



EcoOnline™ Performance+

OKU Panel Solar Pool Heating System

Installation and User Manual - Revised 4/11/2023



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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
- AS 1170.2 - 2011 (Amend 2 Dec 2012) Structural design actions - Wind actions
- 'HAZPAK' produced by the work-cover authority
- AS 3000 (2007) Sections 6.3, 6.4 & 6.5
- AS 1926.1 & 1926.2 (2007) swimming pool safety - location of safety barrier

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 met the system should NOT be purchased or installed.



DANGER

For ground level collector installations the installer **MUST** check child safety fence regulations in the relevant state. **Under no circumstances should collectors be installed so as to compromise the effectiveness of a child pool or spa fence safety barrier by providing a climbable object.**



DANGER

Due to the potential of falling from heights, mounting panels 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.



WARNING

At present this collector array system is **not recommended for exposed installations in cyclonic regions C or D, or on houses situated on top of hills in cyclonic region B, or on second story (or higher) roofs.** Installations on tiles are for Wind Region A only.



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 Legionnaires 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

- 35 year limited Warranty on all OKU 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 if panels are run at pressures **other than a maximum of ± 1psi (6kPa)**,
- or if the collectors are installed well **below the water level (max 1.5m)**.

***Why?** Such installations will expose the collectors to strong fatiguing positive/negative pressures. These situations will have detrimental effects on the collectors which will limit lifetimes and can also result in significant shrinkage of the collectors which would put strain on roof attachments.*

4 System Sizing Guarantee

Sizing systems is difficult involving a lot of factors which we could get wrong. Hence in addition to the above Warranties EcoOnline offers a System Sizing Guarantee as follows. If we sized your system (or you use our online calculator) and you took our advice and you aren't happy with the system's performance (heat output), then you can purchase *up to 25% more* panels originally supplied by EcoOnline **up to two years** after your original purchase and we will ship the items **free of shipping charges**.

5 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

5.1 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.

6 Pool Chemistry Compatibility Guide



CAUTION

Please note the **silicon joiners** used in the system are **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 longevity. If required Sodium Bisulphate acid can be used to keep the pH down.

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

7 Pump Sizing Guide

7.1 A Word on Pump Sizing Choice



Read Carefully

Variable speed or PV solar powered pool pumps are not to be used with OKU panels.

***Why?** Such pumps have large start up currents and will expose panels to high fatigue working pressure fluctuations.*

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.EcoOnline.com.au/oku-performance-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 prime reliably, see **Installing a By-Pass Tube or By-Pass Ball Valve** section 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.

Australian Standard Input Pump Power for Independent Systems			
Pool Water Volume	Min - Max Recommended Flow	For 1 st Story Install (3m):	For 2 nd Story Install (6m):
		Min - Max Input Pump Watts	Min - Max Input Pump Watts
20,000 L	50 - 67 L/min	270 - 300 Watts	350 - 380 Watts
25,000 L	63 - 83 L/min	300 - 330 Watts	370 - 410 Watts
30,000 L	75 - 100 L/min	320 - 370 Watts	400 - 450 Watts
35,000 L	88 - 117 L/min	340 - 400 Watts	420 - 480 Watts
40,000 L	100 - 133 L/min	360 - 440 Watts	450 - 520 Watts
45,000 L	113 - 150 L/min	390 - 470 Watts	470 - 560 Watts
50,000 L	125 - 167 L/min	420 - 510 Watts	500 - 600 Watts
55,000 L	138 - 183 L/min	450 - 560 Watts	530 - 640 Watts
60,000 L	150 - 200 L/min	470 - 600 Watts	560 - 690 Watts
65,000 L	163 - 217 L/min	500 - 640 Watts	600 - 740 Watts
70,000 L	175 - 233 L/min	530 - 700 Watts	620 - 790 Watts
75,000 L	188 - 250 L/min	570 - 740 Watts	660 - 840 Watts
80,000 L	200 - 267 L/min	600 - 790 Watts	700 - 900 Watts

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	45000L
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

7.2 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.*

7.3 Filter Pump Sizing for Manual Systems



Read Carefully

For manual type systems running off the 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.*

8 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 32 PVC (DN30), except for larger multiple row arrays with a secondary header pipe feeding each row, for which you should use 40 PVC (DN40). 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.

9 Roof Type Compatibility Guide

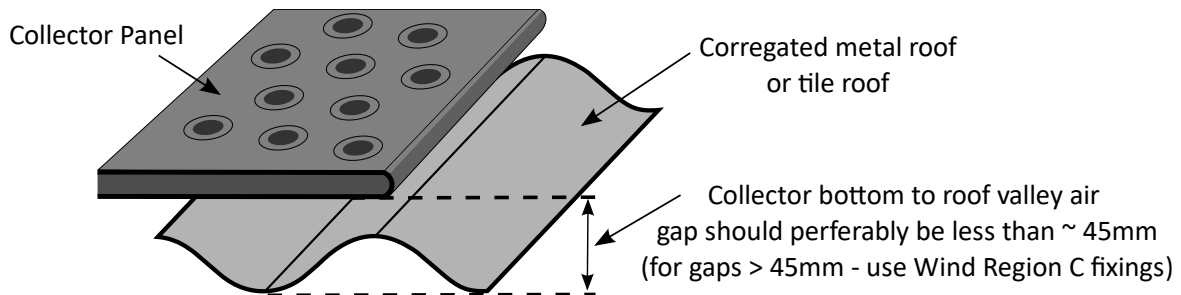


WARNING

If panels are to be installed on a roof, then the following should be observed to limit wind uplift potential.

- 1) **Installed panels should lay flat close to the roofs surface.** It is recommended the air gap distance between the bottom of the installed collector and the valley points of the roof corrugations should be no greater than approximately 40mm.
- 2) **Panels should have adequate clearance from roof edges.**
- 3) **Panels on roofs MUST NOT be mounted on tilt frames.**

Why? The average air gap distance between the mounted collector and roof structure has a strong influence on wind loadings. Furthermore, due to roof edge turbulence effects wind loadings are highest near roof edges.



Roof Type	Peak to Valley Measure	Recommendations
Standard Corrugated Iron roof (Custom Orb)	17mm	Use Respective Wind Region Fixings
Relatively Flat Tile roof	Less than 25mm	Use Respective Wind Region Fixings
Spandek Iron roof	24mm	Use Respective Wind Region Fixings
Modulated Tile roof	Greater than 25mm	Use Next Level Wind Region Fixings
Trimdek Iron roof	29mm	Use Next Level Wind Region Fixings
Klip-lok Iron roof	43mm	Use Highest Wind Region C Fixings
Flatdek Iron roof	45mm	Use Highest Wind Region C Fixings



WARNING

Panels installed above the roof structure with 50mm or greater underneath air gaps experience much higher wind loadings and are now subject to the Australian wind loading standard AS/NZD 1170.2.

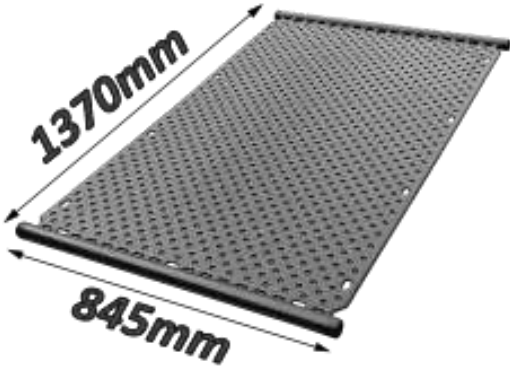
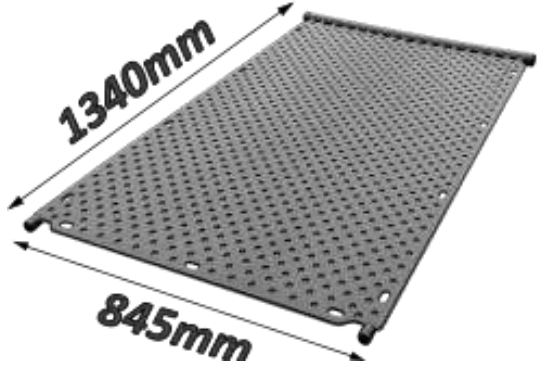

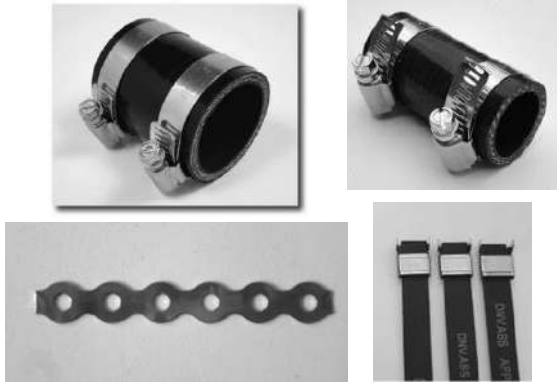


10 Wind and Climate Considerations



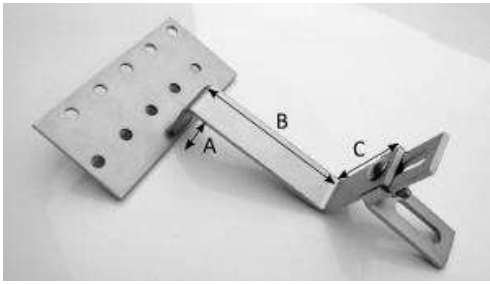
CAUTION

It is the responsibility of the installer to consider wind loading factors, see “wind proofing” section below. **If the installation site is within strong wind speed areas, then the extra stainless steel guide line must be installed across each row with the in-between panel anchor points.** Do not assume supplied components are sufficient.

