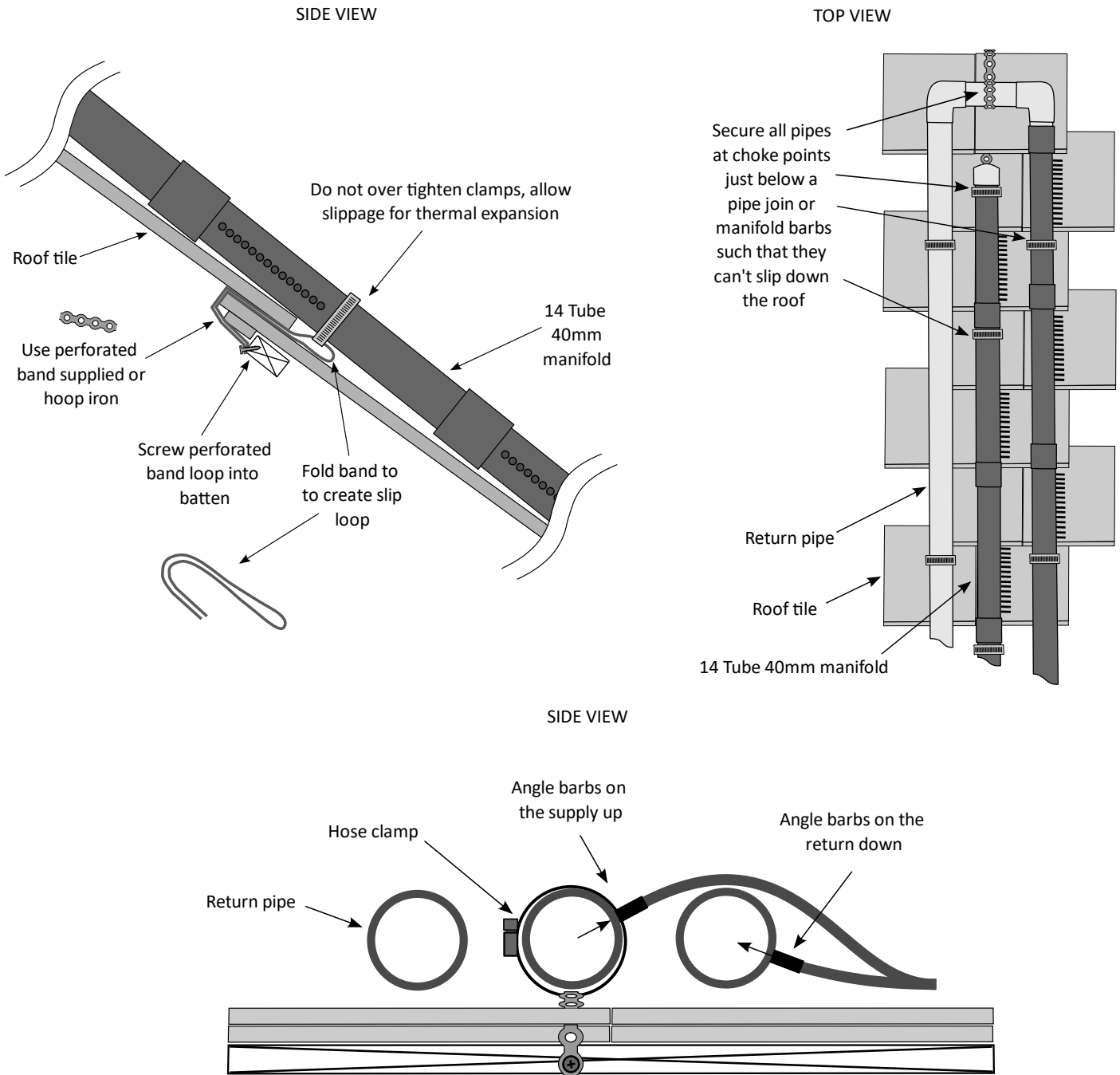
16 Roof Assembly and Attachment



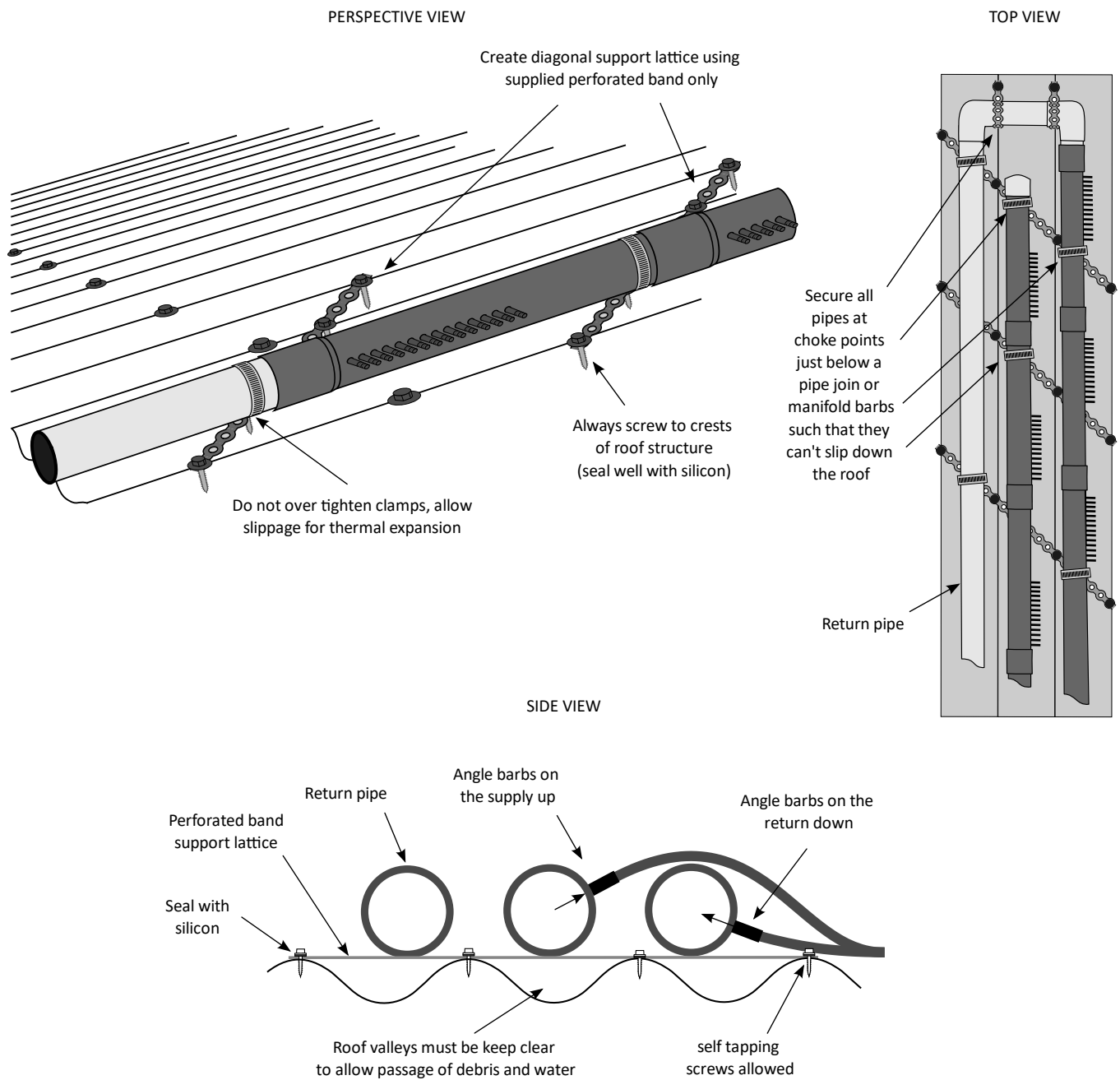
WARNING

When working with power or hand tools always follow the safety instructions. Wear the recommended personal protective apparel. Make sure electrical cables are kept away from any water and from foreign objects which pose a **potential cable severing or crushing hazard**.
When using glues, solvents or sealing agents make sure **you know and seek the proper first aid** in case of an accident.

