Certified System

Australian Standard Certified Polymer

EcoOnline PoolMaster$_{X2}$ ™

10 Tube PVCn Strip Collector

Solar Pool Heating System

Installation and User Manual - Revised 20/11/2020

EcoOnline.com.au
best choice under the sun

Optex Solar Pty. Ltd.
ABN: 88 128 228 884
www.EcoOnline.com.au
email: info@EcoOnline.com.au

EcoOnline.com.au best choice under the sun

Contents

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 a **SAFETY** issue that **may** cause injury or property 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? *Italic text is optional reading. Gives extra information and reasoning for recommendations that are non-obvious and/or counter intuitive.*	

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 meet 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 Reltech Pool Pumps
- 3 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 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.

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 conservative 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 high flow rate; take care not to over-pressurizing 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.

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 1st Story Install (3m): Minimum Input Watts Required**	**For 2nd 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									
	Average depth								
Waters Area	**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 1st Story Install (3m): Maximum Input Watts**	**For 2nd 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)**

6.2.1 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 m^2 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.

6.3 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.*

6.4 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 × 4m² Strip Collector Kit (number of kits depends on system purchased)				
				
1 × 27m 10 tube PVC strip role (150mm wide)	**4** × 10 Tube Manifold (150mm), **1** × Grommet, **2** × Cable ties	**40** × tube locking collars	**1** × silicon tube per 4m² kit	**1 ×** Pipe clamp + 0.5m band for fixing per 4m² kit

Other Essential System Components (depending on system purchased)					
					
1 × 32/40 PVC Vacuum breaker valve	**1 ×** Can of silicon lubricant spray	**1 ×** Drain Down Kit	**2 ×** 10 locking collar for repair kit	**1 ×** 10 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	P-type PVC cement & primer	Fixing screws for perforated band

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

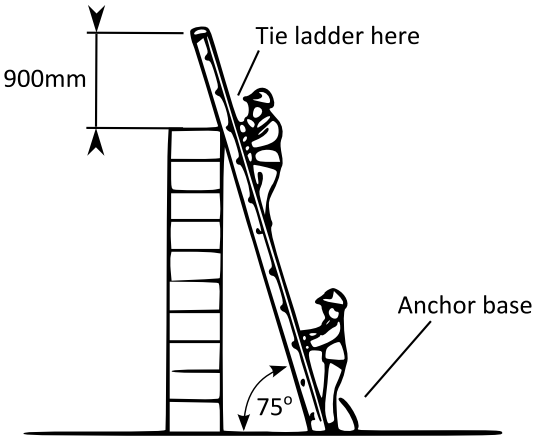
11 Safety When Working at Heights

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

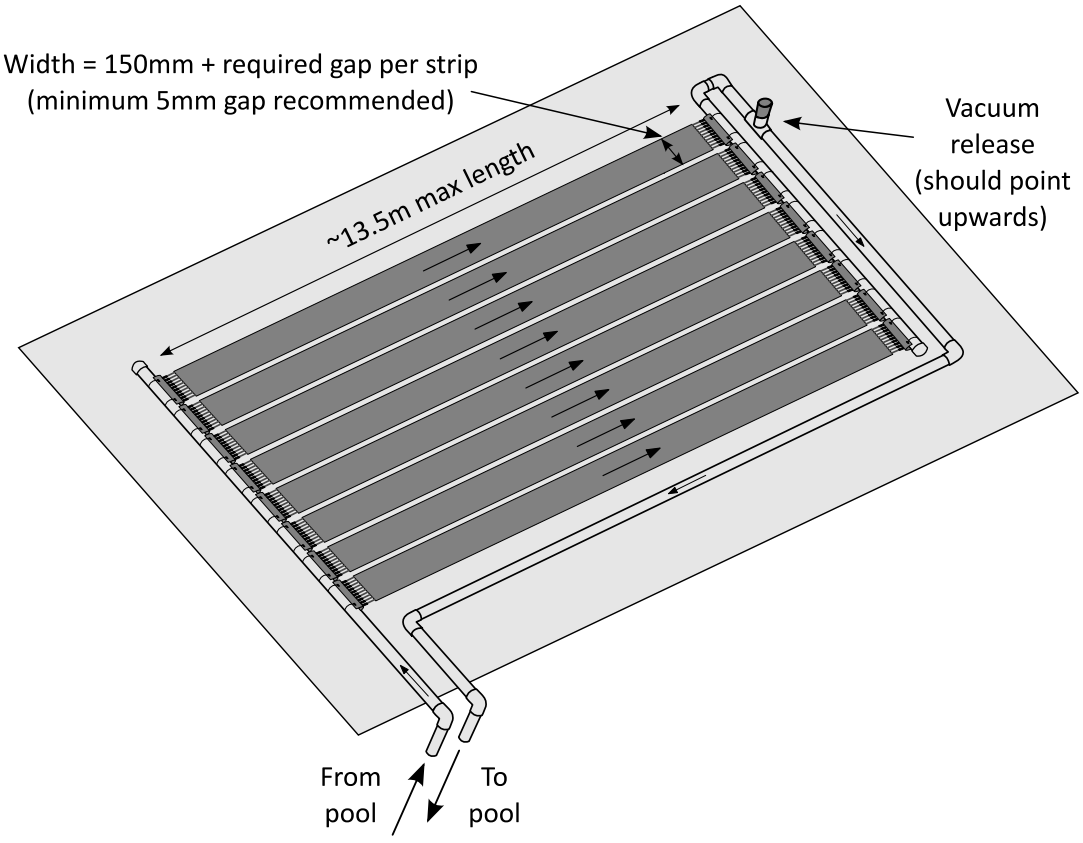
The collector array can face anywhere from West to East, with an optimal orientation of North for most areas. South facing orientations are generally not recommended, unless the roof pitch is quite flat < 5˚ for southern states and < 15˚ for northern states.

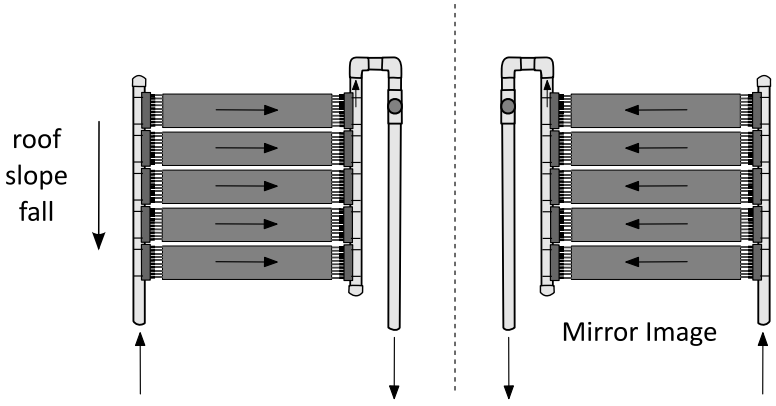
13 Collector Water Flow Configurations

CAUTION

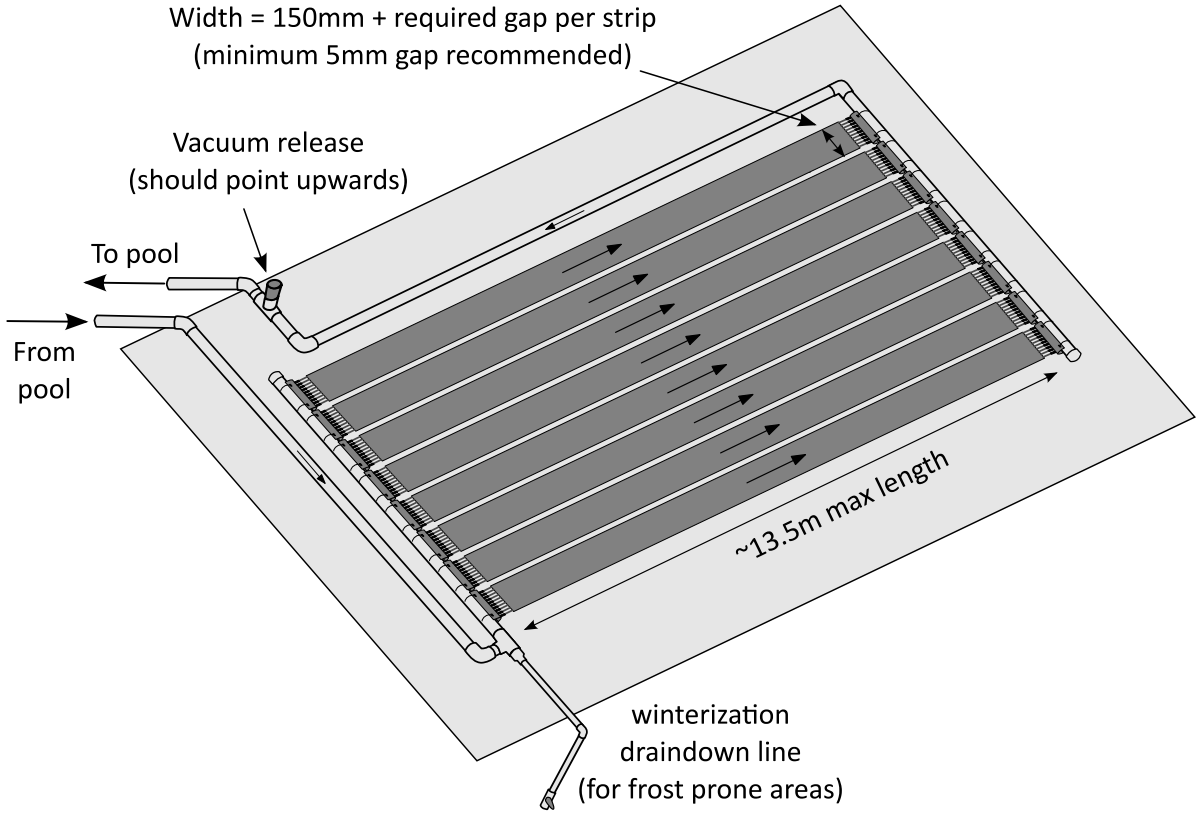
All collector array configurations must be installed with a **vacuum release valve** on the return line and a **non-return valve** on the pump side.