11 Collector Array Components

Interconnect OR Dual Header Panel Kit:	
 <p>1 × HDPE dual header panel</p>	 <p>1 × HDPE interconnect panel</p>
 <p>2 × 40mm ID reinforced silicon joiners 4 × Stainless steel hose clamps 6 × 316 Stainless steel straps (black) 1 × 10cm length perforated 316 stainless band</p>	 <p>1 × 40mm ID reinforced silicon joiner 1 × 25mm ID reinforced silicon joiner 4 × Stainless steel hose clamps 3 × 316 Stainless steel straps (black) 1 × 10cm length perforated 316 stainless band</p>
Other Collector Array Components	
 <p>1 × 40 PVC Vacuum breaker valve (MUST be installed)</p>	 <p>2 × 40mm OD hose barb to 25/32 PVC glue socket/take off</p>

Roof Mounting (Solar roof hook supplied only if requested and purchased)

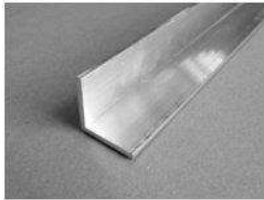


1 × 304 Stainless solar roof hook (height adjustable)

Dimensions: A = 47.5mm, B = 112mm, C = 60mm

12 Additional Required Components (Not Supplied)

You also require some of the following extra items depending on your system. These are available in any plumbing store. The aluminium angle is available from Capral Ltd. or Ullrich Aluminium Pty. Ltd.



Aluminium angle 30mm x 30mm x 4mm for metal roofs. 40mm x 40mm x 3mm for tile roofs



4mm stainless steel cable & four cable ties per row



PVC piping (recommend 32 PVC (DN30) on roof)



PVC bits, including a 32 PVC (DN30) or 20 PVC (DN 20) socket for heat smoothing barbs



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.

13 Required Tools

- Battery powered hand drill
- Corking gun (for Silicon glue)
- Personal Sun/UV protection
- Heat Gun
- Industrial Ladder
- A single 32 PVC (or 20 PVC) Socket – for heat smoothing any misshapen barbs (see below)
- Screwdriver
- Hack saw
- Assorted drill bits
- Tape measure
- Needle nose pliers
- Safety glasses
- Gloves
- Power Lead
- Tin snips
- Power Lead



WARNING

When working with power or hand tools always follow the safety instructions. Wear the recommended personal protective equipment, such as **gloves, safety glasses, respiratory and hearing protection**. 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 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.



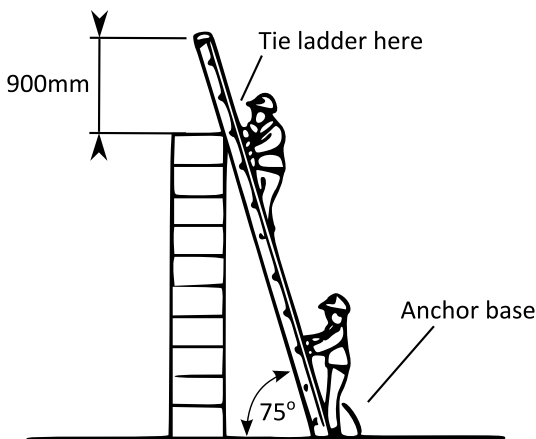
WARNING

The collectors can be walked on without damage. Take extreme care to use non-slip shoes and **never walk on wet collectors**, especially on installations with any significant pitch. **HDPE material is a slippery and waxy surface. If the collectors need to be walked on for mounting purposes, ALWAYS use a safety harness and fall arrest system.**

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.

14.1 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.



DANGER

Solar panels should not be mounted in windy or gusty conditions; a panel can easily be caught in the wind and cause a loss of balance and result in a fall.

15 Choosing a Place to Install the Collector Array

When choosing a location for your collector array you should consider:

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



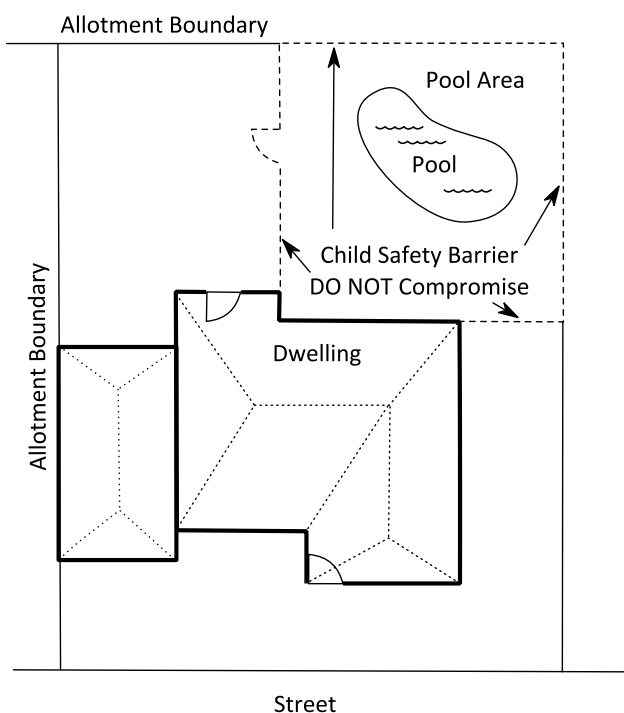
Read Carefully

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



DANGER

For ground mounted arrays, under no circumstances should a collector array be mounted in anyway so as to compromise the effectiveness of a pool or spa Child Safety Barrier.



The figure to the left shows an example of a Child Safety Barrier marked with a dashed line. A collector array should not be mounted near the Child Safety Barrier - **both on the inside and outside of the Pool Area** unless proper clearances are observed. **Consult your Local Government, The Building Commission or SPASA for details regarding pool safety barriers in your state.** Please keep up to date with regulations as they change over time. For more information see, AUSTRALIAN STANDARDS 1926.1 2007 AND 1926.2 2007 FOR POOL SAFETY BARRIERS.

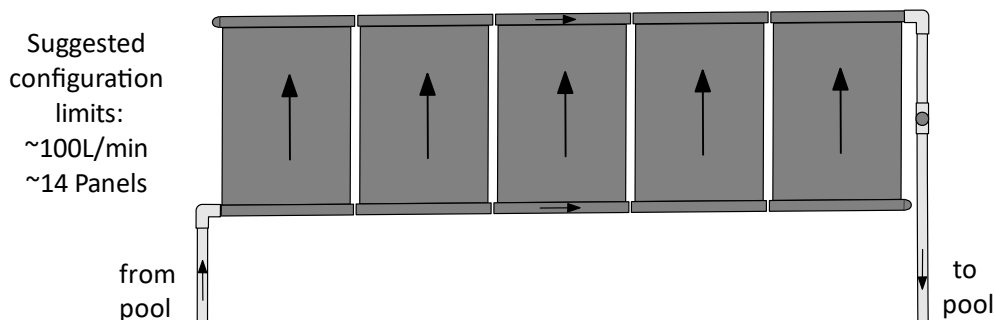
- Do not install the collectors **leaning against the outside of a Child Safety Barrier** so as to create a climbable object for children to access the pool or spa.
- Collectors installed inside the pool area in front of a boundary fence must be offset away from the boundary fence with the **proper clearance** from the top of the fence so as not to provide a foothold for a child climbing into the

pool area.