16.1 Tile Roof Mounting of Manifold Assembly

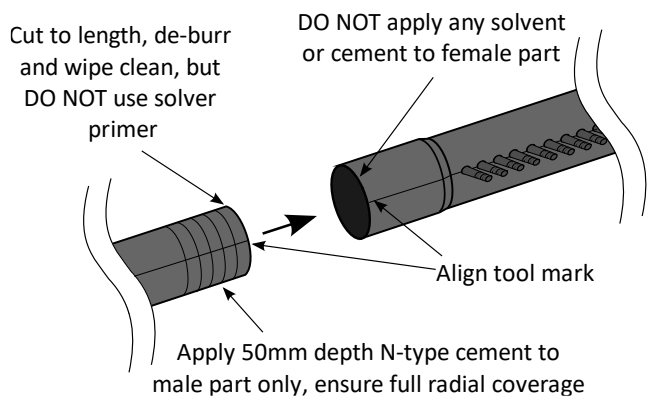


16.2 Corrugated Metal Roof Mounting of Manifold Assembly

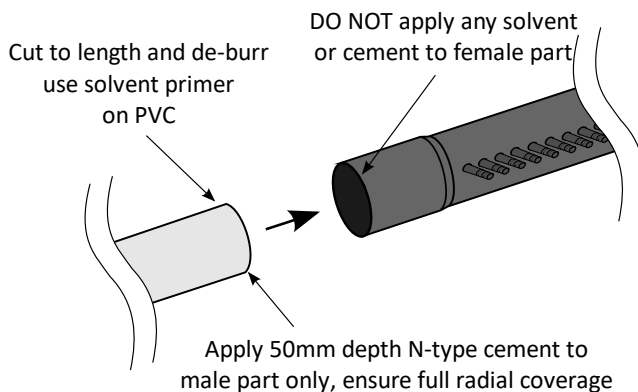


16.3 Manifold Gluing Procedure

Manifold to Manifold



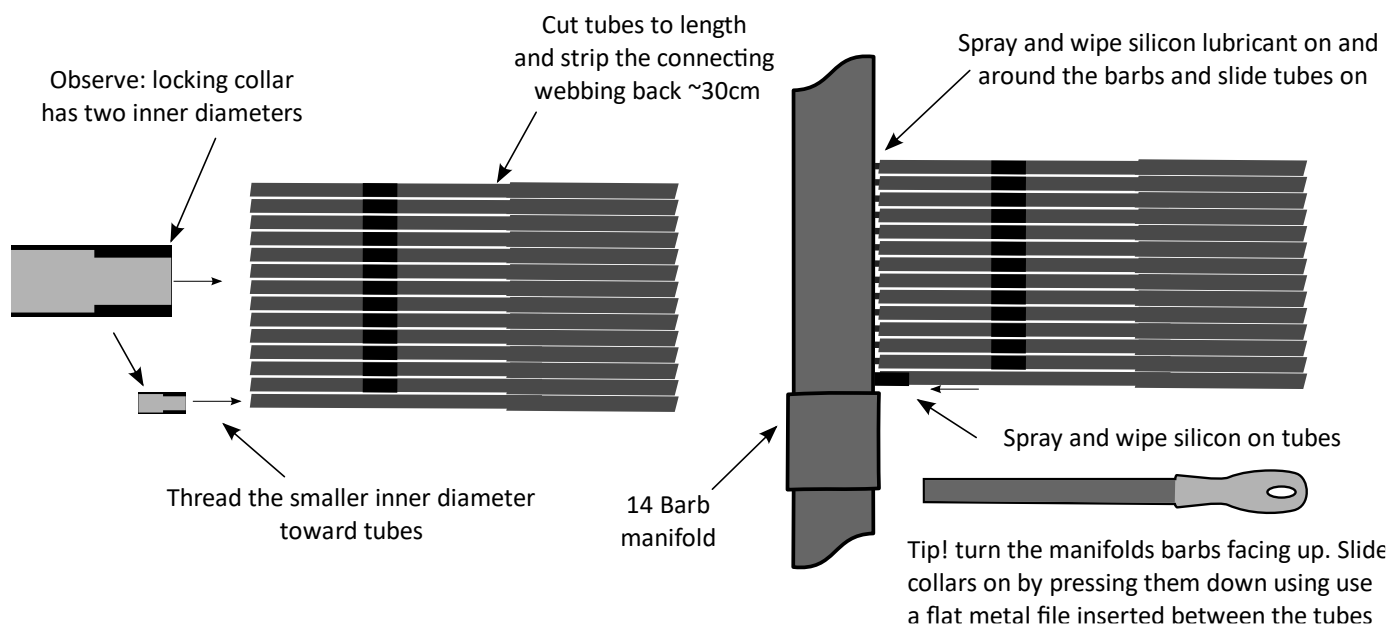
Manifold to PVC



Read Carefully

Use N-type cement only for manifolds **and the vacuum release valve**. DO NOT apply primer or cement to any manifold female part. Work quickly, insert male part into female socket immediately after cement application. Twist $\frac{1}{4}$ one way then the other to spread any glue, align tool marks and hold in place for a moment. Wipe any excess to prevent cement induced stress cracking.