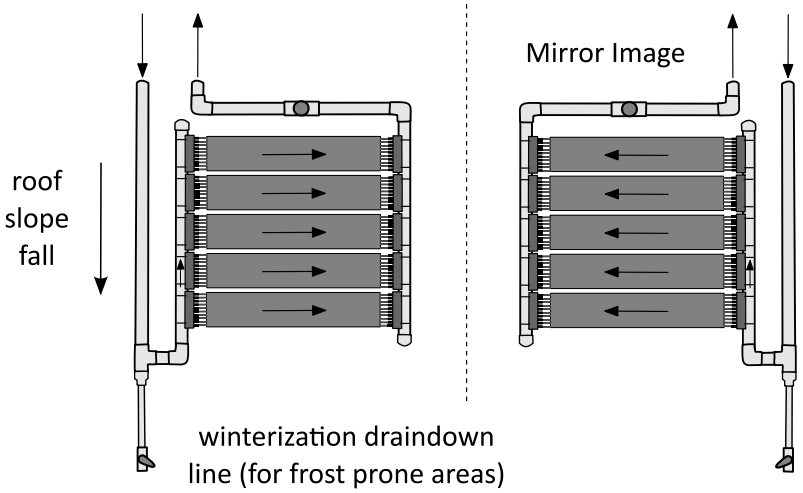
13.1 Bottom Feed Basic (Square, Parallelogram or Trapezoid)



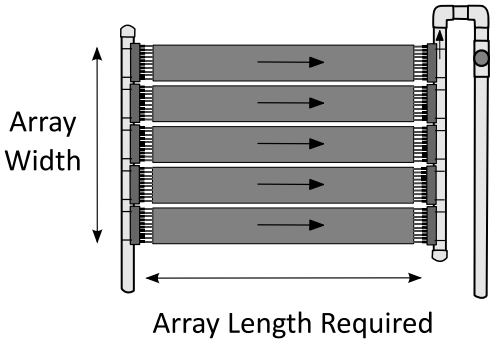


13.2 Top Feed Basic (Square, Parallelogram or Trapezoid)





13.3 Narrow Roof Space (Extra Manifolds) Configuration



Array Length	Manifold Count* (per role)	Array Width** (per role)
13.5 m	4 (supplied)	320 mm
9 m	6 (2 extra required)	480 mm
6.75 m	8 (4 extra required)	640 mm
5.4 m	10 (6 extra required)	800 mm
4.5 m	12 (8 extra required)	960 mm
3.86 m	14 (10 extra required)	1120 mm
3.375 m	16 (12 extra required)	1280 mm

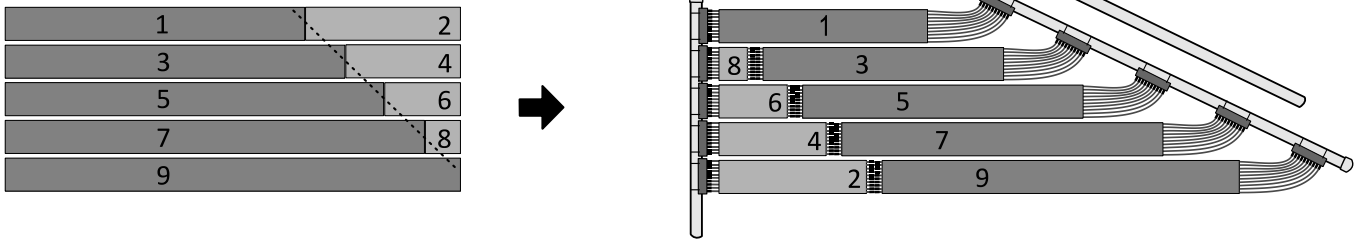
* Manifold count must be an even number
** Includes the 150mm strip and 10mm gap

Read Carefully

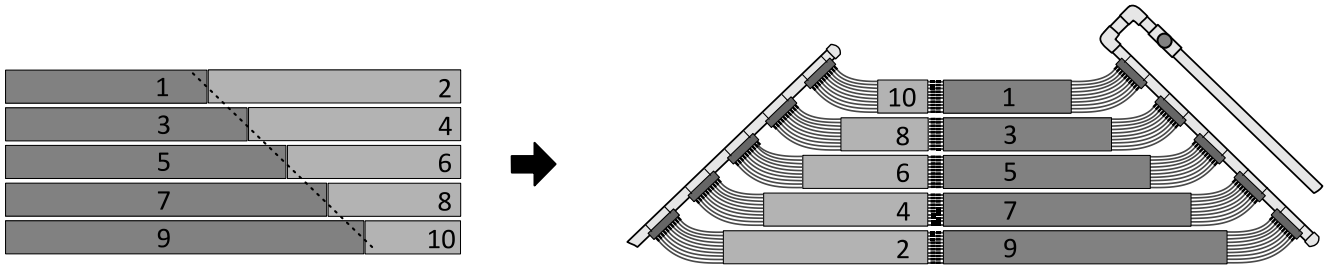
The extra manifold configuration is recommended over the multiple loops up and back due to a more aesthetic appearance, however you will need to purchase extra pairs of manifolds and extra joiner sets (if required).

13.4 Trapezoid Narrow Roof Space (Extra Manifolds and Splice Kits)

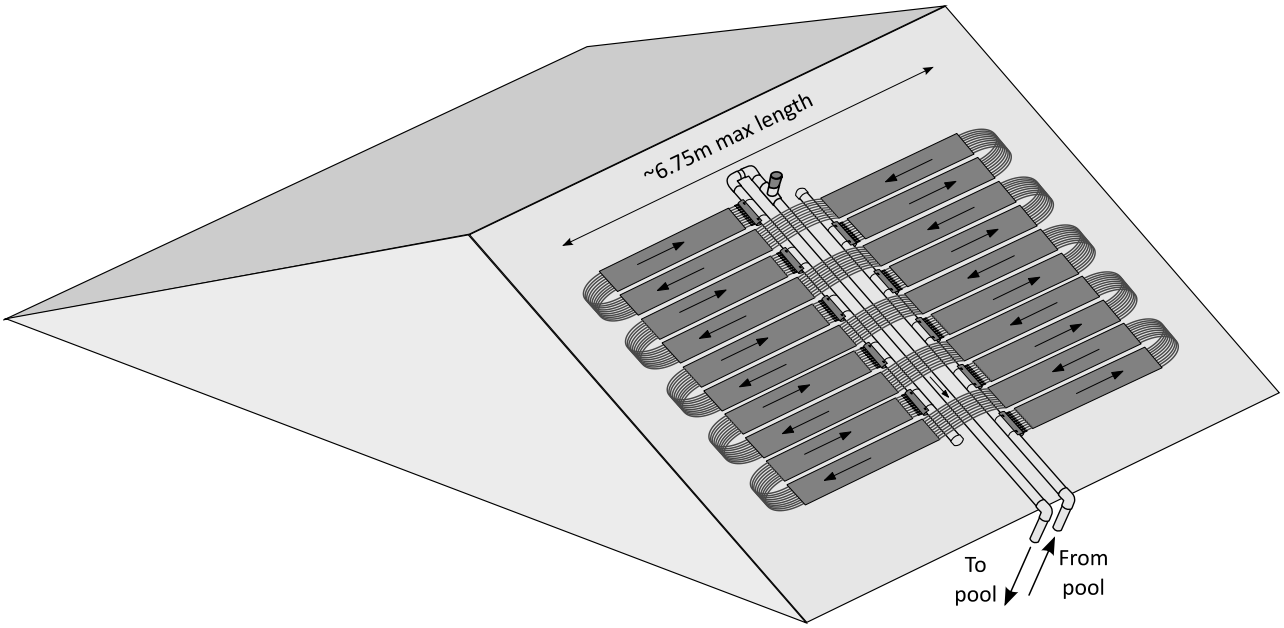
Trapezoid arrays require 10 barb splicing kits (with collars) to join the off-cuts