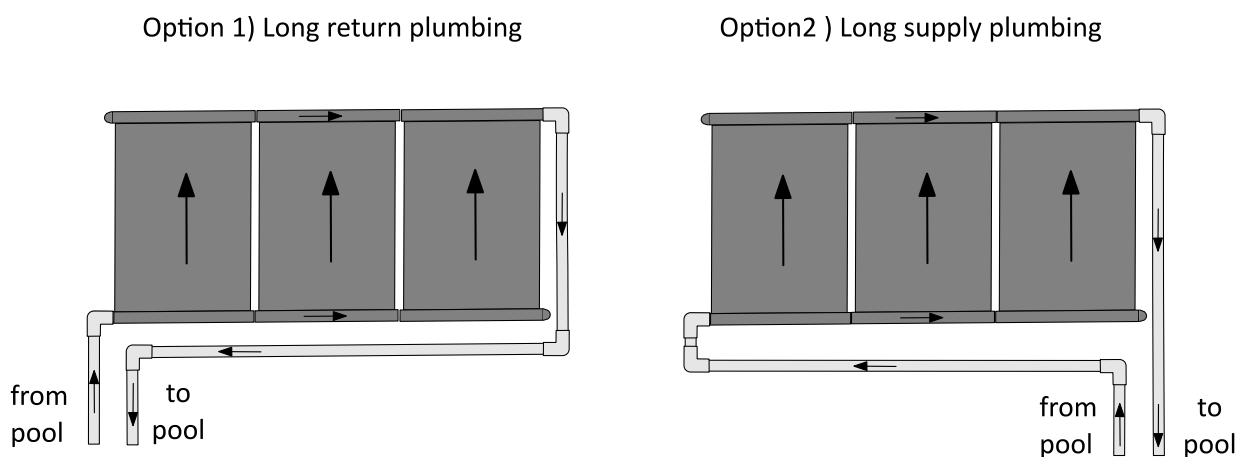
- Do not install the collectors too close to the inside of a Child Safety Barrier so as to provide **foot or handholds from the outside** of the barrier.
- For spa baths and above ground pools do not lean the collector array against the side of the spa or pool so as to create a **ramp or climbable object**.

16 Collector Water Flow Configurations

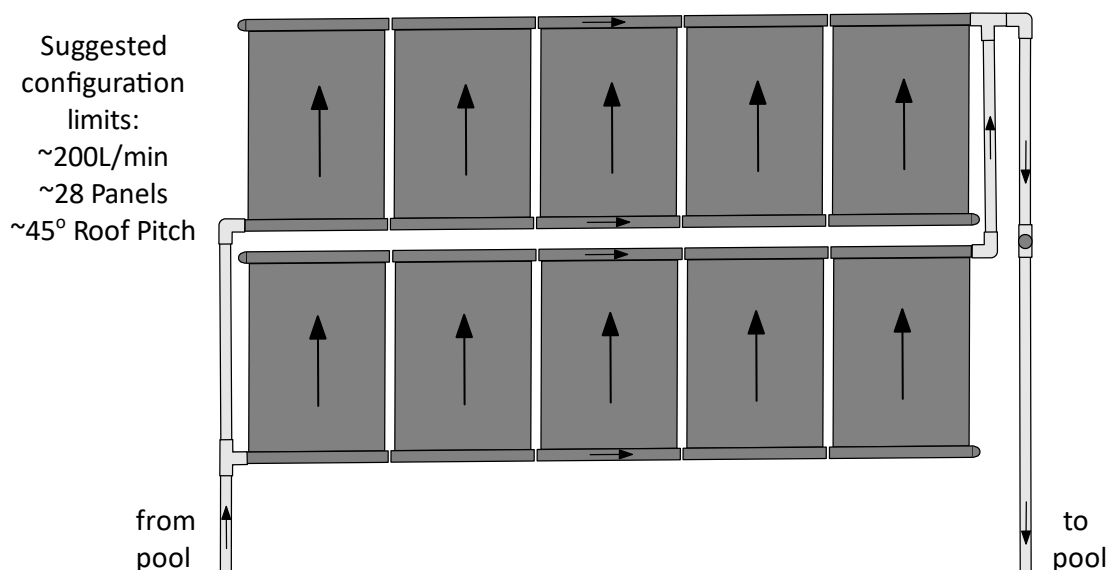
16.1 Dual Header Panel Single Row Flow Configuration



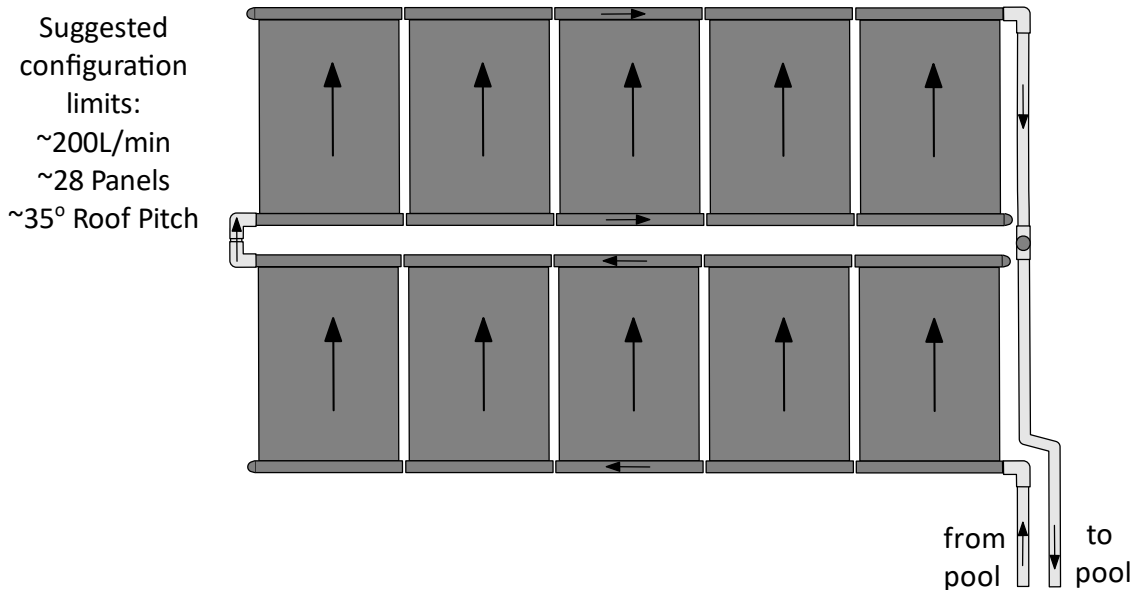
16.2 Supply and Return Plumbing Options



16.3 Dual Header Panel Two Rows In-Parallel Configuration



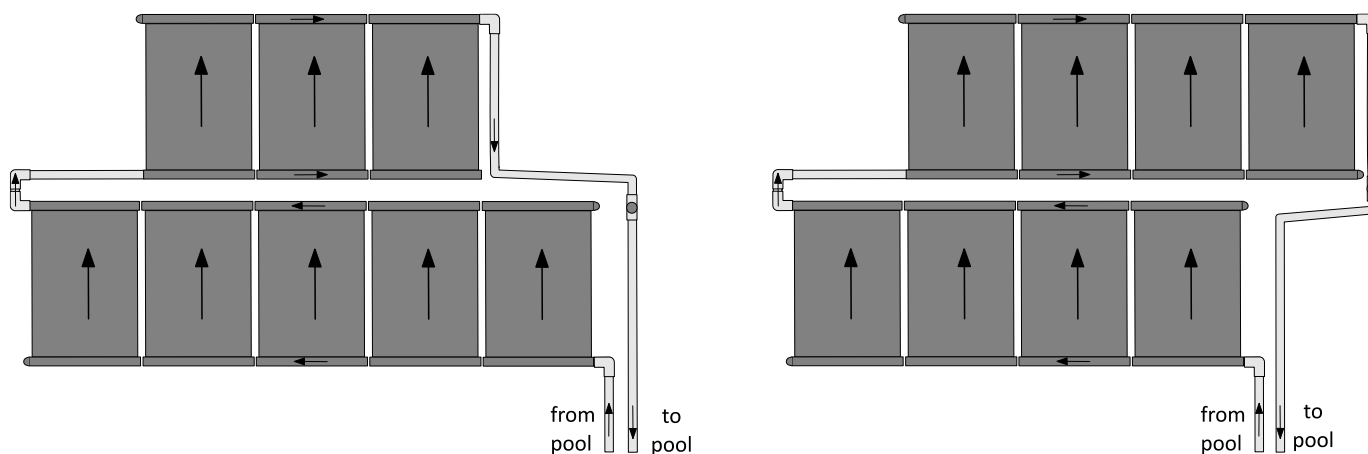
16.4 Two Row Serpentine Flow Configuration