16.4 Connecting the Tubes to the Manifold Barbs

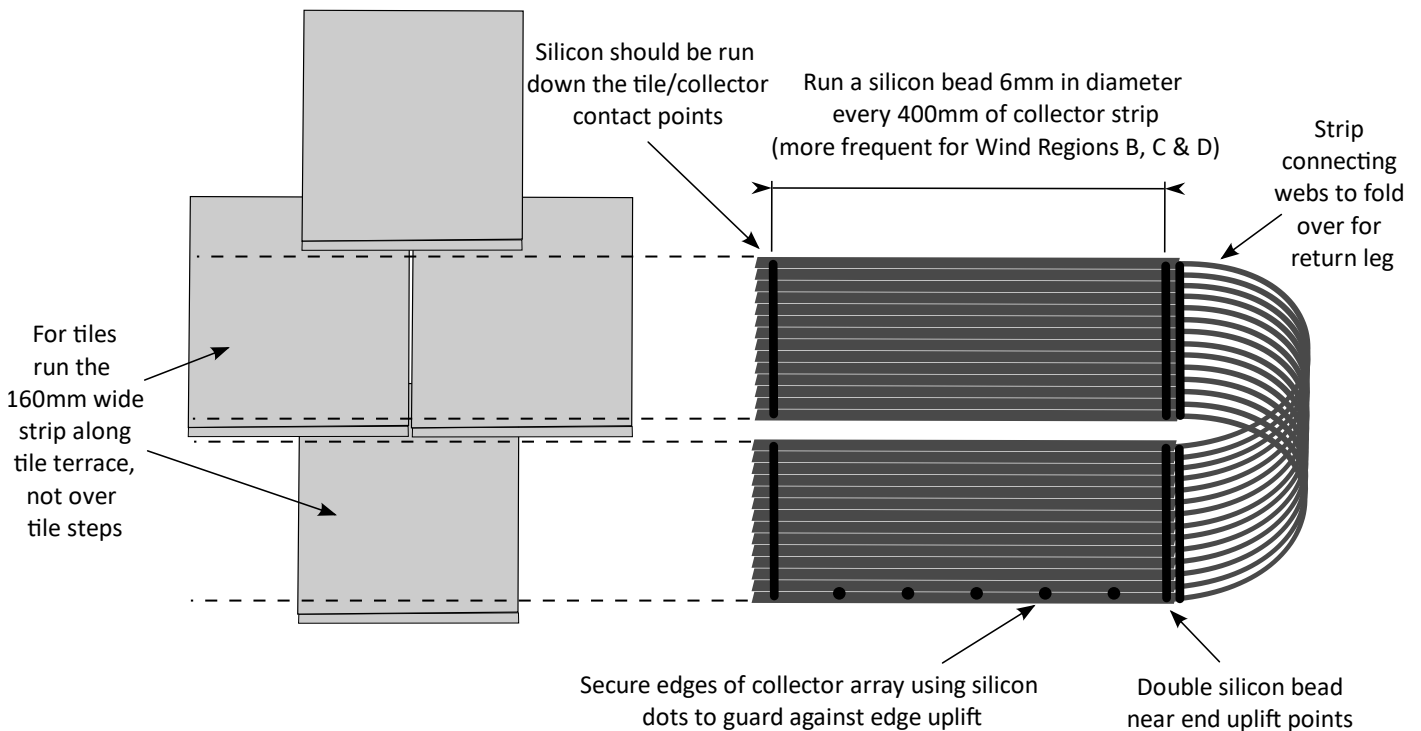




WARNING

Take care not to overspray silicon on a critical part of the roof as this will create poor silicon glue adhesion and a dangerous slippery working environment. **Spray toward the manifold assembly piping only - NOT toward the outgoing tubes.** We recommend you use a cloth and clean your hands regularly.

16.5 Strip Collector Assembly and Gluing



Read Carefully

Ensure roof is clean and dry. Any moss will need to be removed using a high pressure strayer. Use supplied silicone adhesive. If you run out, the brand "Parafix" outdoor silicon can be used as an alternative and is available at most hardware stores.



Read Carefully

Consider the passage of water under the collector. Make sure water can still drain and run under the collector. **On very flat tile you will need to lay a vertical strip of spare collector tube at periodic lengths to allow drainage under the collector strip.**



Tip

When stripping the return leg, use a blunt flat head screwdriver to press holes through weak point in one side of the webbing first. Use needle nose pliers to pull out webbing.



Tip

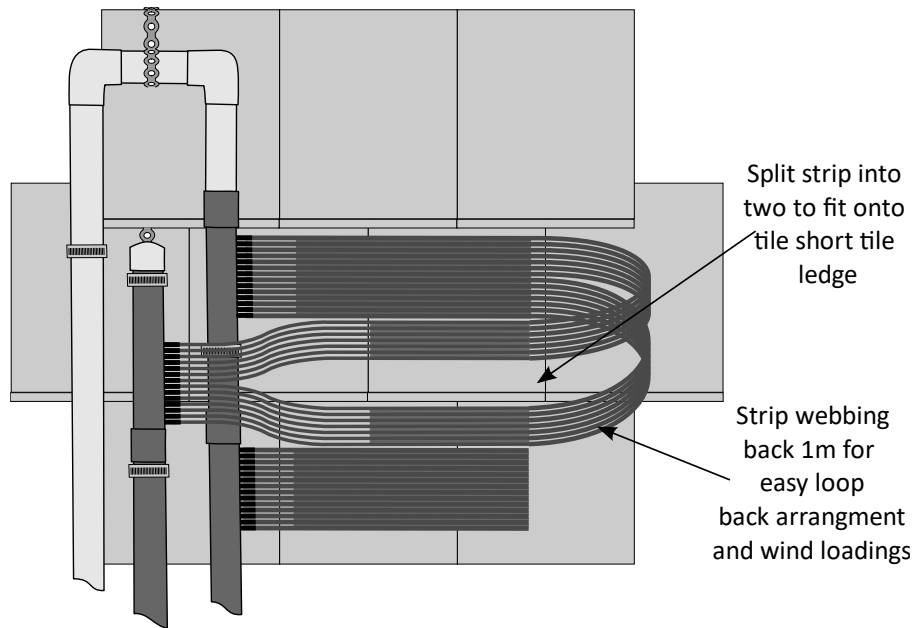
When gluing the strip start from the manifold. Glue the first part then place a couple of heavy objects such as a brick on an unglued part to stop the glued side of the strip from being disturbed as you lift the next part of the strip to run silicon under. Move the bricks along as you glue the next part.



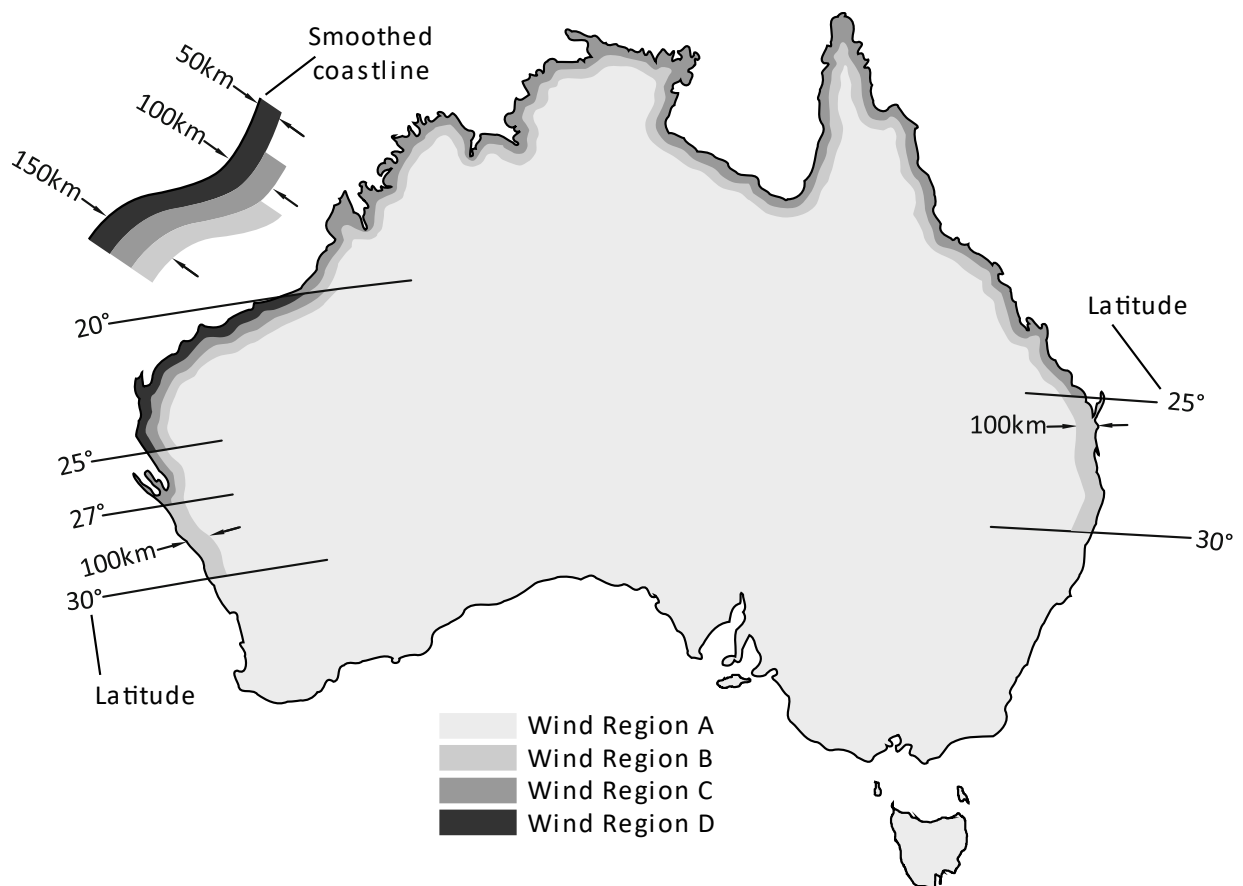
Tip

If you make a mistake and you need to remove the locking collar **use a hair dryer or heat gun to warm the tube.** For extra grip use a piece of sand paper around the tube to pull off.