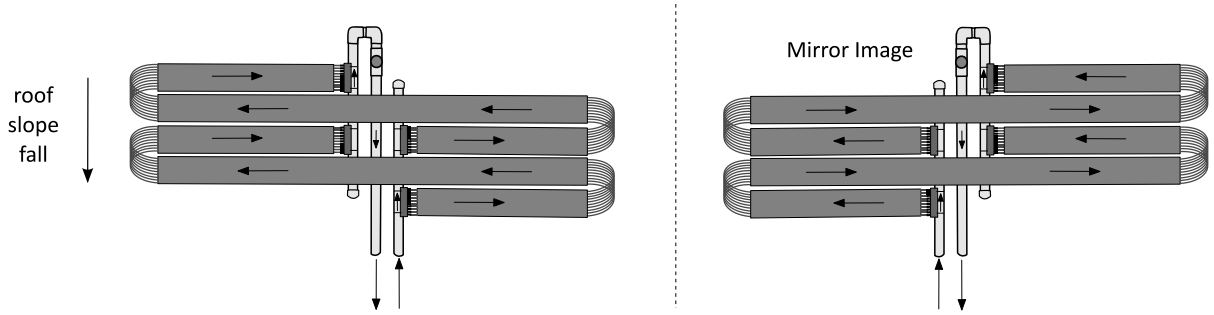


Budget 1 splice kit per strip run



13.5 Bottom Feed Overlap (Square, Parallelogram or Trapezoid)



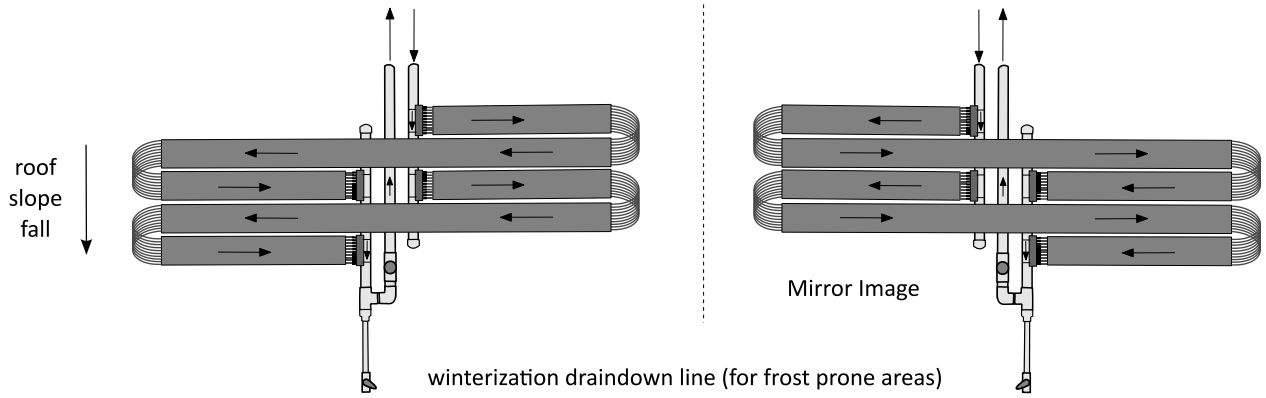


Read Carefully

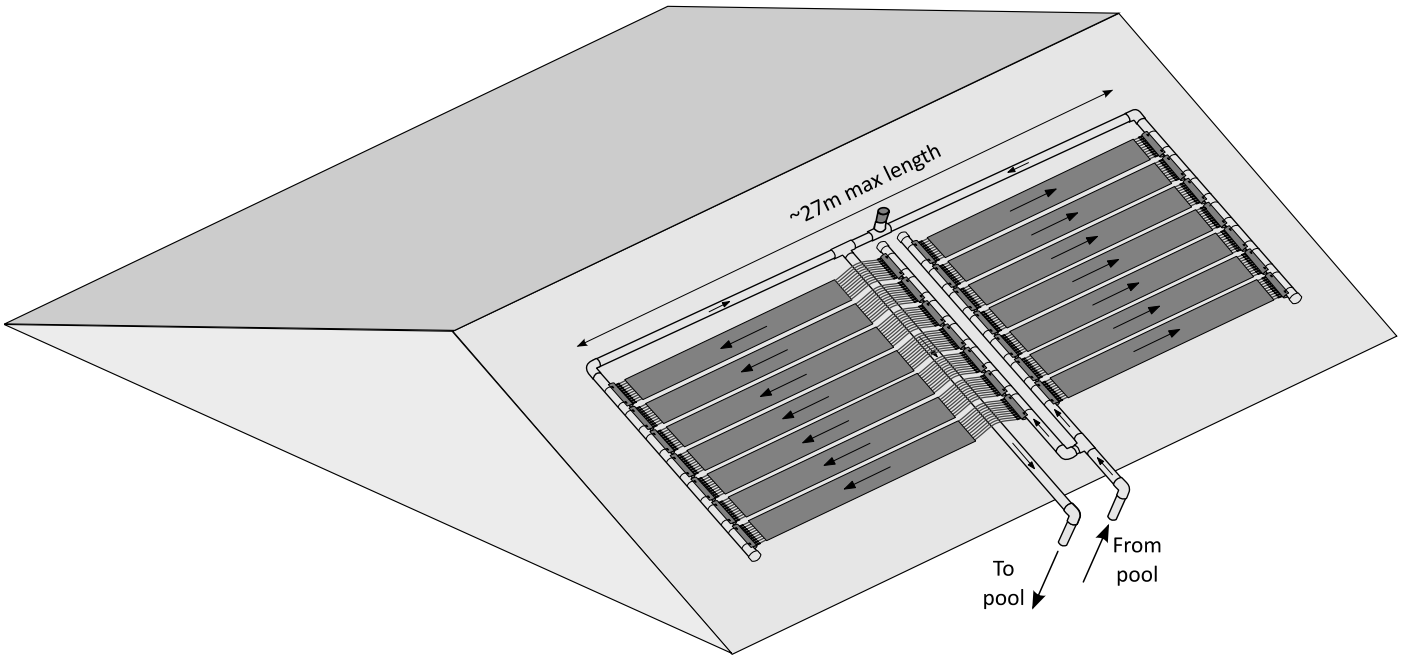
As a general principle for all configurations, water flow in the manifold supply and return pipe **MUST always flow in the same direction to achieve balanced water flow in each strip**. Either up the roof for bottom feed system or down the roof for top feed systems.

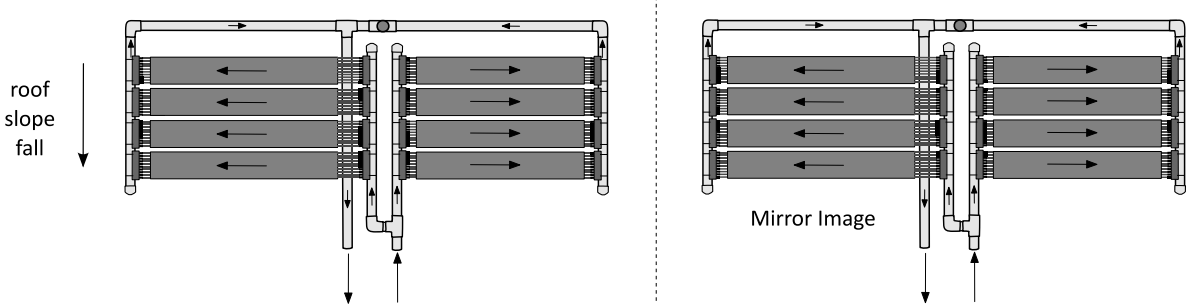
Why? *Without the third balance pipe water always takes the shortest path, reducing flow in the higher tube strips.*