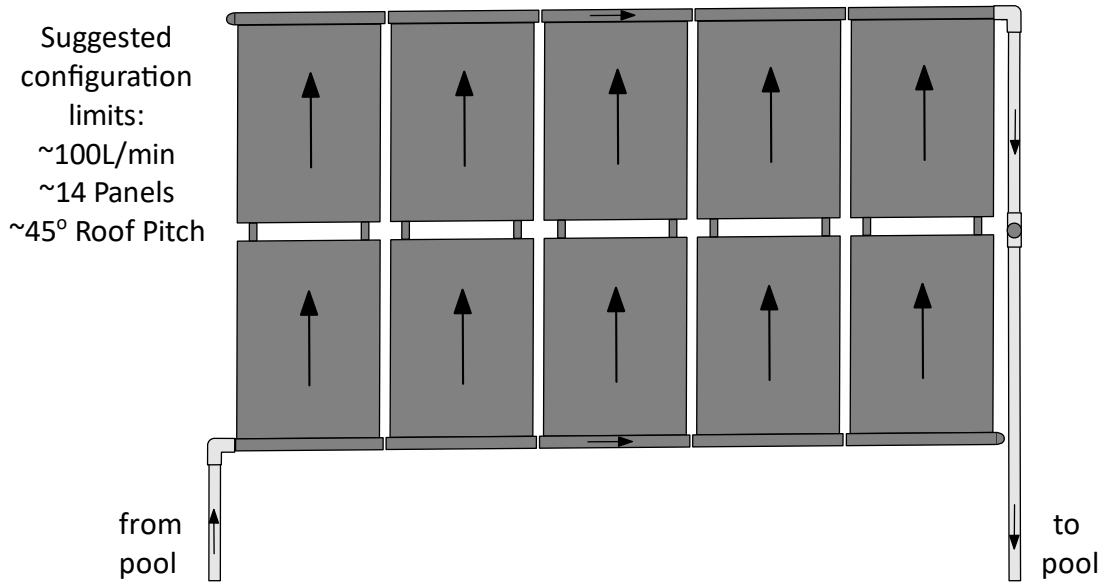
16.5 Parallel vs Serpentine Flow Configurations

Parallel Configuration 17.3 (Recommended)	Serpentine 17.4 (Max: 100L/min, 20 Panels)
Splits flow - lower panel pressures	Higher panel pressures
Harder to plumb, more PVC bits	Easier to plumb but headers must be level
Better for larger panel per row arrays	Okay for arrays ≤ 10 per row
Okay for any pitch 2° (flat) - 90° (fence)	Okay for standard roof pitches between 5° to 35°
Use for three or more row configurations	Not suited for three row configurations (unless array has ≤ 20 panels)

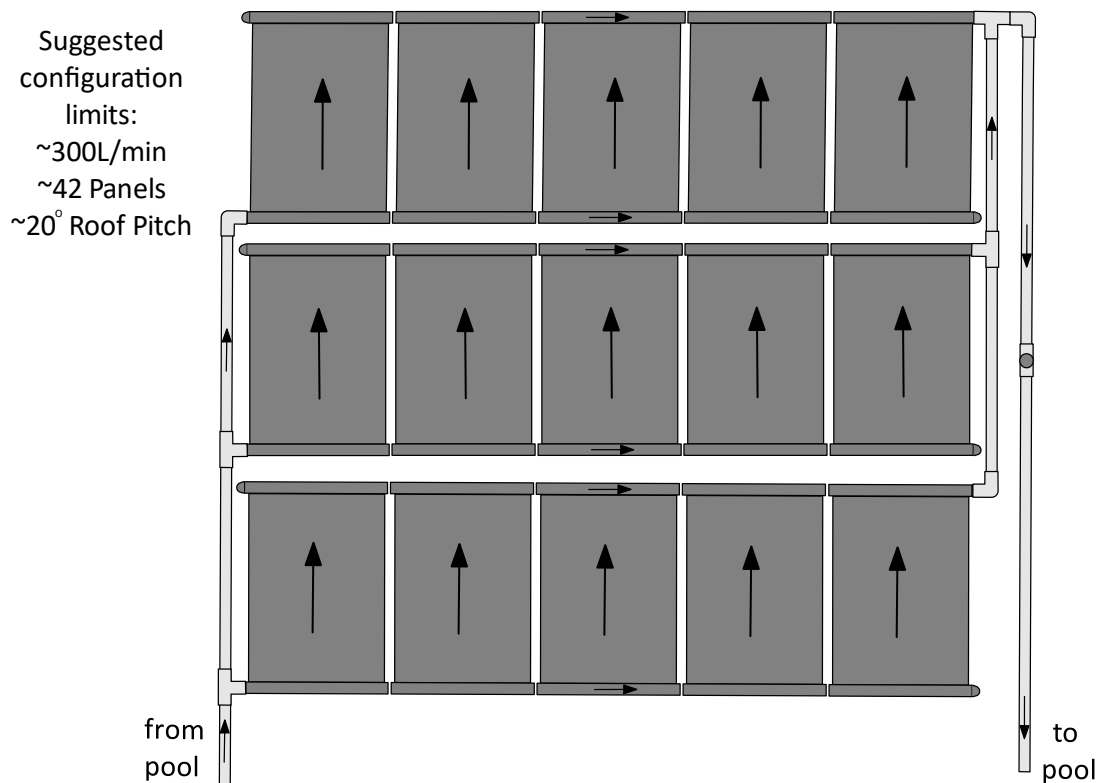
16.6 Serpentine Flow for a Trapezoid or Parallelogram Array



16.7 Interconnect Panel Flow Configuration



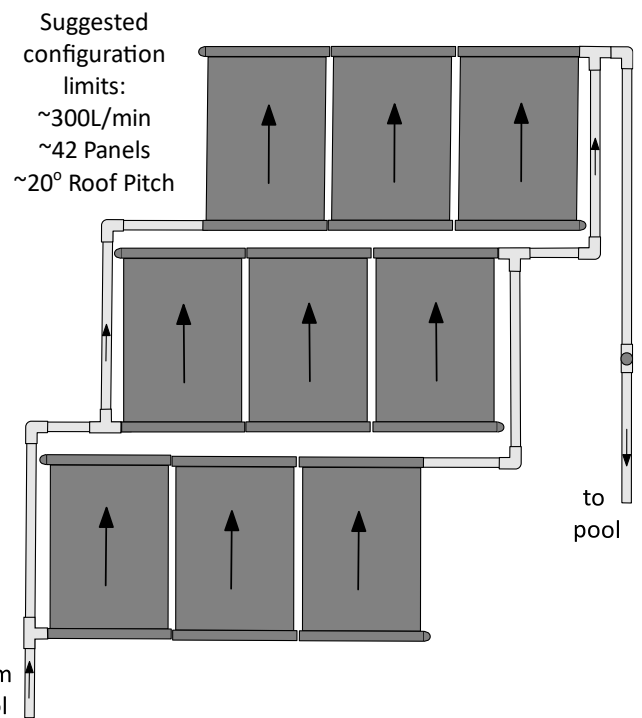
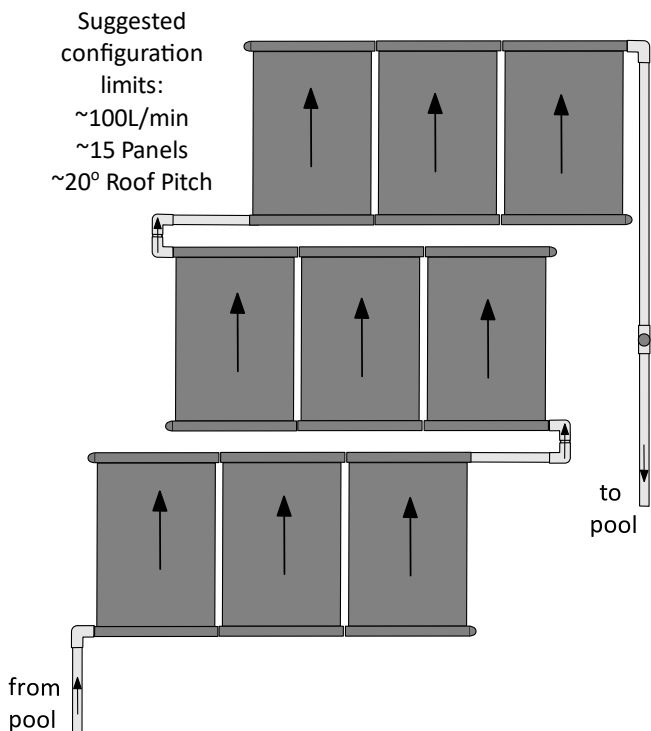
16.8 Three Row In-Parallel Flow Configuration