16.6 Alternate Strip Tile Layout for Short or Long Ledge Tiles

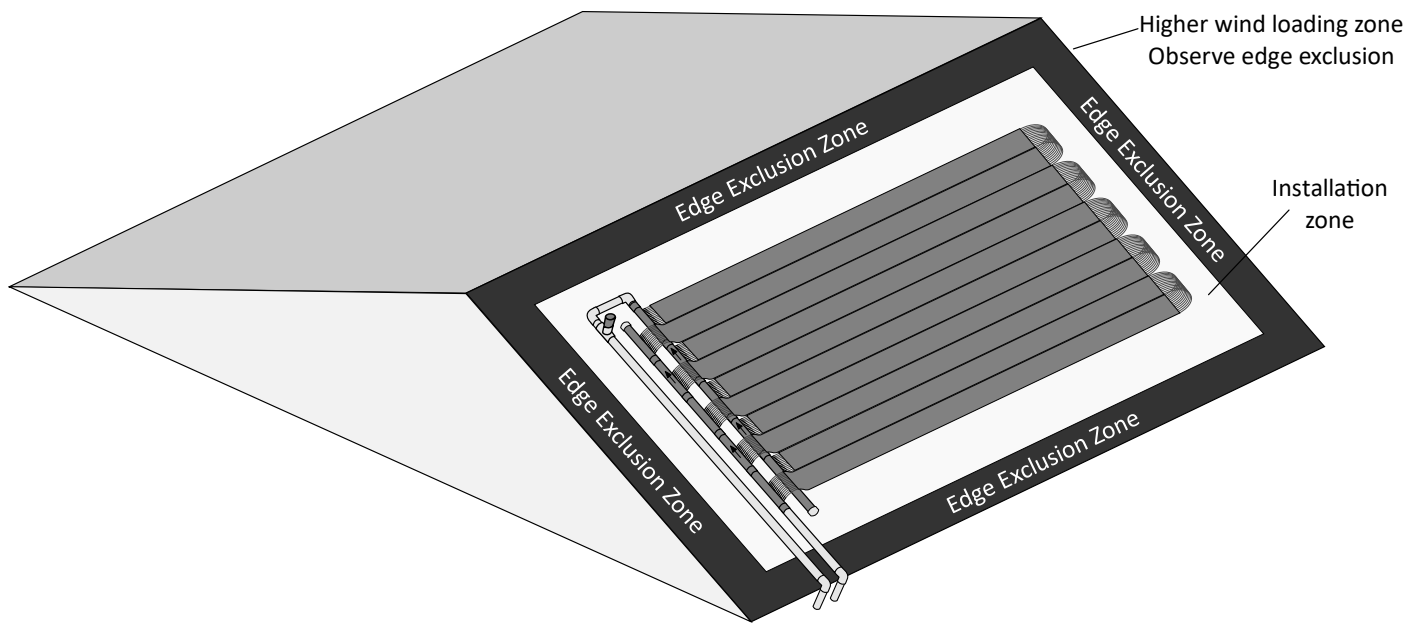


17 Extra Wind Proofing



Coastal region boundaries are smooth lines set in from a smoothed coastline by 50km, 100km or 150km lines. If you are in Wind Regions B, C or D, or situated on a hill or in open terrain, you will need to increase the above specified frequency of fixings.

17.1 Roof Edge Exclusions Zones



WARNING

Note: Strips installed near or within a roof edge exclusion zone require **2 X** the fixing strength in that local area. Strips installations within a roof corner exclusion zone require **3 X** the fixing strength in that local area.

18 Collector Installation Order and Procedure



WARNING

Collectors laid on a flat surface can be walked on without damage. Do not step on a hot collector with a roof fixing screw underneath it. **Take extreme care to use non-slip shoes and never walk on wet collectors, or just glued collectors.**

- 1) Measure roof and plan out your installation using a diagram first.
- 2) Lay a few manifolds and collector ends **out on the ground** and measure where you need to cut them so that they align with the collector strips.
- 3) If your manifolds run at an angle you'll need to check the angle on the roof using the supplied template (see above) to get the correct manifold spacing.
- 4) Cut and glue manifolds checking spacing as you go.
- 5) Lay the two completed manifold assemblies on the roof. In the appropriate place create the looped roof attachment points for tiles, or perforated band diagonal supports for metal roofs.
- 6) Lay the manifold on the perforated band attachments and fix loosely at first using hose clamps.
- 7) Lay the collector strips out.
- 8) Cut the collector strips near the base of the respective barb manifold and connect the tubes to the barbs.
- 9) Glue remaining pipe work and vacuum release valve in place.
- 10) Tighten the hose clamps to secure the manifolds (while still allowing for some thermal expansion).
- 11) Drill 8.5mm hole and install pressure gauge on supply line using grommet.
- 12) Allow 24 hours for the glue to set before pressurizing components.
- 13) Turn the system on for the first time and check for leaks.
- 14) Check pressure gauge you may need to reduce or increase pressure using PVC ball valves.
- 15) With the system running glue the collectors down (keep the system running/cool while the glue sets).
- 16) Install any remaining components.

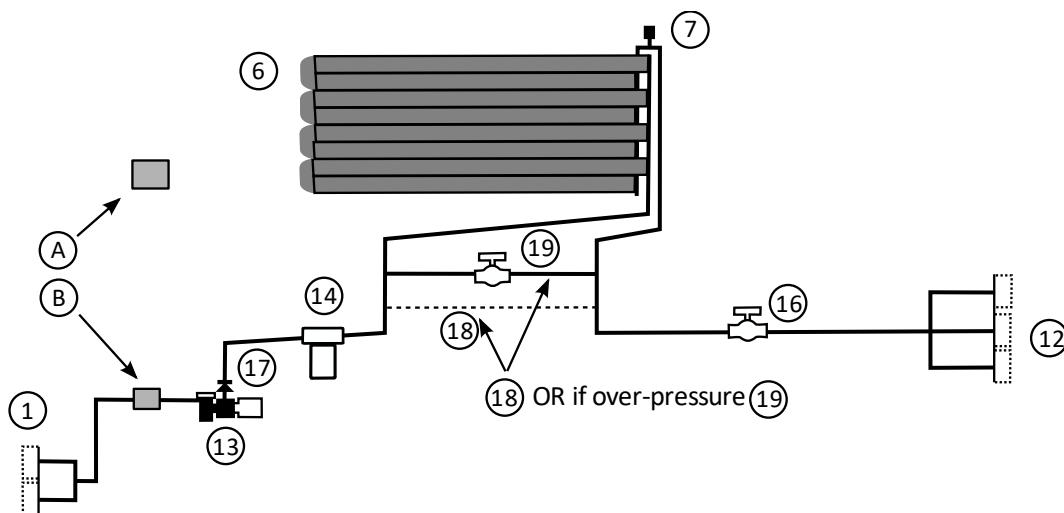
19 Plumbing Diagram Configurations



CAUTION

When constructing pipe work consider the thermal expansion of long lengths of pipe work and the stress this produces on joins. **Note: the minimum spacing for PVC 40 pipe supports is 900m, less for smaller pipes. Use the perforated band to create saddles.**

19.1 Configuration 1: Independent/Separate System



LEGEND:

- | | | |
|-------------------------------|--------------------------------|--|
| A - Roof Temperature Sensor | 7 - Vacuum release valve | 16 - Ball valve brake (if required) |
| B - Pipe Temperature Sensor | 12 - Pool return | 17 - Pump Integrated non-return |
| 1 - Pool suction | 13 - Dedicated solar pump | 18 - 6mm by-pass line (if required) |
| 6 - PVC solar strip collector | 14 - Tuffman strainer canister | 19 - Ball by-pass if required (6mm hole) |

Notes: Solar pump can run independently of the filter pump. A and B are the recommended temperature sensor installation zones for the controller

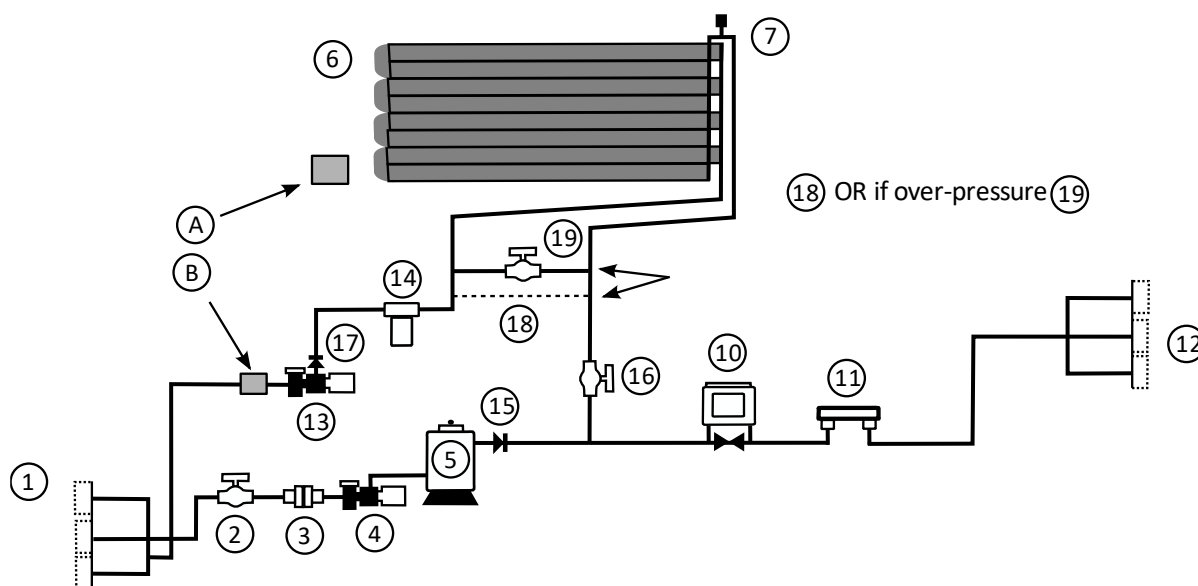
Advantages:	Disadvantages:
* More energy efficient as a small solar pump runs independent of the large main filter pump	* Requires separate solar suction provisions to be installed



WARNING

This system requires separate/independent Australian Standard approved suction and return lines going into your pool. **If you need to retro fit these you must contact a pool builder.**

19.2 Configuration 2: Integrated Independent System



LEGEND:

A - Roof Temperature Sensor

B - Pipe Temperature Sensor

1 - Pool suction

2 - Ball valve

3 - Union socket/join

4 - Filter pump

5 - Main pool filter

6 - PVC solar strip collector

7 - Vacuum release valve

10 - Auxiliary heater

11 - Chlorinator

12 - Pool return

13 - Dedicated solar pump

14 - Tuffman strainer canister

15 - Main filter check valve

16 - Ball valve brake (if required)

17 - Pump Integrated non-return

18 - 6mm by-pass line (if required)

19 - Ball by-pass if required (6mm hole)

Notes: For pool with only 1 return port, the filter pump must be set on a timer to run outside of solar hours to exclude the possibility of the two pumps running together. A and B are the recommended temperature sensor installation zones for the controller

Advantages:	Disadvantages:
<ul style="list-style-type: none"> * More energy efficient as a small solar pump runs independent of the large main filter pump * Can be retrofitted to older pools depending on access to underground suction line 	<ul style="list-style-type: none"> * Pumps can't run simultaneously for pools with only 1 return port. * Suction tees above or only just below the water line will require regular maintenance of non-return valves



WARNING

If the pool has more than one return port and the filter pump and solar pump run together, the installer must check the combined flow does not exceed suction inlet flow rate limits.

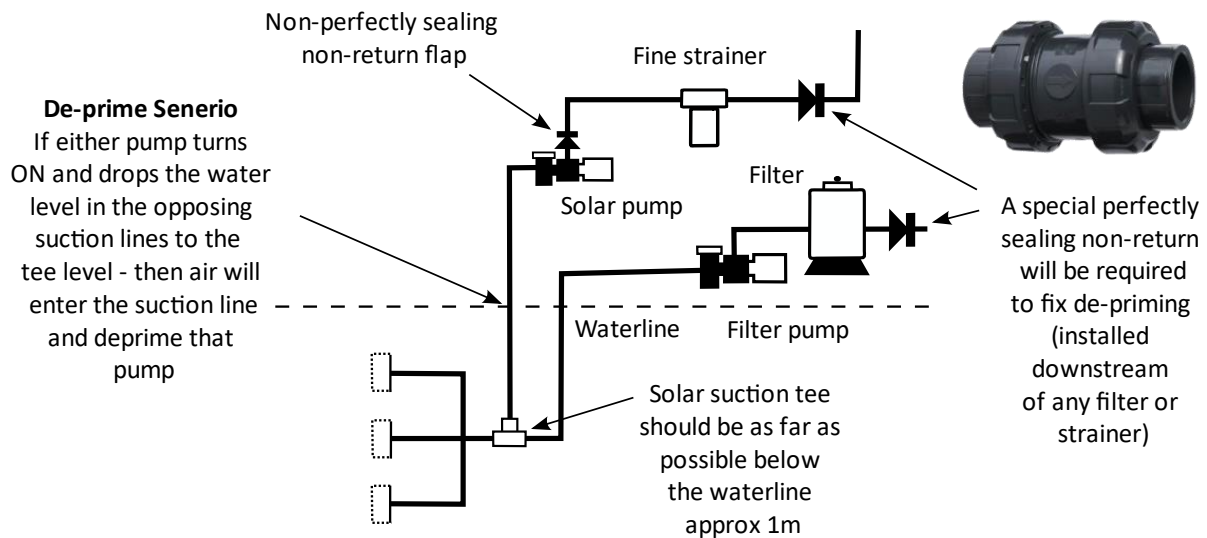
19.3 Notes on Teeing into the Suction Line for Configuration 2



CAUTION

Note: the tee into the suction line must be performed far below the waterline (> 1m).