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

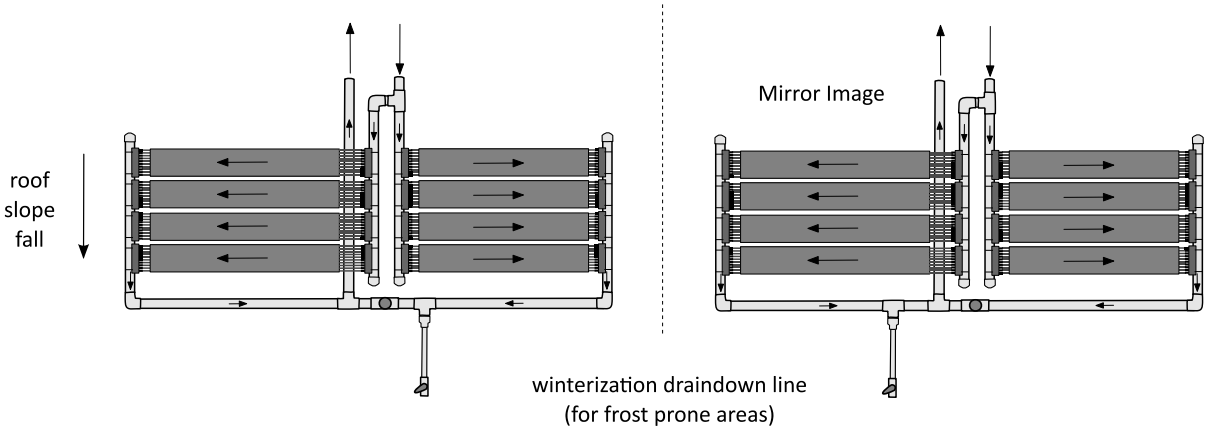


13.7 Bottom Feed Butterfly (for long 27m collector arrays)

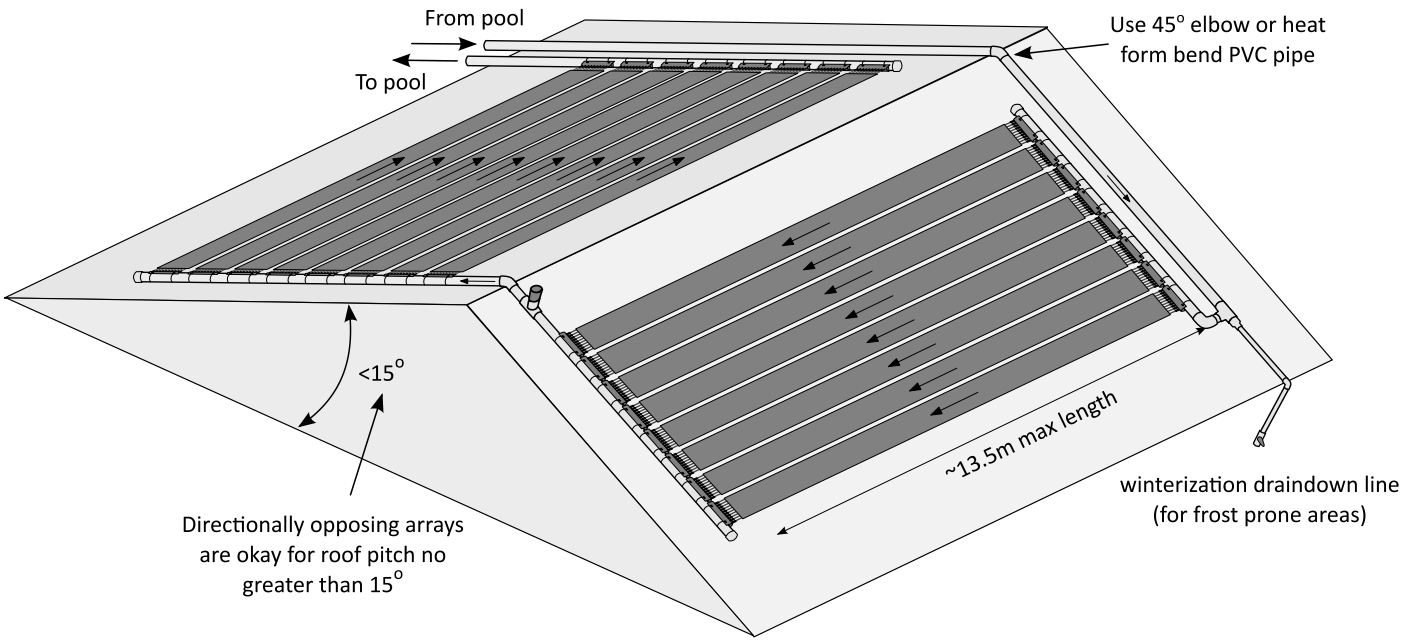


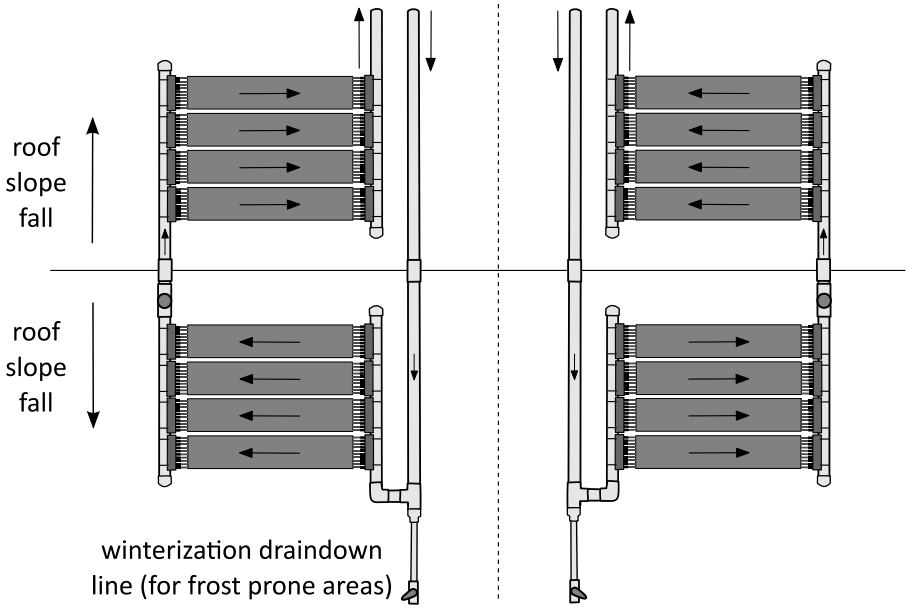


13.8 Top Feed Butterfly (for long 25m collector arrays)



13.9 Multi-Directional Opposing Bottom and Top Feed Arrays



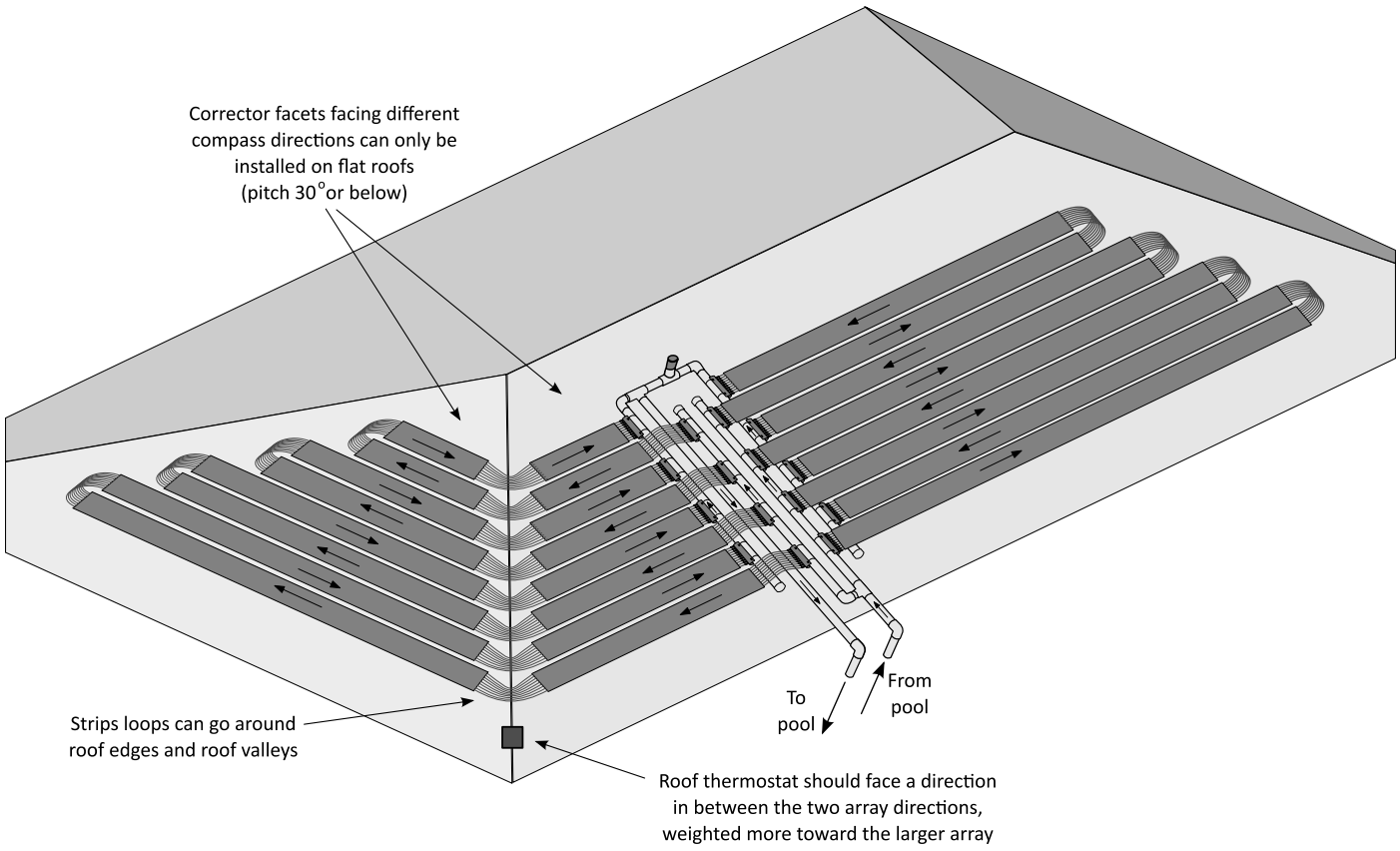


Read Carefully

Collector arrays that face opposing compass directions are not recommended unless the roof pitch is less than ~15˚. 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.*

13.10 Multi-Directional Arrays - Option 1

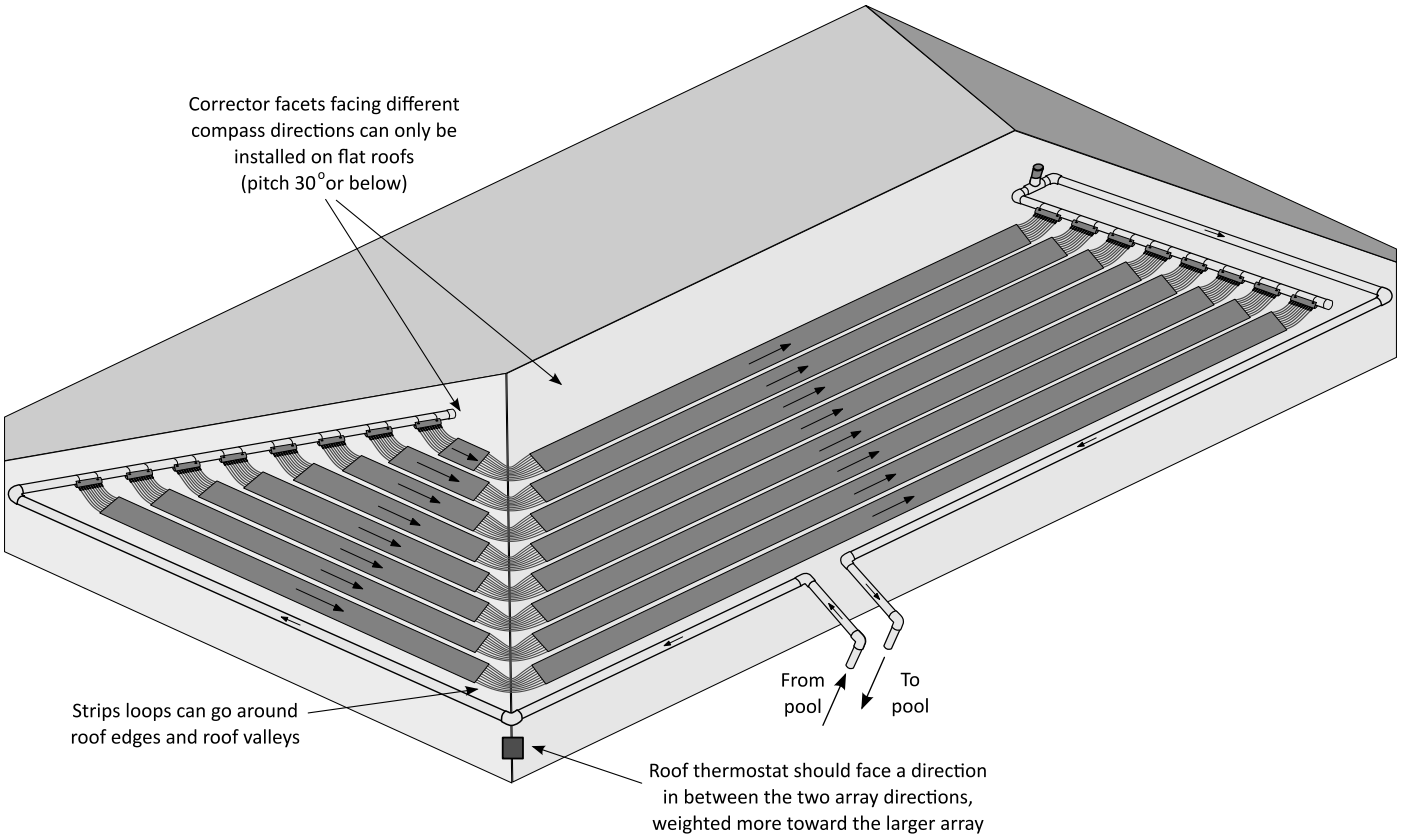


Read Carefully

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.*

13.11 Multi-Directional - Array Option 2

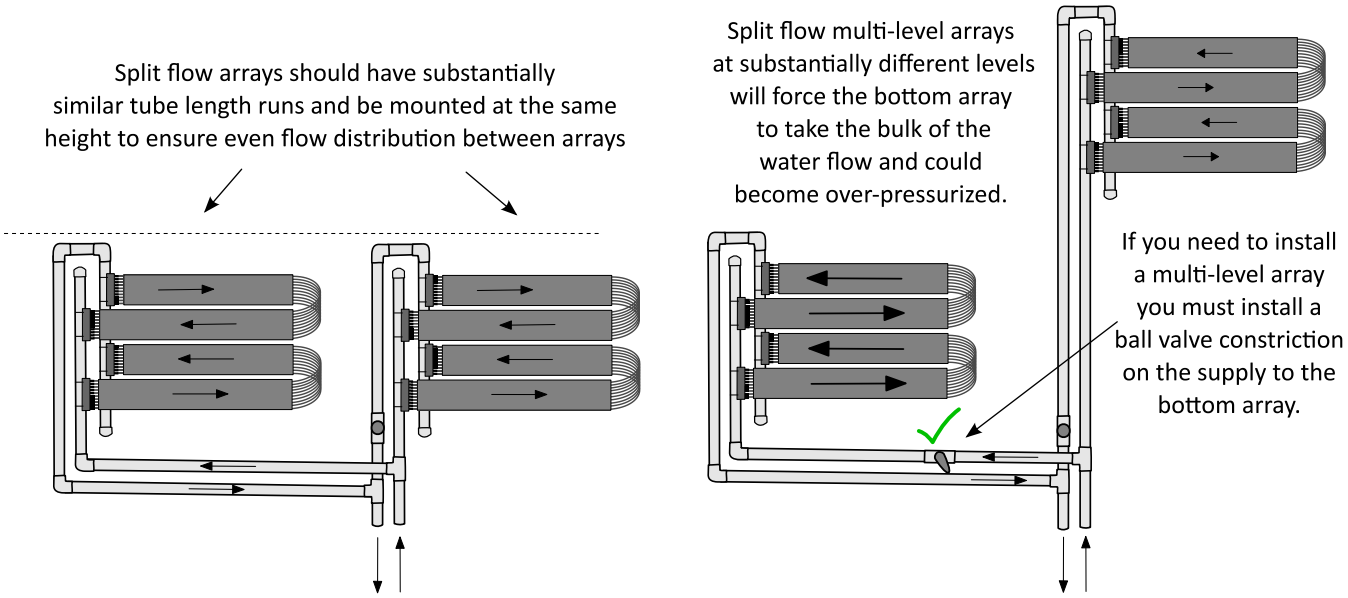


Read Carefully

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.*

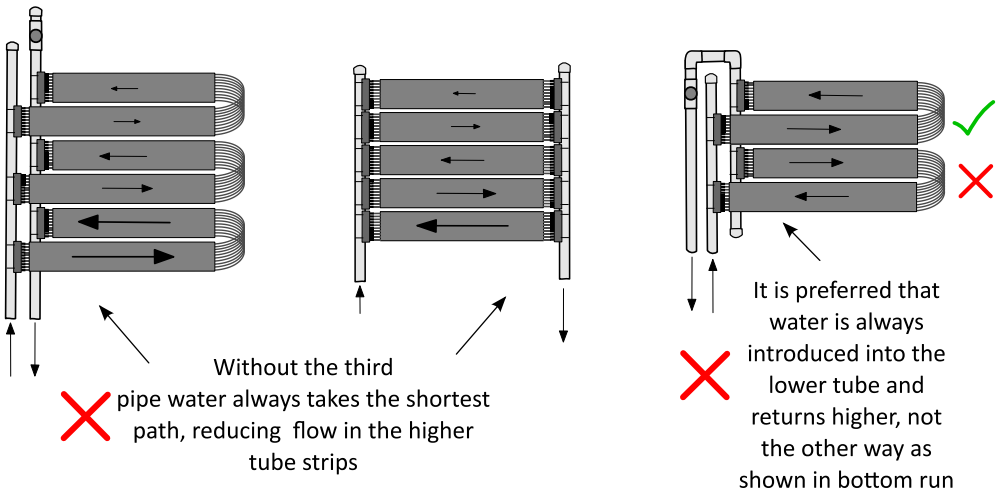
13.12 Bottom Feed In-Parallel Split Arrays (For Multi-Level Split Arrays)

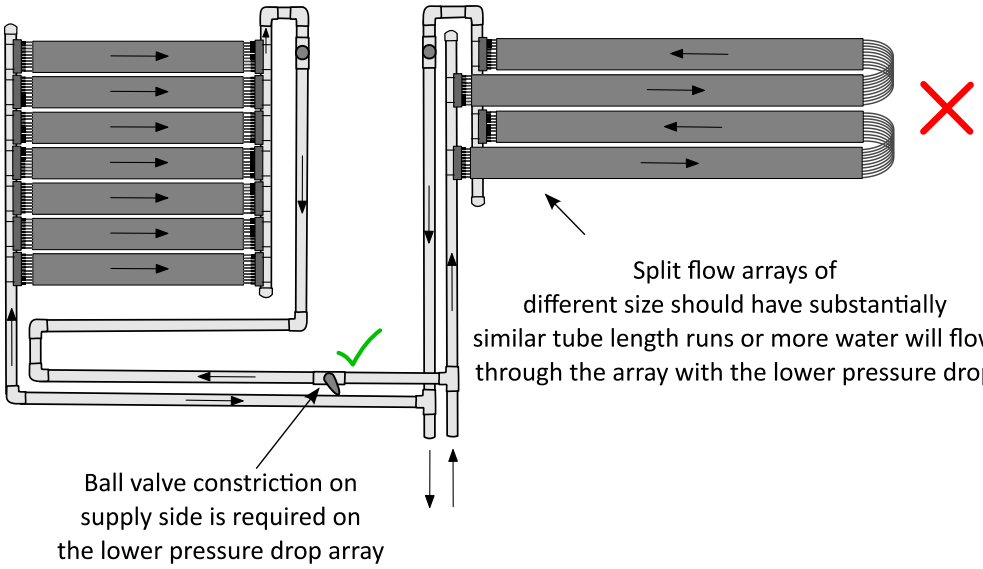


Read Carefully

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.