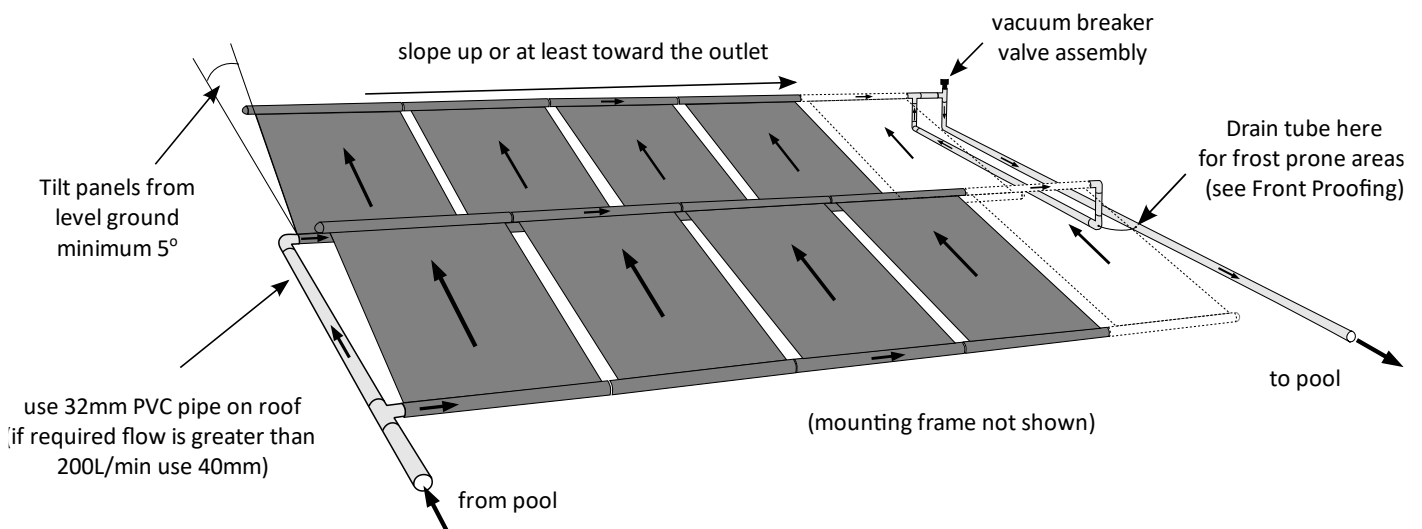
CAUTION

Please note: the bottom row of panels in a three row (or more) configuration installed on a roof pitch greater than 20° will experience greater pressures. When carrying out the **Pressure Optimization Procedure** in Section 27, we recommend setting the lowest positive pressure possible.

16.9 Staggered Array Flow Configurations



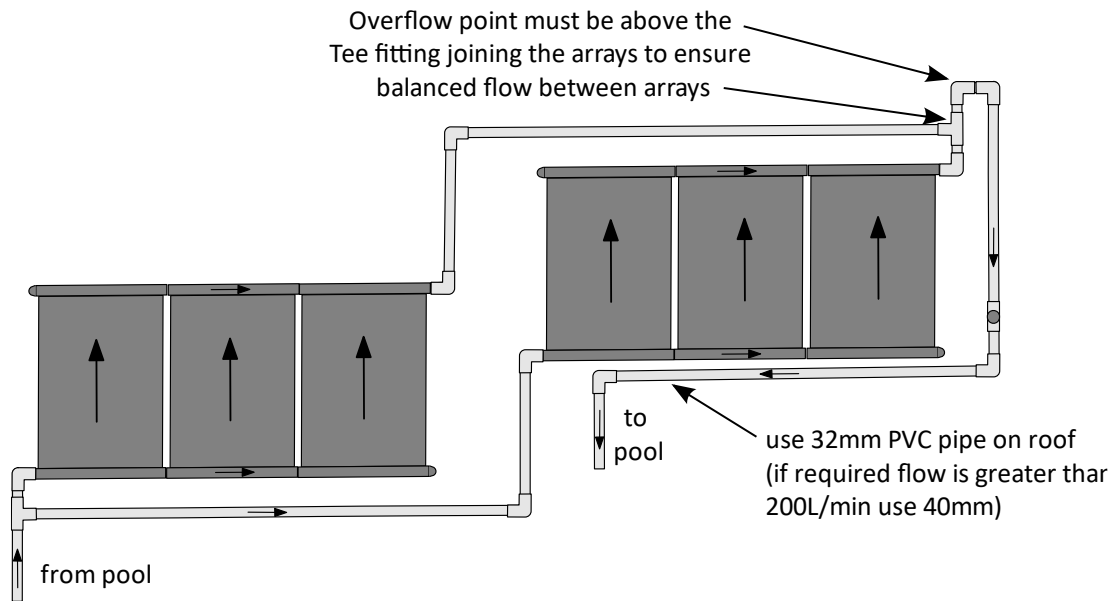
16.10 Level Ground Mounting Configurations



DANGER

For ground mounted arrays, under no circumstances should a collector array be mounted in anyway so as to compromise the effectiveness of a pool or spa Child Safety Barrier.

16.11 Split Array at Similar Height Levels

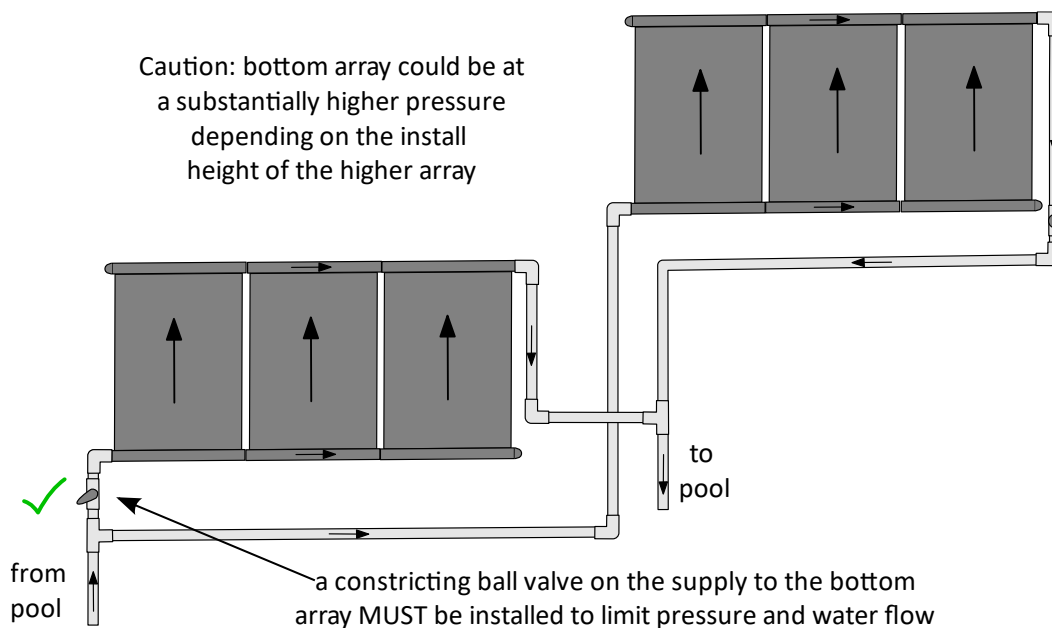


Read Carefully

Split collector arrays with a vertical height difference no more than 1m can use the above configuration. Both arrays should be installed facing the same direction - **or have no more than 30° compass facing difference between them**. In this latter case the temperature sensor should be installed at an angle that is an average of the two collector array compass facing directions.

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

16.12 Split Array at Substantially Different Heights



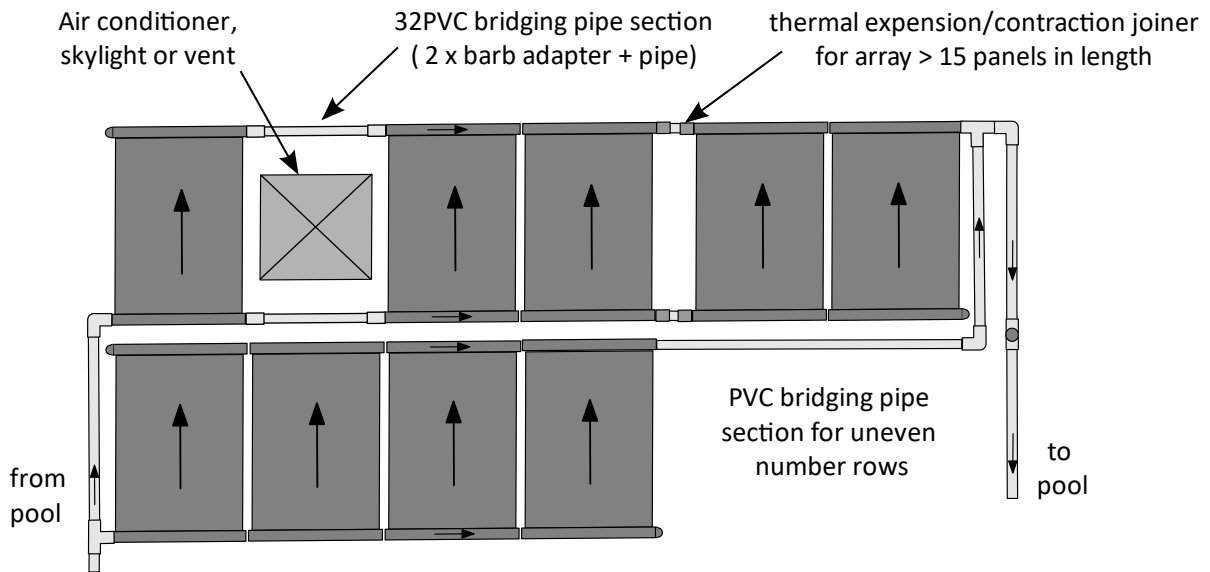


Read Carefully

Split collector arrays with a vertical height difference of greater than 1m **MUST** use the above configuration with a constricting ball valve installed on the supply to the bottom array to protect it from excessive pressure.