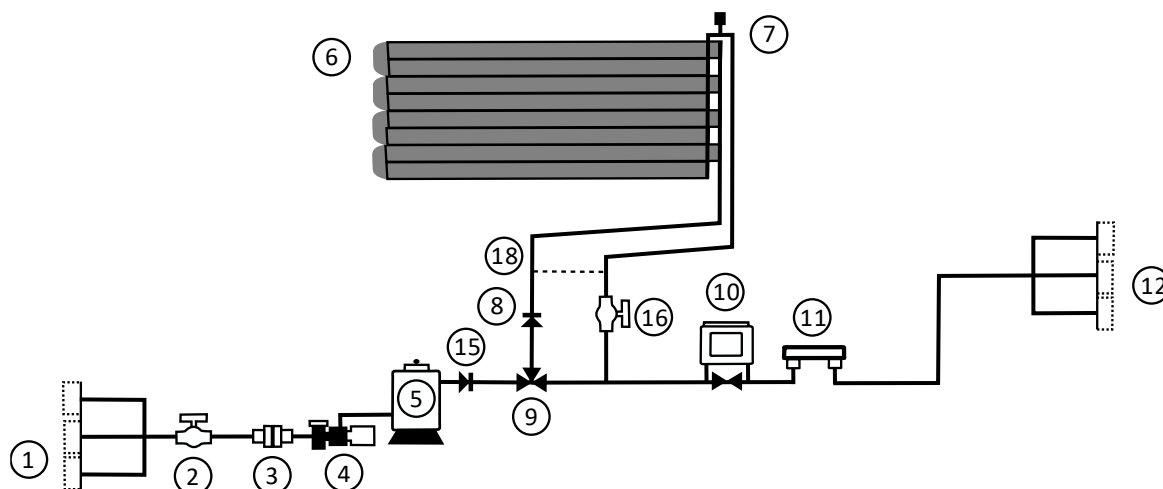
Why? When the filter pump starts it will create negative pressure in the suction line which will drop the water line in the solar suction line - if the water line drops below the tee point air will be drawn de-priming the main filter pump.



If the tee can't be installed more than 1m below the waterline, or if it can only be installed above the waterline, some installers will put in a perfectly sealing non-return on the solar line to stop the main filter pump de-priming.

Please be aware, this is a special valve with a polished ball and rubber seat, contact us at info@ecoonline.com.au if you require it. A standard flap non-return will not suffice. Also note, such a system will need regular careful maintenance of the solar and filter line non-returns. Any failures or even the smallest leaks in these non-returns, due to twigs or grit getting into the rubber seal, will pass air and eventually de-prime pumps.

19.4 Configuration 3: Manual/Timer/ Motorized Valve System



LEGEND:

- | | | |
|-----------------------|---------------------------------|-------------------------------------|
| 1 - Pool suction | 6 - PVC solar strip collector | 11 - Chlorinator |
| 2 - Ball valve | 7 - Vacuum release valve | 12 - Pool return |
| 3 - Union socket/join | 8 - Check valve (with 6mm hole) | 15 - Main filter check valve |
| 4 - Filter pump | 9 - 3 Way diverter valve | 16 - Ball valve brake (if required) |
| 5 - Main pool filter | 10 - Auxiliary heater | 18 - 6mm by-pass line |

Notes: Manual or motorized three-way valve (9). (Note: automatic controls are omitted for clarity).

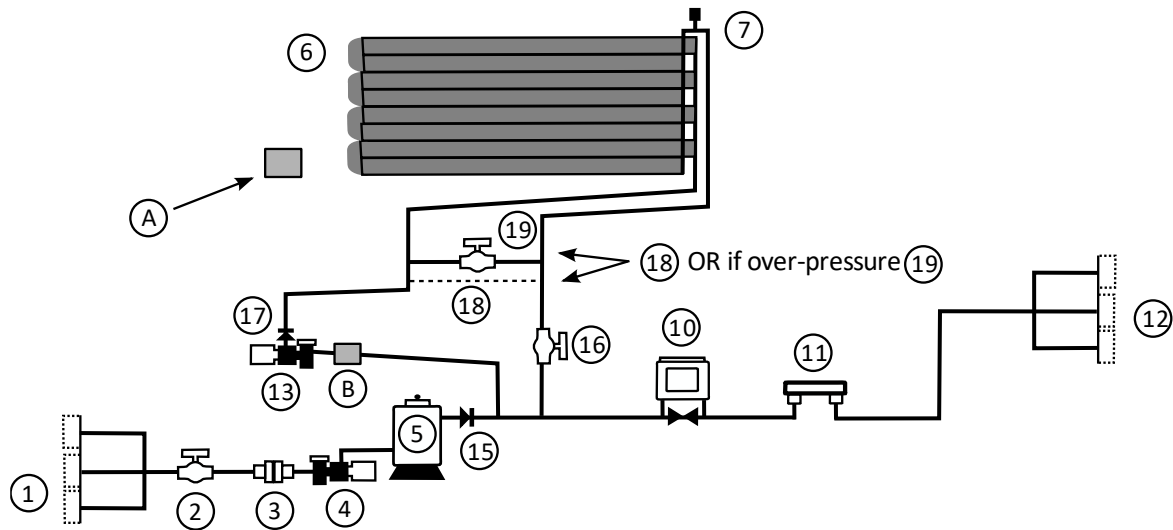
Advantages:	Disadvantages:
<ul style="list-style-type: none"> * Manual system requires no extra pump required * Only filtered water runs through collectors * Can be retrofitted to pools that don't have separate solar provisions * Motorized three-way valve and controller can be retrofitted later 	<ul style="list-style-type: none"> * Manual system, needs to be turned off/on or on a timer * Large main filter pump needs to run all day for solar * Requires specialized motorized valve and controller to automate * Increases pressure and decreases flow rate in the filter system * Not recommended for two story installations



CAUTION

For manual pool heating systems running off a main pool filter pump, please check that the pump is large enough to accommodate the extra load of supplying water to the collectors at the required pump height. Generally, this configuration is not recommended for two story or greater installs.

19.5 Configuration 4: Booster/Retrofit System



LEGEND:

A - Roof Temperature Sensor	5 - Main pool filter	13 - Dedicated solar pump
B - Pipe Temperature Sensor	6 - PVC solar strip collector	15 - Main filter check valve
1 - Pool suction	7 - Vacuum release valve	16 - Ball valve brake (if required)
2 - Ball valve	10 - Auxiliary heater	17 - Pump Integrated non-return
3 - Union socket/join	11 - Chlorinator	18 - 6mm by-pass line (if required)
4 - Filter pump	12 - Pool return	19 - Ball by-pass if required (6mm hole)

Notes: Solar booster pump locked to run with filter pump - requires specific controller Dontek V7RTS. Solar pump (13) should of lower flow than filter pump (4). A and B are the recommended temperature sensor installation zones for the controller

Advantages:	Disadvantages:
<ul style="list-style-type: none"> * Less extra plumbing is required for solar * Only filtered water runs through collectors * Does not require separate solar suction provisions 	<ul style="list-style-type: none"> * Requires second pump and special controller * Large main filter pump + solar pump need to run all day for solar



CAUTION

This configuration is not recommended for single story installs for pools with only a single return port due to the potential over pressurization of the panels when both pumps run at the same time. However for two story or greater installs, even with a single return port, this is the recommended configuration for pools that don't have separate suction ports.

19.6 Installing the Strainer for Independent Systems



Install the Tuffman strainer canister as shown in the plumbing diagram above with the clear side down. If the strainer is installed below the waterline you should install a PVC ball valve to isolate the strainer for cleaning purposes. Depending on the level of pool use and debris in the pool the strainer may need to be cleaned regularly. Use a jet of water.

20 Installing the Controller for Independent Systems

Please refer to the controller manual as different controllers have specific installation instructions. Here we only add supplemental instructions; they should not override any specific controller instructions. Note: controller manuals are downloadable from the EcoOnline.com.au website.

20.1 Installing the Roof/Hot Sensor

If your controller comes with a long 20m cord hot roof sensor it should be adhered using silicon to a sun exposed roof tile or section of corrugated metal roof. It should **NOT be installed, on top off, inserted into, or under the actual PVC collector strips**. Ideal placement is within arm's length of the gutter.



Tip

If the cord is too short the sensor can also be located on any **unshaded** "roof proxy" surface that faces the same part of the sky as the collector strips to approximate the surface temperature of the roof itself. Alternatively, it can be extended see below.