13.13 Plumbing Configurations Not Recommend



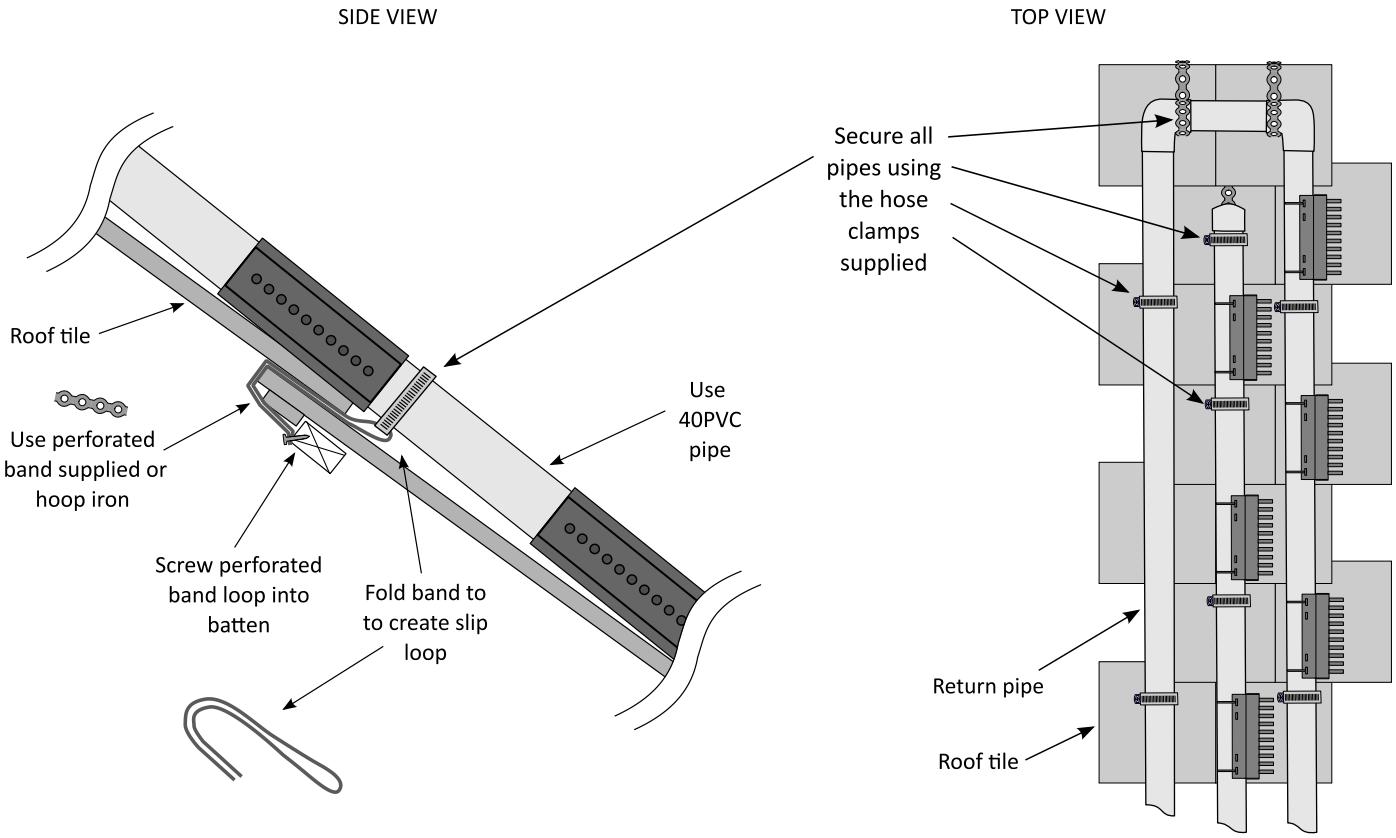


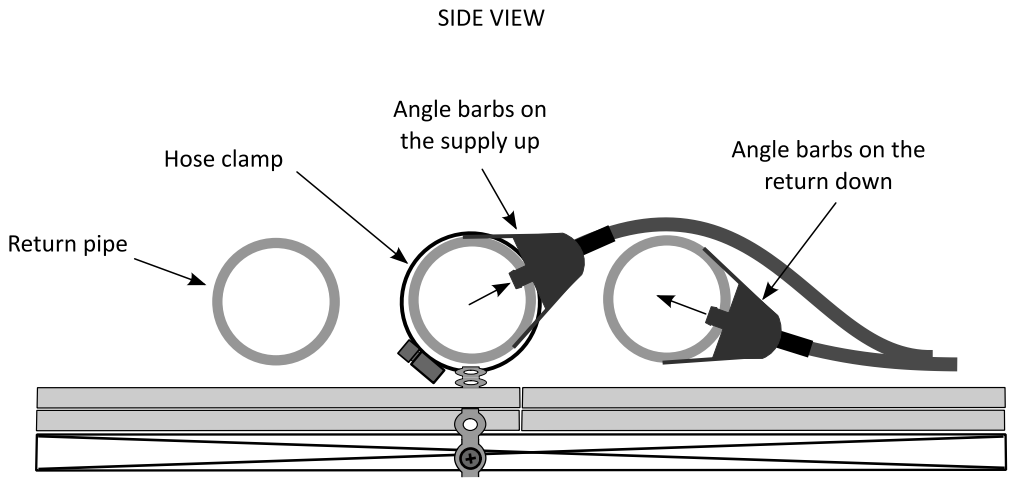
14 Roof Assembly and Attachment

WARNING

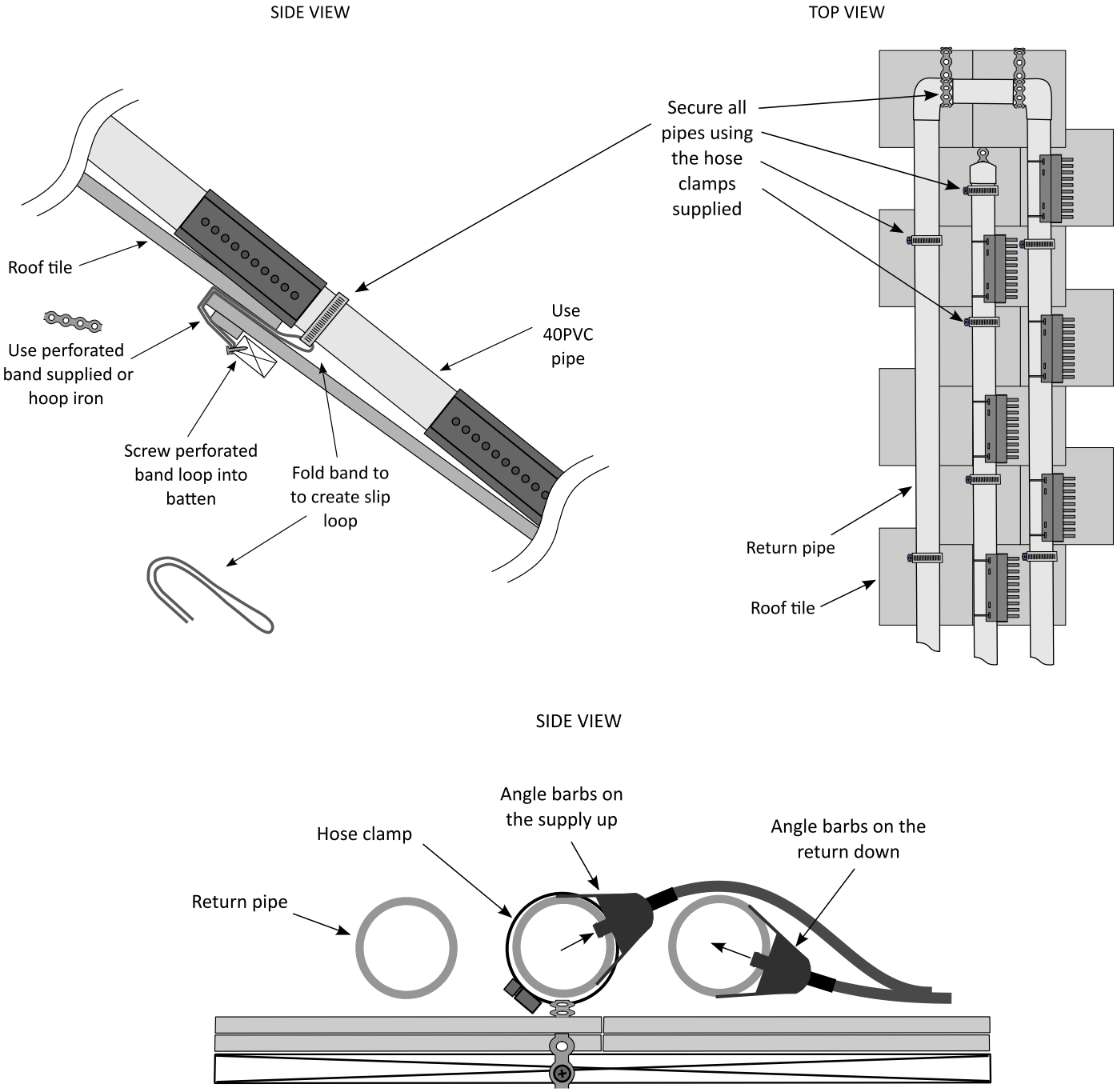
When working with power or hand tools always follow the safety instructions. Wear the recommended personal protective apparel. Make sure electrical cables are kept away from any water and from foreign objects which pose **a potential cable severing or crushing hazard**. When using glues, solvents or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