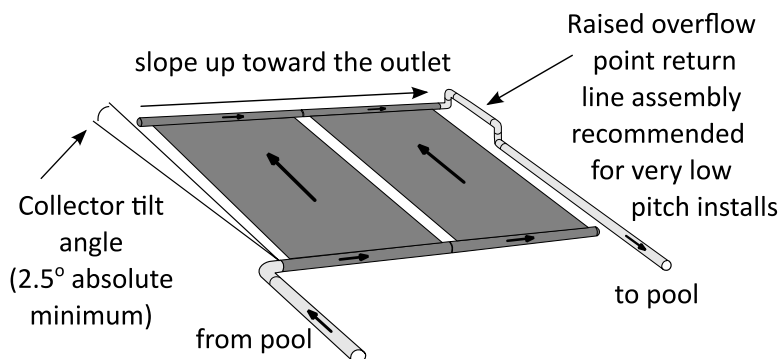
Why? Without the constricting ball valve, the bottom array would receive all the water flow.

16.13 Bridging Obstructions, Expansion Joiners and Uneven Rows

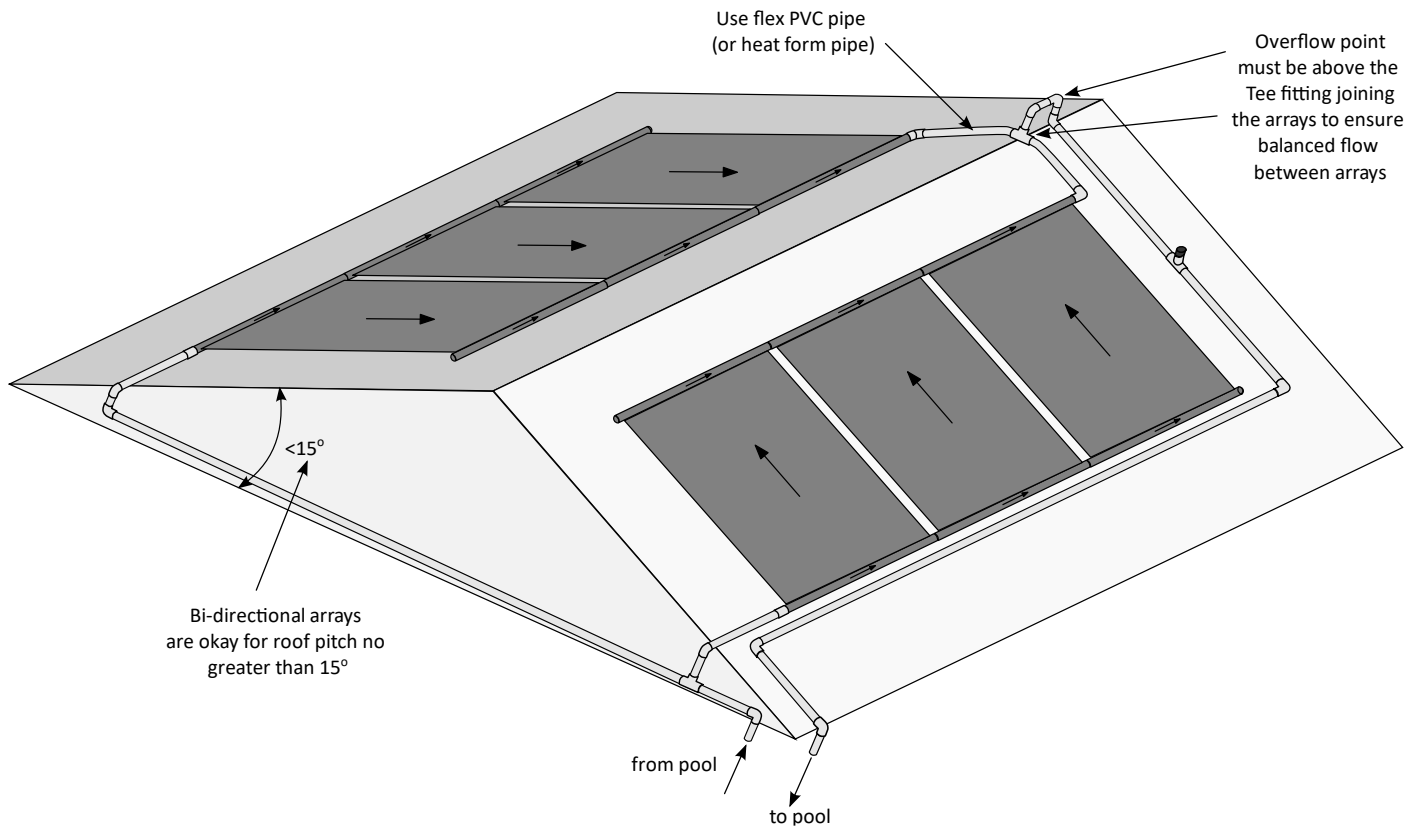


Please contact info@EcoOnline.com.au or visit our store for the special 316 slide expansion joiner for arrays that are greater than 14 panels in a single row.