20.2 Installing the Pool/Cold Sensor

The cold sensor should be **fitted inside a section of PVC suction line** (before the solar pump) and sealed using the grommet supplied. For this you will need to drill a hole in the suction line, please check the controller manual for the recommended size.



WARNING

Standard unmodified drill bits have "positive rakes" and can easily "bite into" soft materials. This can cause a sprain injury as a hand drill will violently kick and spin. Drill bits can easily be modified to "**zero rake**" to prevent this, see <https://www.youtube.com/watch?v=pAngKHIZgyA>. Alternately, a step drill bit or a standard drill bit spun backwards can be used. A cone shaped rolled up piece of sandpaper can be used to even out or increase the diameter of the hole to size.



Tip

PVC plastic should be preheated to 50°C using a heat gun to prevent it from splitting during drilling. We recommend you practice on a pipe off cut before attempting the hole.

20.3 Extending Sensor Cords

The sensor cords can be extended using similar type cord but in a larger gauge wire. Note, the Dontek cold sensor uses a shielded type cord; hence you will need the same type (but in a higher gauge) if extending it. Please contact Dontek or Ascon if unsure.



CAUTION

When extending the cord, we recommend a “lap splice” solder join with adhesive heat shrink. Solder joins should not be placed in any conduit section running under ground.

21 Drain-Down, Frost Proofing and Winterization

21.1 Drain Down

All pool heating systems have a drain down design and MUST drain as fully as possible when the system stops.



Read Carefully

The use of a water tight non-return valve on the solar supply will prevent drain down which could result in water freezing inside PVC piping in frost prone areas and/or hot water stagnation in summer. **Any non-return valves installed on the supply line MUST have a 6mm drain hole drilled in the flap to allow drain down. Why?** *The main purpose of the non-return valve is to prevent a large volume of water from spinning the pumps rotor backwards when the pump stops. A 6mm hole allows slow drain down while also preventing hammer action in the flap when the pump stops.*

21.2 Winterization

Your collector strips as well as your solar booster pump will require regular winter flushing, you should make sure the controller you have has a winter mode. If you do not want to run your system over winter you can winterize your system by draining the solar side of the system, disconnecting the solar booster pump and flushing the pump with clean water for storage over winter.

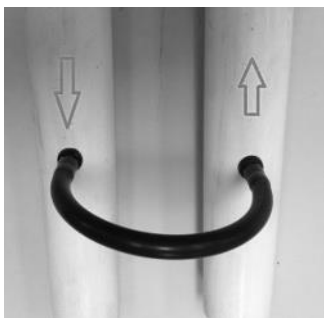


CAUTION

PVC piping should be installed with a slope such that all water drains out of the piping to when the pump stops to ensure a freeze proof system. There should be no U-bend water traps - these can freeze over and burst plumbing lines in the winter. Note: PE lines are not affected as these are frost impervious.

21.3 Installing a By-Pass Tube or By-Pass Ball Valve

A drain tube (18) or a by-pass ball valve (19) with 6mm hole can be used to drain non-self draining sections of PVC piping in frost prone areas. In some cases where there are issues with pump priming and a perfectly sealing non-return valve (8) is required; the aforementioned by-pass lines can be installed on the supply and return solar lines leading up to the roof approximately one metre above pump level to reduce priming pressure. Please request this component if you require it.



To install, drill into the PVC pipe using a modified “zero rake” 8.5mm drill bit. Insert the rubber grommet into the hole first, and then insert the single barb side barb into the grommet. Finally connect the by-pass tube to the double barb side barb ends.



WARNING

Standard unmodified drill bits have “positive rakes” and can easily “bite into” soft materials. This can cause a sprain injury as a hand drill will violently kick and spin. Drill bits can easily be modified to “zero rake” to prevent this, see <https://www.youtube.com/watch?v=pAngKHIZgyA>. Alternately, a step drill bit or a standard drill bit spun backwards can be used. A cone shaped rolled up piece of sandpaper can be used to even out or increase the diameter of the hole to size.



Tip

PVC plastic should be preheated to 50°C using a heat gun to prevent it from splitting during drilling. We recommend you practice on a pipe off cut before attempting the hole.

22 Optimizing Collector Pressure

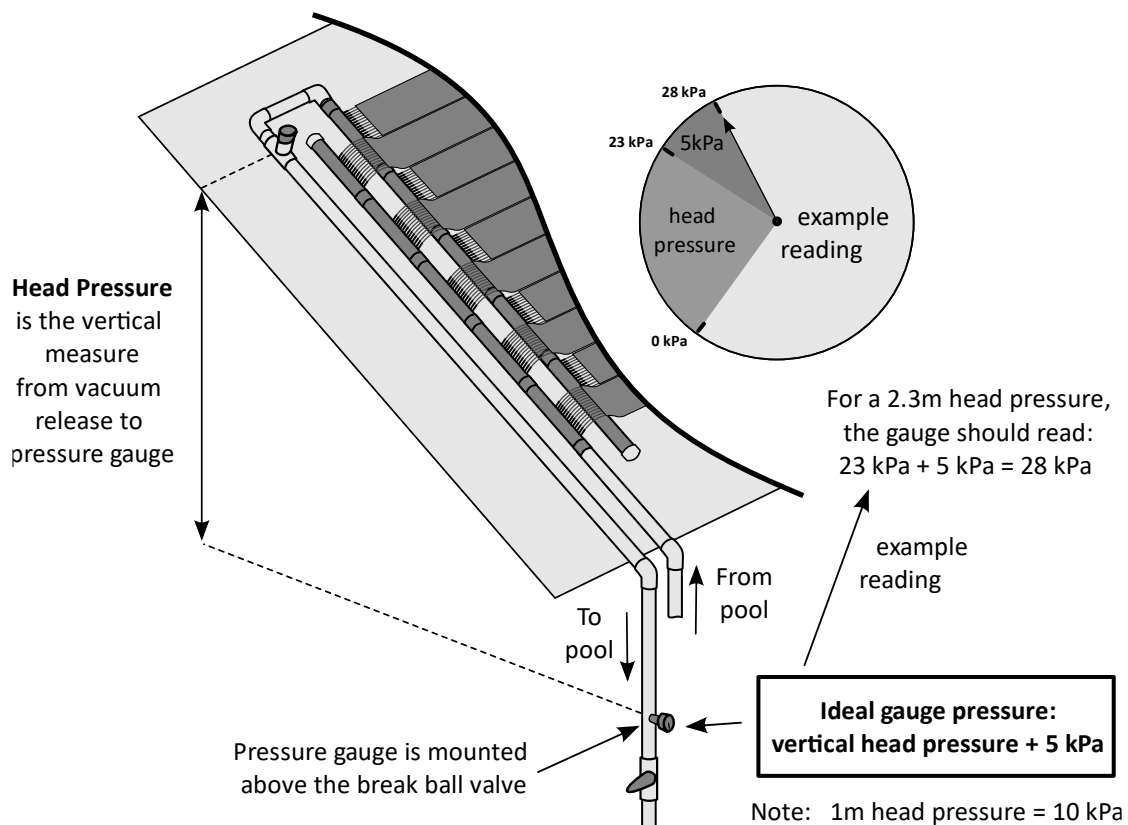
22.1 Installing the Pressure Gauge



The pressure gauge **must be installed on the return line preferably near eye level**. Drill into the PVC pipe using an 8.5mm drill. Insert the rubber grommet into the hole tapered end first. Use pink Teflon tape on brass tread, lubricate the brass barb with silicon spray prior to insertion into the grommet. **Note: PVC plastic should be preheated to 50°C using a heat gun or it may split when drilling.**

22.2 Pressure Check Procedure

To make pressure adjustment depending on over-pressure or under-pressure situations, you'll need to install either a ball by-pass valve (19) to reduce pressure or a ball break valve (16) on the return line to increase back pressure (both at near ground level for easy adjustment). Manual type systems need only the adjustable 3-way ball valve. Collector pressures can then be adjusted as follow:



Gauge Pressure	Pressure Adjustment Advice
Less than: head pressure + 5 kPa	Install ball valve brake (16) (see plumbing diagrams) to increase back pressure in return line
About equal to: Head pressure + 5 kPa	Pressure is ideal no action required
Greater than: head pressure + 5 kPa	Excessive pressure - install extra pool returns or remove eyeballs from returns, or install by-pass (19) with ball valve

22.3 Negative Pressure and Air Bubble Issues

If the pump height is substantial and/or you have more than one return outlet to your pool, it may be that your pump cannot **positive pressurize** the vacuum release valve. In this case you will get undesirable constant bubbling in the outlet to the pool as the vacuum release valve is at negative pressure and is drawing in air. If this happens you will need to install the down draft/brake PVC ball valve (16) on the return line (see plumbing diagrams) and carry out the following procedure:

Start the system and wait for it to settle.