14.1 Tile Roof Mounting of Manifold Assembly

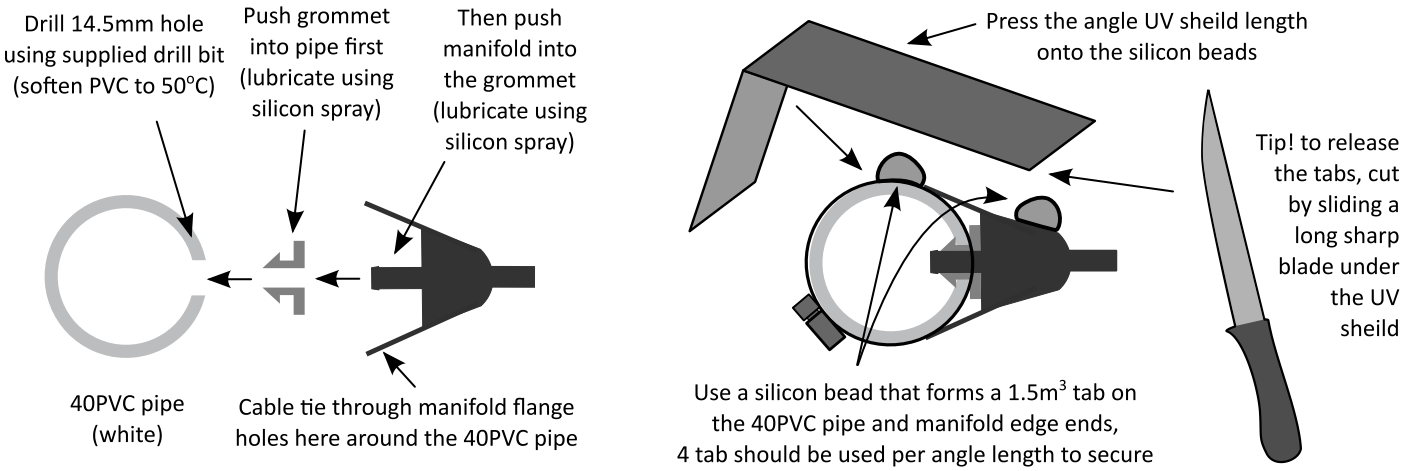


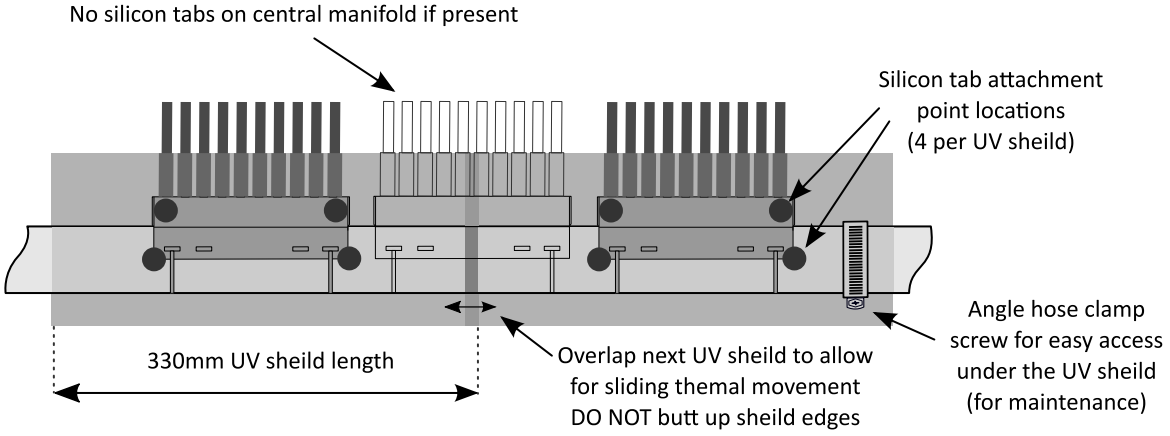


14.2 Corrugated Metal Roof Mounting of Manifold Assembly



14.3 Manifold and UV Shield Install Procedure

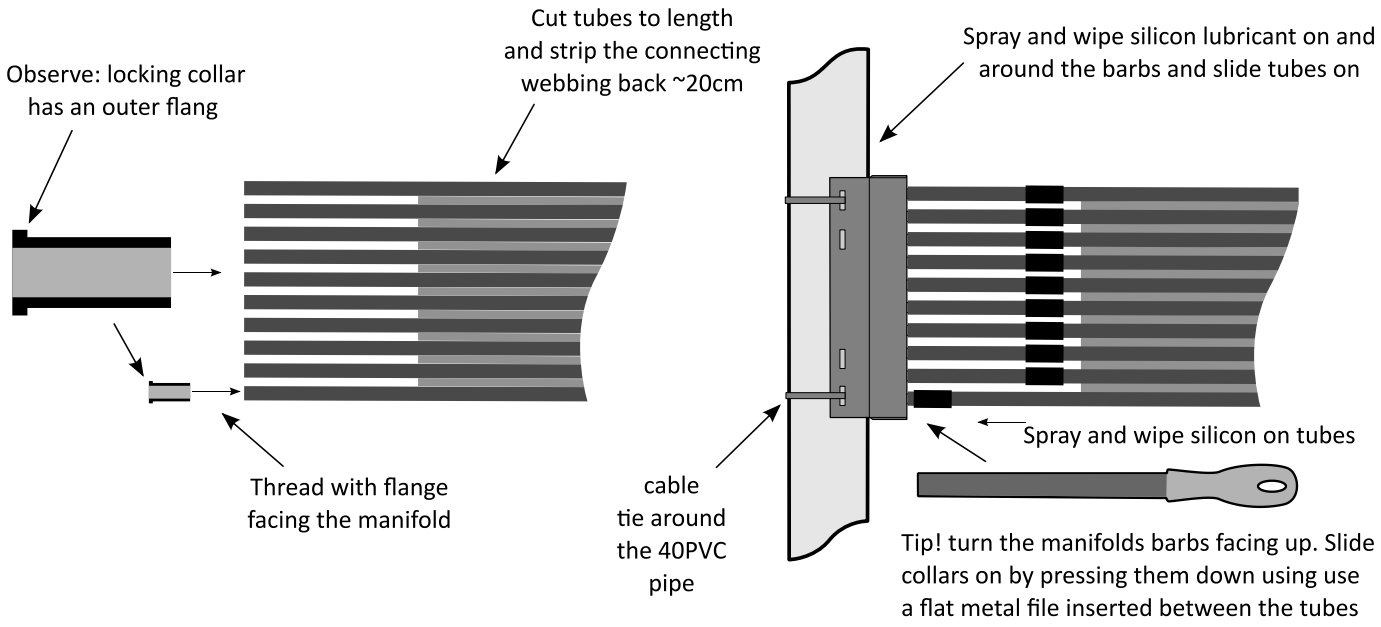




Read Carefully

Note the metal UV shield will have a different thermal expansion to the polymer PVC pipe, hence observe the above points. This is so that the PVC pipe has thermal room to move without placing shear stresses on the manifolds PVC barb.

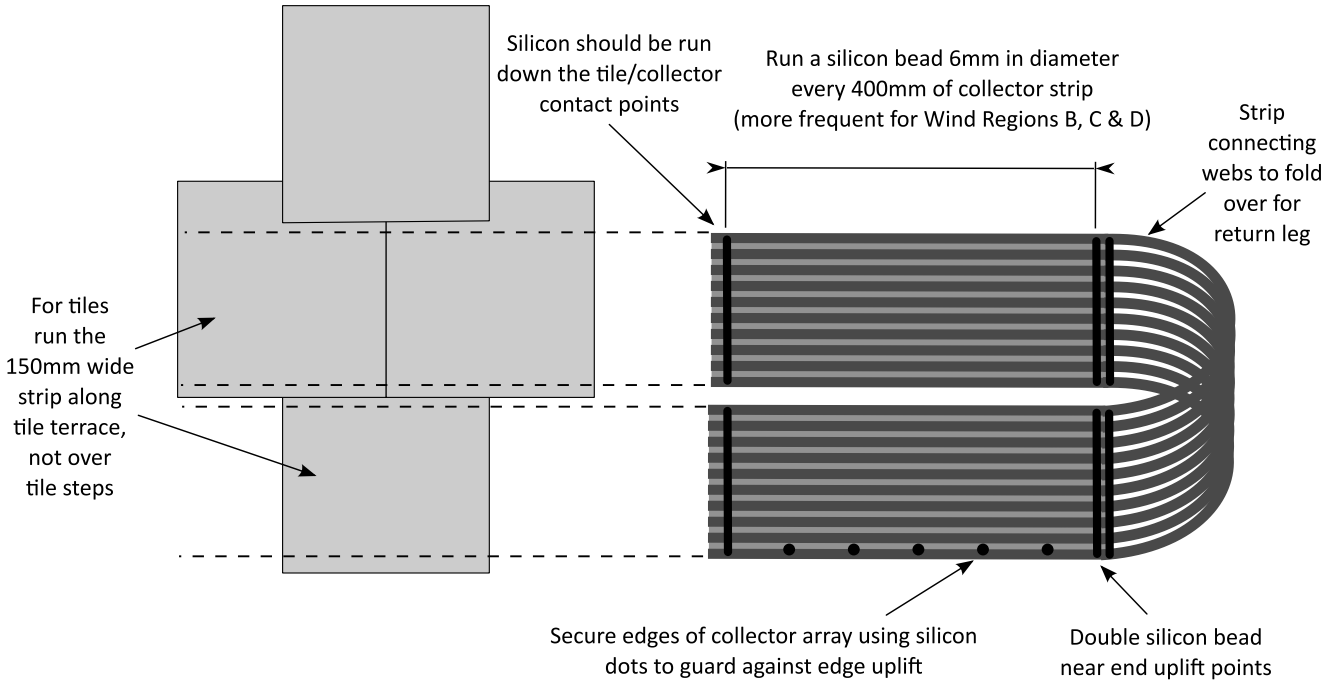
14.4 Connecting the Tubes to the Manifold Barbs