16.14 Return Line Configuration for Low Pitch Roof



16.15 Preferred Bi-Directional Flow Configuration

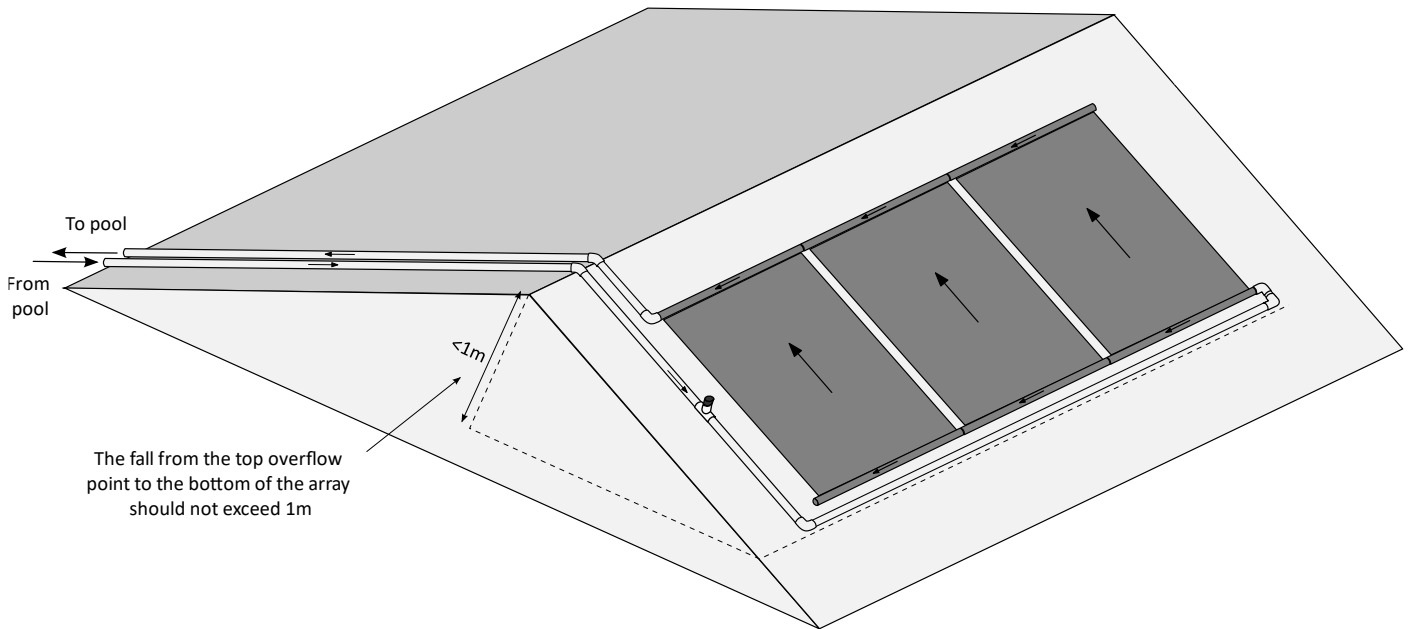


Read Carefully

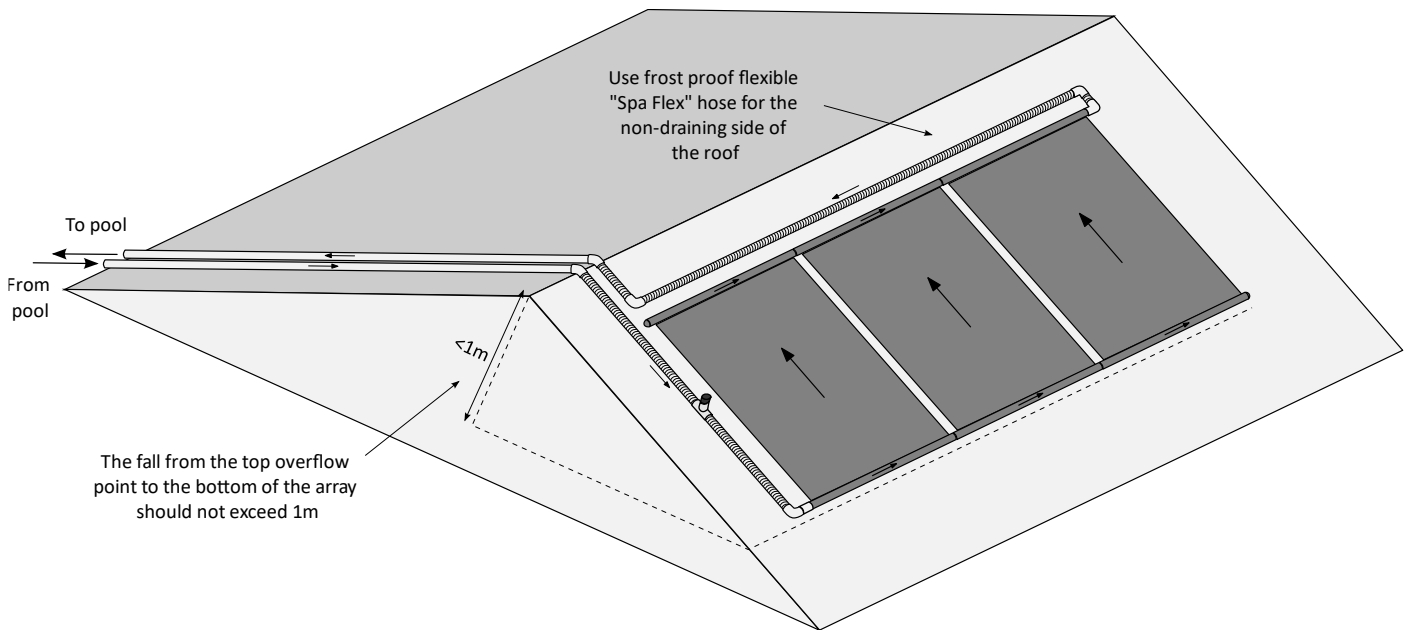
Collector arrays that face opposing compass directions are not recommended unless the roof pitch is less than $\sim 15^\circ$. In this case the temperature sensor should be installed at an angle that is an average of the two collector array directions.

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

16.16 Top Feed Flow Configuration for Non-Frost Areas



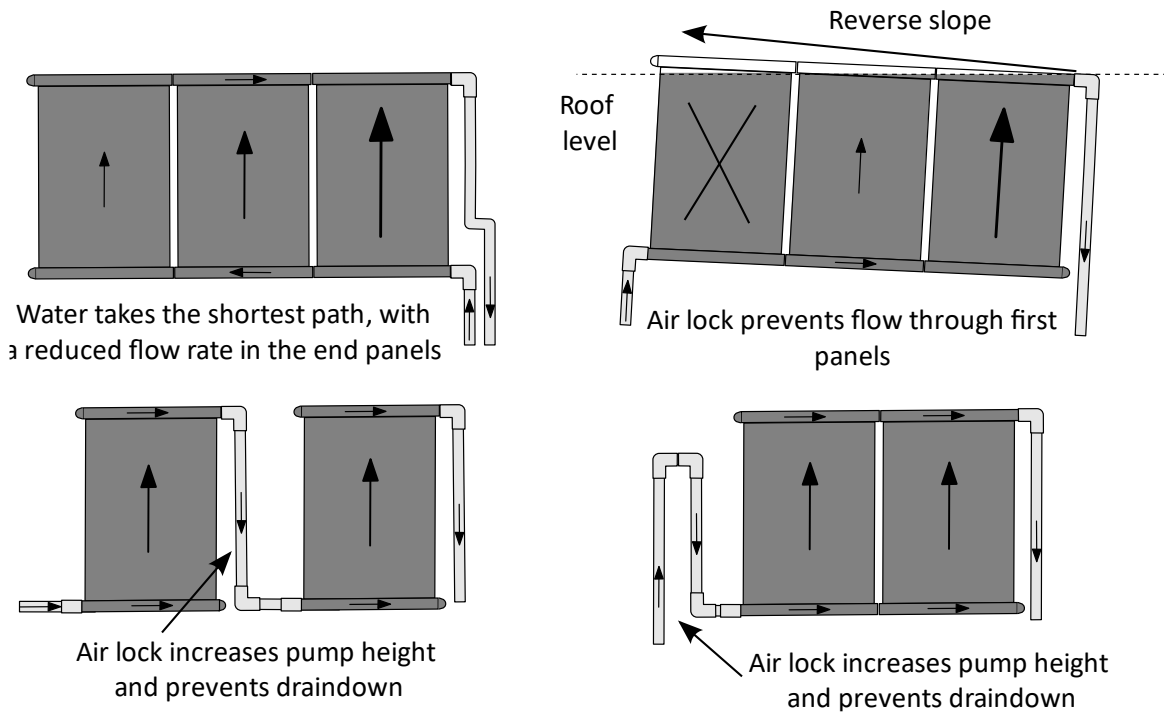
16.17 Top Feed Flow Configuration for Frost Areas



Read Carefully

For frost prone areas the supply and return lines that runs over the top of the roof **MUST** be run using UV rated "Spa Flex" hose (note Spa Flex hose requires special flexible PVC glue).

16.18 Plumbing Flow Configurations Not Recommended



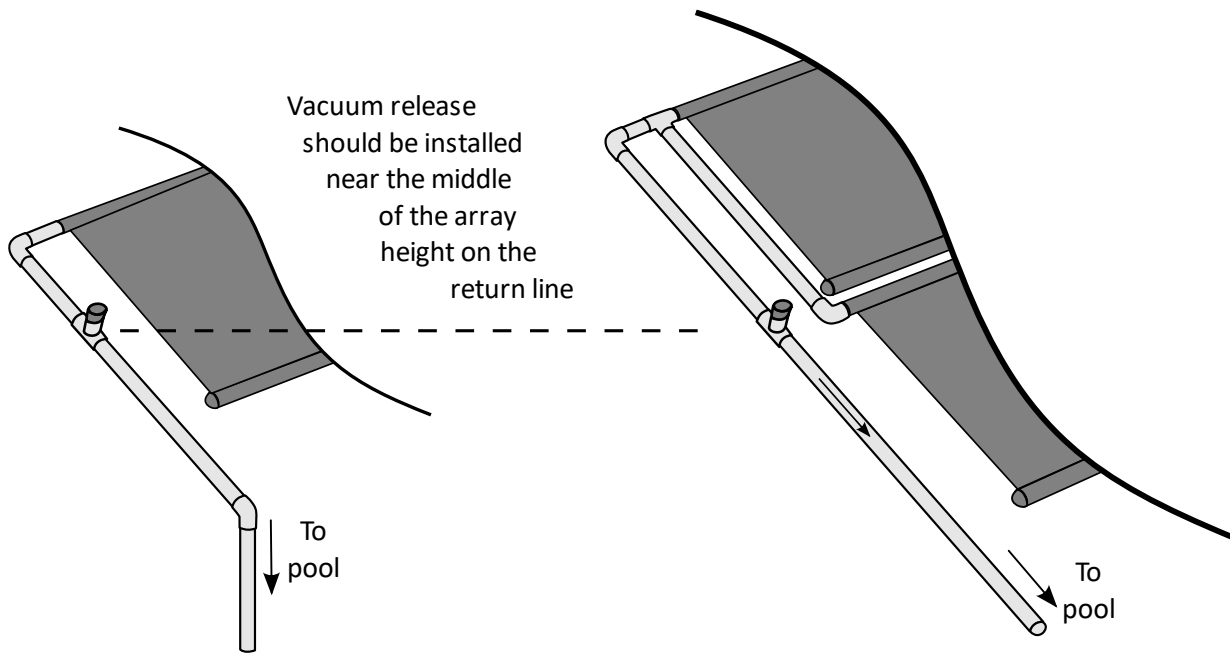
Read Carefully

To make sure all air bubbles are evacuated upon filling collector should be installed with a minimum recommended pitch of 3-5°.