- 1) Constrict flow in the return line using the ball valve brake (16, see plumbing diagrams) lever handle by a small increment.
- 2) If after some time the air bubbling continues, constrict flow by another small increment.
- 3) If air bubbles stop reliably at this point, then the vacuum valve is now at the required positive pressure, the pressure gauge should read a value near the **head pressure** (vertical distance from vacuum release and pressure gauge) + a few kPa's, this is ideal.
- 4) Leave the ball valve brake at this setting/constriction permanently (remove handle).
- 5) If the required constriction is greater than 50% you will need a stronger pump.



Read Carefully

Use the below procedure for solving air bubbling issues, DO NOT remove or drop the level of the vacuum release valve or increase pump strength. The vacuum release valve MUST be mounted as specified to ensure collectors are not pressure worked.

22.4 Adjusting the 3 Way Valve for Manual Systems

The following procedure for a manual system need be carried out only once during installation.

- 1) Open the three way ball valve (9, see plumbing diagrams) using the lever handle by a small increment.
- 2) Wait to see if there is sufficient flow and back pressure to create positive pressure at the vacuum valve (7).
- 3) If after some time air bubbling is still present in the return line, open the three way valve (9 see plumbing diagrams) by another small increment.
- 4) If air bubbles stop reliably at this point, then the vacuum valve is now at the required positive pressure.
- 5) Fix in place a back stop on the ball valve lever handle at this travel point, as this will be your maximum opening point for your three way valve when turning the heating system on again.

22.5 Optimizing Pressure for Oversized Pumps



CAUTION

Over-sized pumps and flow rates could potentially limit the lifetime of your collectors due to pressure working. Note, the return line to the pool MUST be unconstricted, with an appropriate number of pool outlets so as not to create significant back pressure.

For an over-sized solar pump (13, see plumbing diagrams) we recommend the following procedure, carried out only once during installation, to limit pressures inside the panels.

- 1) Removed any potential constrictions in the return line going back into the pool such as eyeballs in the return outlets.

- 2) If pressure is still too great (as measured at the pressure gauge, see above **Pressure Check Procedure**, install a by-pass ball valve (19) (see plumbing diagrams).
- 3) Turn the solar pump on with the by-pass-ball valve fully open.
- 4) Constrict the by-ball valve in small increments until you get the correct pressure, see above.
- 5) Fix the by-pass ball valve handle in place by some means.

23 Checking for Balanced Water Flow

At midday with the sun shining on the collectors and the pump operational, run your hand over every part of each collector in the array. The collector tube near the supply should be cool to the touch while the tubes near the return should be only slightly warmer to the touch. No part of any collector should be hot to the touch. **Hot spots indicate that there is no or little water flow through this part of the tubes.**



Tip

During operation the outlet water flow should be strong with a temperature no greater than about 5-7°C that of the inlet. **Why?** *Faster flows rates will result in a lower temperature difference across the collector array and hence will maximize collector efficiency; however this should be balanced against electricity usage and maximum allowable tube pressure.*

24 Service and Maintenance Schedule



CAUTION

Important: before carrying out any system maintenance you **MUST** check for any manual and or technical service bulletin updates and download the latest installation manual from our Downloads Page: www.EcoOnline.com.au/downloads

Maintenance Issue - Service Procedure	Monthly	Quarterly	Annually
Strainer – Depending on pool usage and level of debris you may need to clean the strainer regularly.	X		
Leaks – A leak check should be performed as leaks can corrode metal roofs and gutters. Any leak should be repaired.		X	
Non-Return Valve – The non-return valve (8 see plumbing diagrams) is a critical system component. It should be checked that the 6mm hole drilled in the flap has not become blocked and that the collectors drain fully when the pump stops.		X	
Vacuum Release Valve – The vacuum release valve (7) is a critical system component. It should be checked that it is not weeping corrosive water onto the roof.			X
Plumbing Degradation – Plumbing should be checked for signs of UV and/or chemical damage. Replace as needed.			X
Debris Accumulation – Check that there is no build up of debris around pipe work or collectors, and that water has a clear path to run down.			X
Winterizing System – You may need to prepare your system for winter dormancy each year.			X

24.1 Collector Puncture Repair Procedure



Locate the leak, cut a 3mm cross section of tubing, strip webbing, and thread the locking sleeves. Lubricate barb joiner using silicon spray. Join tubes using the barb connector. Lubricate and slide on locking collar, using a blunt object, such as the back of a kitchen spoon.

25 User Information

25.1 Notes on First Usage

After the system is switched ON for the first time, please be aware that it will take up to 1 week for the pool **and the surrounding ground around the pool** to warm up and come to a new temperature equilibrium. As such systems that are used intermittently, for example on weekends only, will not result in pool temperatures as high as continuously ON systems.

25.2 Potential for Hot Water at the Outlet on Start Up



WARNING

Users should be made aware that under rare conditions on system start up, very hot water ~ 60°C will be ejected at the outlet return ports which has the potential to scold swimmers. Users (especially children) should be advised to keep away from outlet during start up.



WARNING

Due to the potential for hot water at the outlet on start-up, solar heating outlets must not be connected to water features or waterfalls, or any other outlet(s) that are not permanently fixed underwater. Where practicable, solar heating systems shall be designed to completely drain down. Where a solar heating system cannot be designed to drain down, a water bypass or tempering device arrangement shall be installed prior to the solar heating outlets into the pool. Contact info@EcoOnline.com.au for a recommended return line water tempering configuration.

26 Important Installation Check List

Your installation should have the following elements:

- Correctly sized pump or pressure optimization carried out.
- A third balance pipe must be installed for all collector arrays.
- For independent systems not going through the filter, the supplied strainer **MUST** be installed.
- The supplied vacuum release valve **MUST** be installed on the roof on the return line.
- Smooth flow is achieved; little air bubbling is present in pool after initial purging.
- A hot spot check was performed. All tube lengths are cool during full sun exposure, indicating water flow.
- A non-return valve was installed (with a small 6mm hole drilled in the flap).
- The drain/equalization tube was installed on the supply and return line.
- Collectors should run and be adhered to the top of ridges of any roof structure, not the valleys to allow water and debris drainage.
- Frost proofing was considered. All PVC lines are sloped such that water runs back into the pool at night.
- Solar controller roof sensor was mounted on the roof and not on a solar collector.
- Extra silicon adhesive was used for collectors near roof exclusion zones (near roof edges).
- Pipes and manifold assemblies are mounted above roof valleys to allow clear drainage of water and debris.
- The pressure gauge was installed on return line and the pressure optimization procedure was carried out.
- User is aware of the maintenance schedule.