WARNING

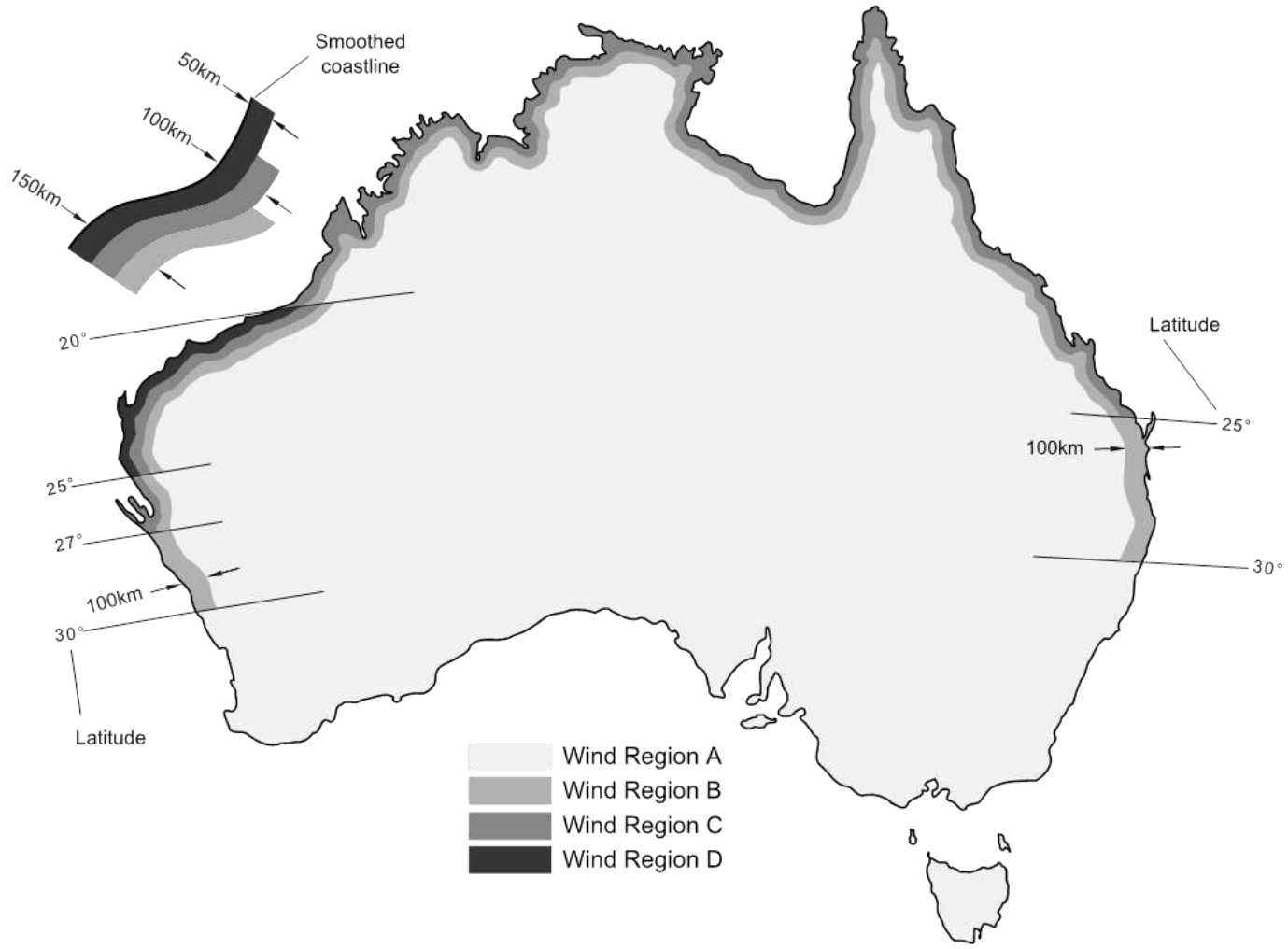
Take care not to overspray silicon on a critical part of the roof as this will create poor silicon glue adhesion and a dangerous slippery working environment. **Spray toward the manifold assembly piping only - NOT toward the outgoing tubes**. We recommend you use a cloth and clean your hands regularly.

14.5 Strip Collector Assembly and Gluing



 Read Carefully	Ensure roof is clean and dry. Any moss will need to be removed using a high pressure stray. 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.

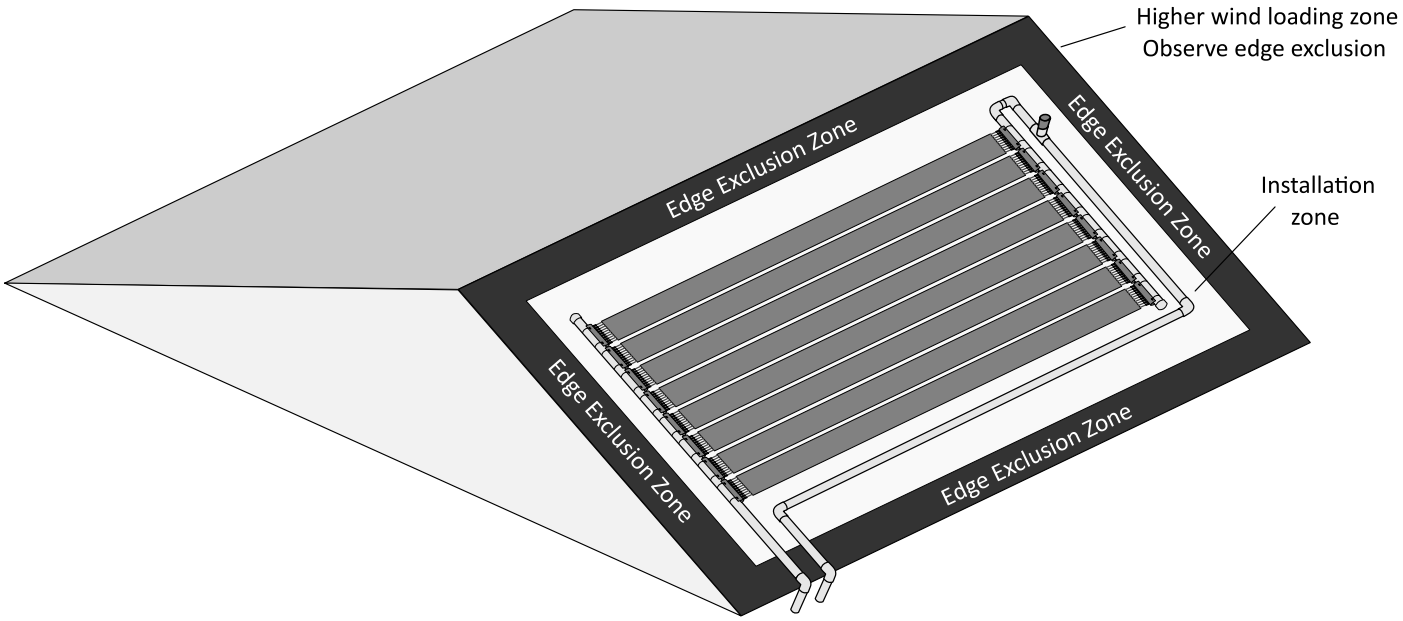
15 Extra Wind Proofing



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.

15.1 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.

16 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.**

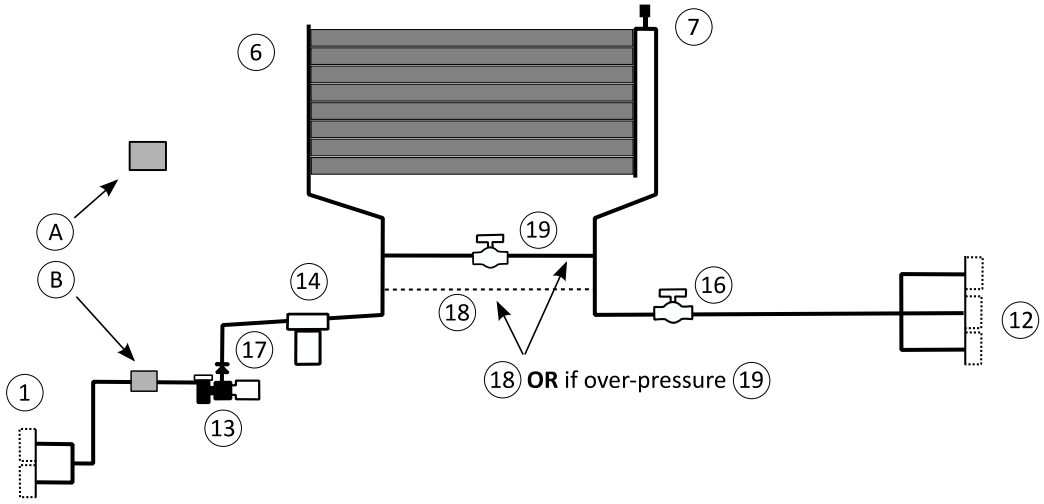
1) Measure roof and plan out your installation using a diagram first.
2) Lay a few manifolds next to PVC pipe **out on the ground**, with the appropriate strip spacing and mark the 14.5mm holes to be drilled.
3) If your manifolds run at an angle or you are installing on tiles, you'll need to check the tube strip spacing pattern on the roof to get the correct manifold spacing.
4) Drill the first manifold holes and assemble the first few manifolds, checking spacing up on the roof 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 return 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.

17 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.**

17.1 Configuration 1: Independent/Separate System



LEGEND:

A - Roof Temperature Sensor
B - Pipe Temperature Sensor
1 - Pool suction
6 - PVC solar strip collector
7 - Vacuum release valve
12 - Pool return
13 - Dedicated solar pump
14 - Tuffman strainer canister
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)

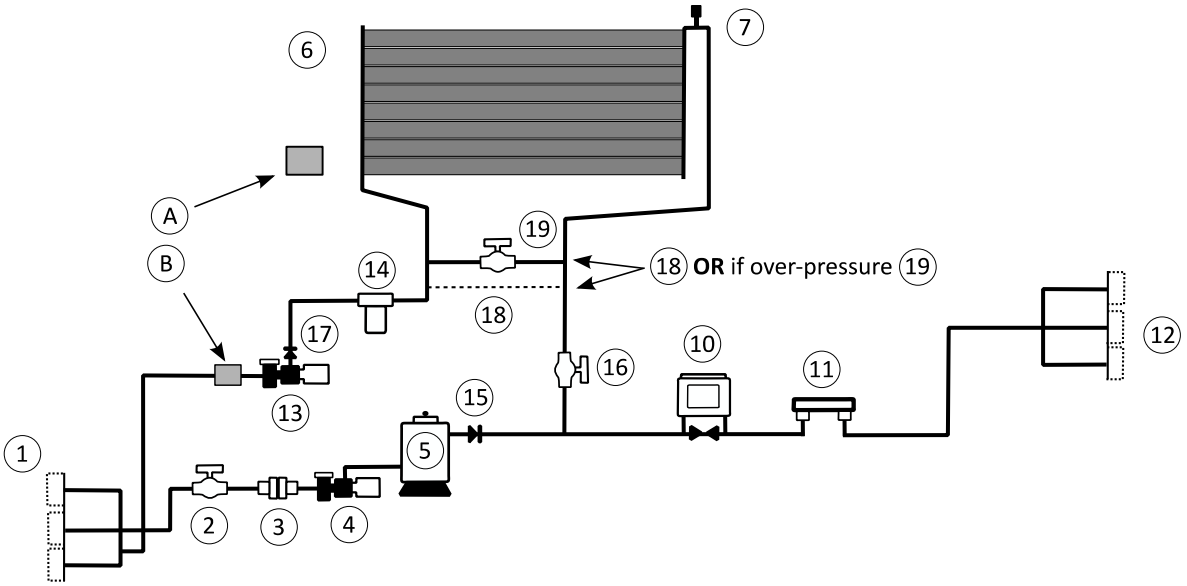
Notes: Solar pump can run independently of the filter pump. A and B are the recommended temperature sensor installation zones for the controller

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.**

17.2 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:
* 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	* 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

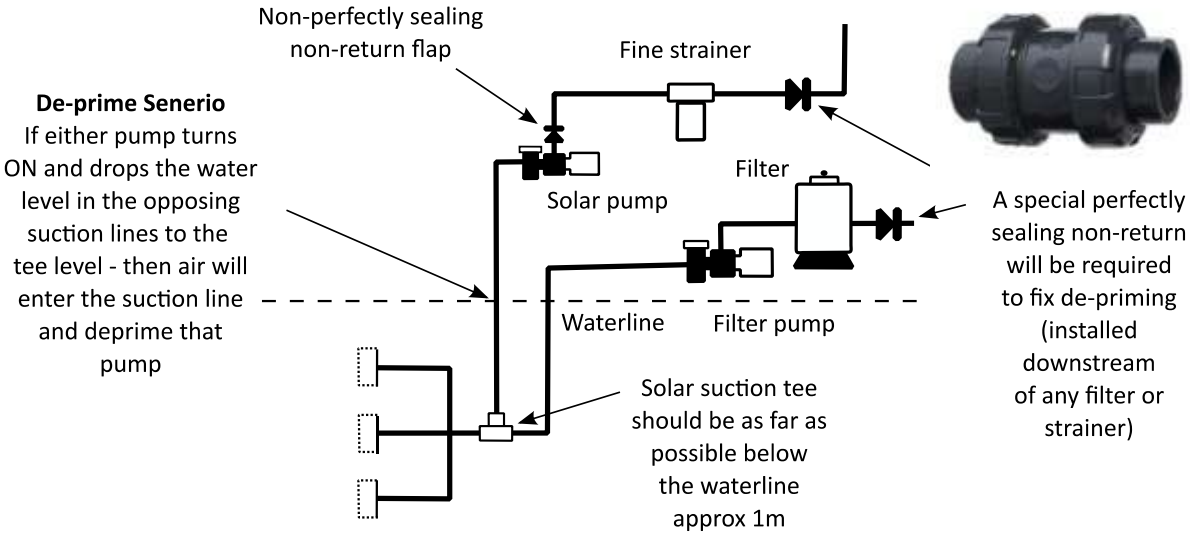
If the pool has more than one return port and the filter pump and solar pump run together, the installer must check the combined flow does not exceed suction inlet flow rate limits.

17.3 Notes on Teeing into the Suction Line for Configuration 2

WARNING

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

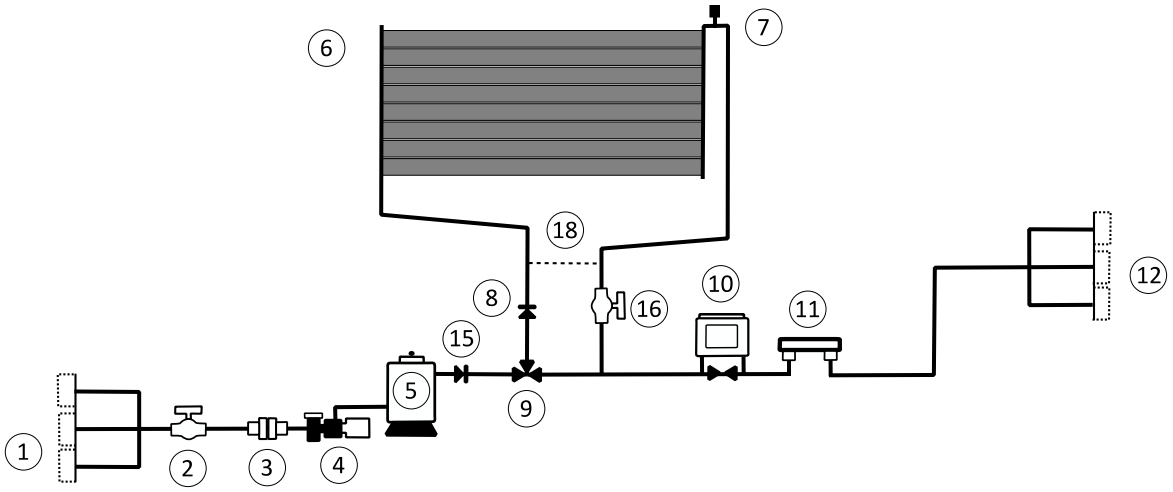
Why? *When the filter pump starts it will create negative pressure in the suction line which will drop the water line in the solar suction line - if the water line drops below the tee point air will be drawn de-priming the main filter pump.*



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.

17.4 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

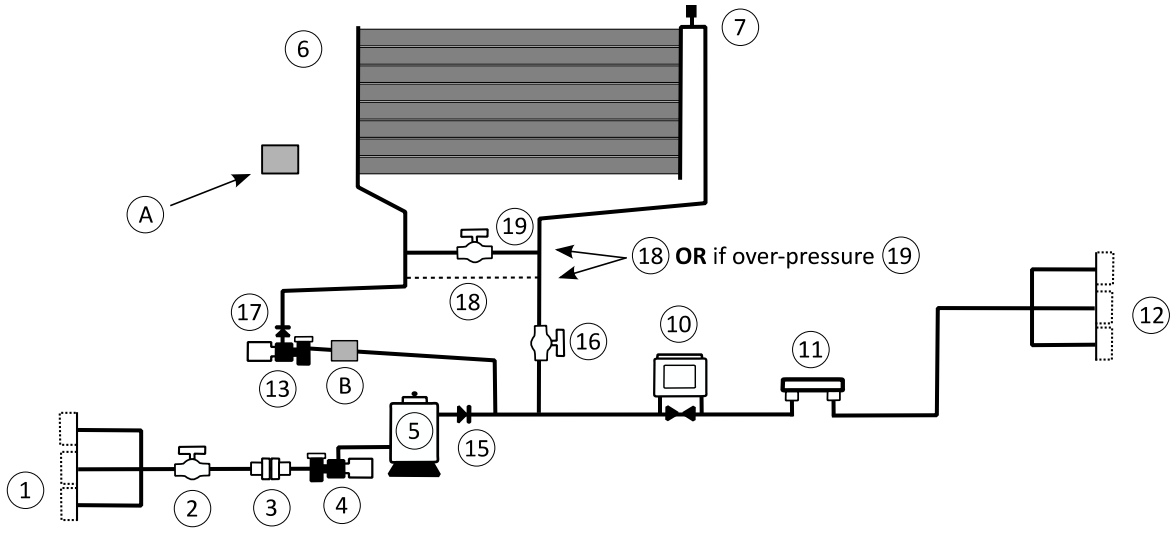
Notes: Manual or motorized three-way valve (9). (Note: automatic controls are omitted for clarity).

Advantages:	Disadvantages:
* 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	* 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.

17.5 Configuration 4: Booster/Retrofit 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
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: 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:
* Less extra plumbing is required for solar * Only filtered water runs through collectors * Does not require separate solar suction provisions	* 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.

17.5.1 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.

18 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.

18.1 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.

18.2 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.

Tip

PVC plastic should be preheated to 50˚C using a heat gun or it may split when drilling. You should practice on a pipe off cut as certain drill bit types can "bight" hard into PVC and the drill can "kick". We recommend a step drill bit. A cone shaped rolled up piece of sandpaper can be used to even out or increase the diameter of the hole if you don't have the exact size drill bit.

18.3 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 placed in any conduit section running under ground.

19 Drain-Down, Frost Proofing and Winterization

19.1 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.*

19.2 Winterization

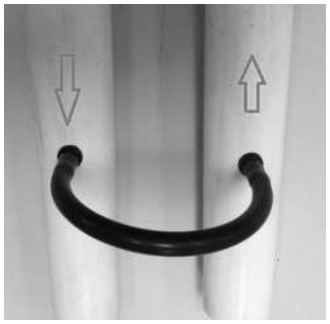
Your collector strips as well as your solar booster pump will require regular winter flushing, you should make sure the controller you have has a winter mode. If you do not want to run your system over winter you can winterize your system by draining the solar side of the system, disconnecting the solar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

19.3 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 an 8.5mm drill. **Note: PVC plastic should be preheated to 50˚C using a heat gun or it may split when drilling.** 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.

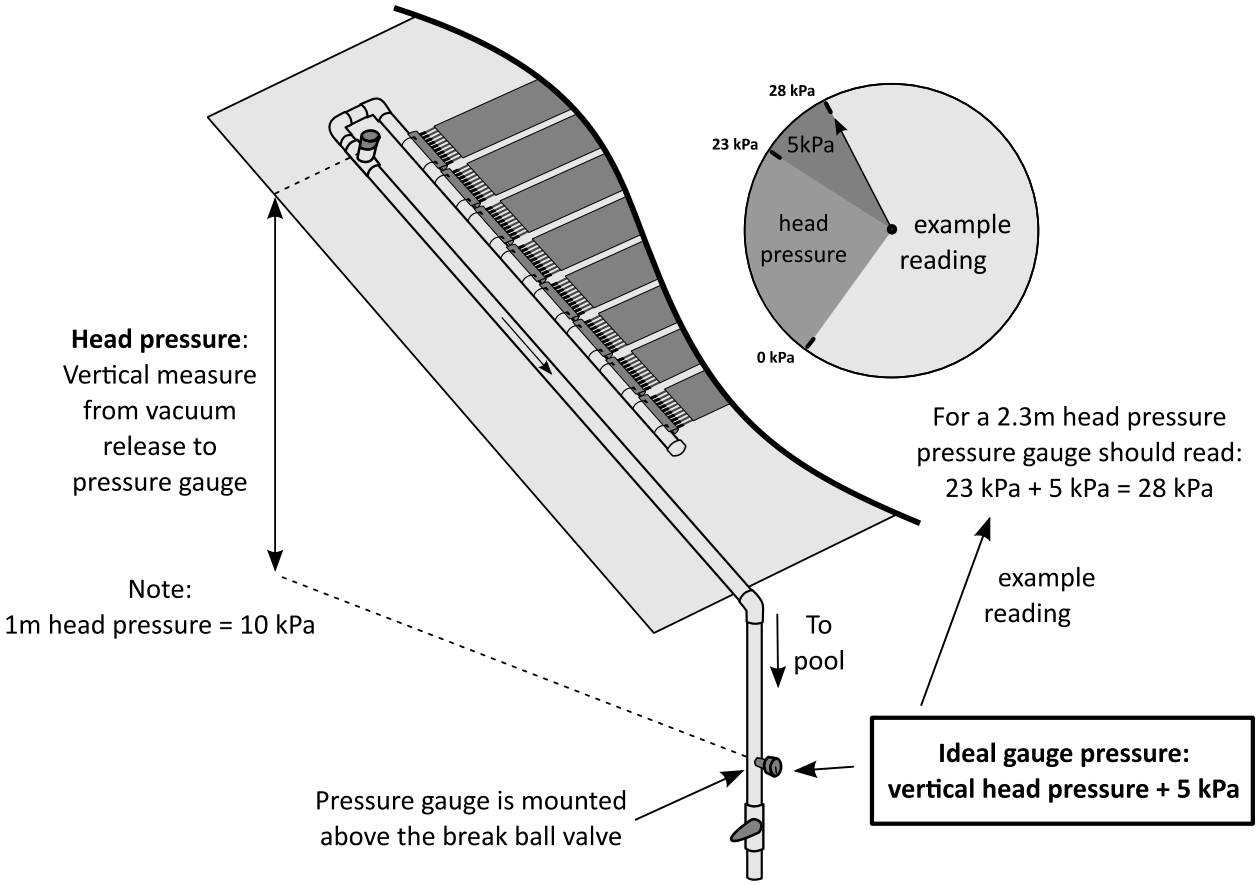
20 Optimizing Collector Pressure

20.1 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.**

20.2 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

20.3 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.

20.4 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.

20.5 Optimizing Pressure for Oversized Pumps

Read Carefully

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.

21 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 3-5°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.*

22 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

22.1 Collector Puncture Repair Procedure

Locate the leak, cut a 3mm cross section of tubing, strip webbing, and thread the locking sleaves. 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.

23 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; no 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.