Read Carefully

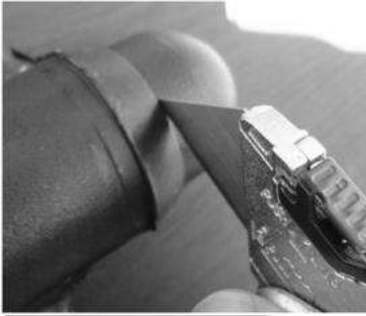
Ideally the collector array top header pipe should have a **1 to 2°** upward slope toward the outlet, to make sure all air is automatically removed from the entire array upon filling. This is especially important for system with row containing 10 or more panels.



CAUTION

The vacuum release is a critical part of the system and must be installed for all collector array greater than 0.5m above the water level.

Why? System without a vacuum release will experience large negative pressure working forces as the pump stops and the water wants to fall back. The vacuum release on the return line and the non-return on the supply line stop these pressure fluctuations.



BEFORE CUTTING - put aside two collectors per row with undamaged end caps. For all remaining collectors cut the single end cap off using a sharp blade or hacksaw.



WARNING

Laceration hazard: Always cut away from your body and ensure no parts of the body are in front of the cutting blade.

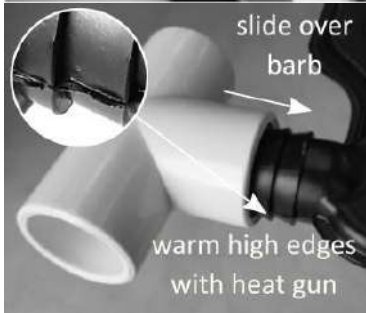


Check all collector pipe connections for raised edges or grooves on the weld lines which could channel water and cause leaks. Clean these up using a blade and/or a heat gun on a high setting.



Tip

Any misshapen barbs can be warmed to 150°C with a heat gun to reform.



Check all barb edges are smooth and spherical to seal properly. For any high or low points, **warm the barb edge with a heat gun on high at 450°C for 3-4 seconds**, then slide over a 32 PVC (DN30) socket or 20 PVC (DN20) socket for the smaller interconnect barb – this will knock down any high points.



When installing silicon joiners, the hose clamp band should be at the end of the silicon joiner and not on the connector barbs. **HAND TIGHTEN ONLY** using with an 8mm hex socket. **Do not glue in silicon joiners.** (Pinhole leaks can be sealed with a little silicon). You may need to slightly re-tighten these with cool water running through the collectors at a later stage, as HDPE has a high thermal contraction.



The **barb end** of inlet/outlet PVC adapter should be glued into the 40mm silicon joiner with any neutral cure silicon as shown.

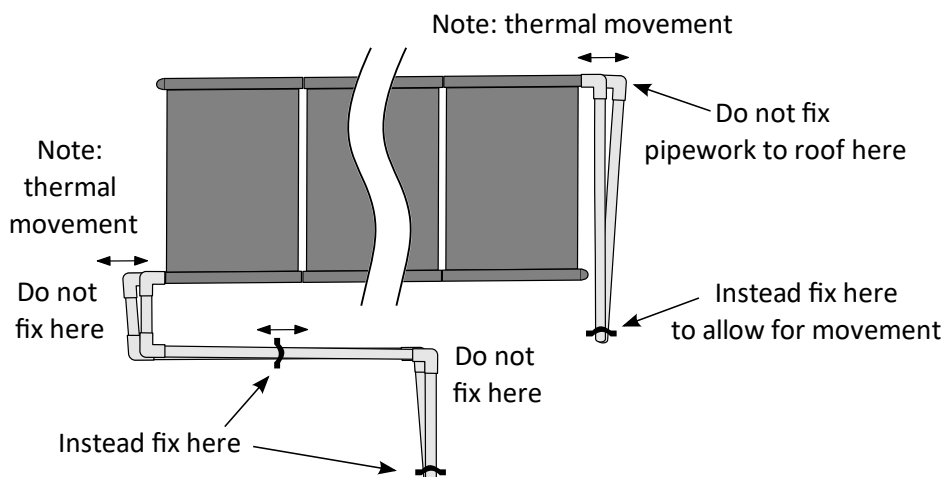
***Why?** PVC barbs can soften at extreme roof stagnation temperatures and contract slightly with clamp pressure. HDPE, on the other hand, will not soften significantly at the maximum roof stagnation temperature of ~80°C.*



The **non-barb end** of inlet/outlet PVC adapter should be glued into **32 PVC (DN30) sockets**.

Note: some 32 PVC (DN30) socket brands are non-standard and are quite loose with our adapters, if so **apply a layer of PVC glue and let dry for 1 hour prior to final socket gluing or use a filler PVC glue.**

18.1 PVC Pipe Roof Fixings



CAUTION

Note the large thermal movement in the array inlets and outlets (depending on how panels you have in one row). PVC pipe work should **NOT** be fixed to the roof near the inlets and outlets, but should be allowed to move with the collector array.

19 Array Roof Fixing Configurations



CAUTION

Note the high thermal contraction and natural relaxation of HDPE: Collectors will contract (in length) by up to 10mm over time and 12mm thermally across temperature extremes. **Hence any fixing means must account for an ultimate contraction of 22mm in length per panel.**

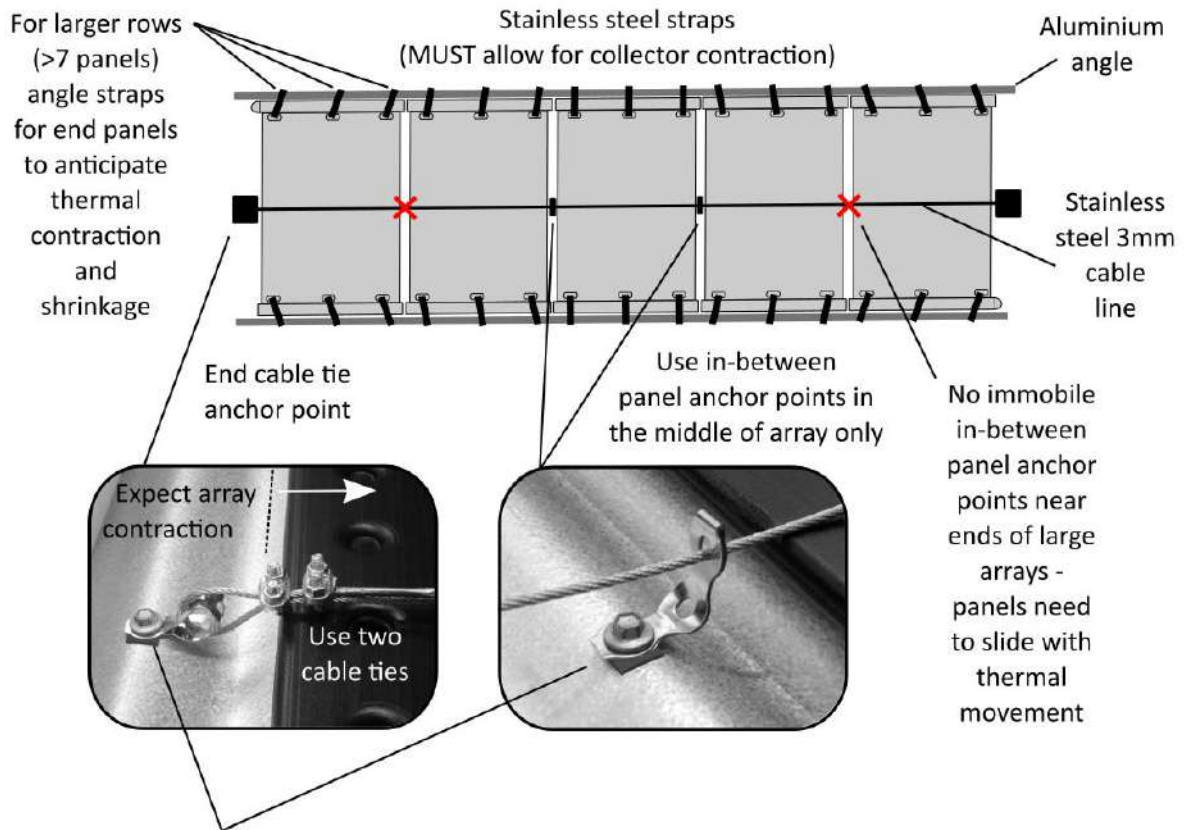


CAUTION

Key design principles when choosing a roof mounting means:

- 1) Consider the high thermal contraction of HDPE
- 2) Panels should be as low down on the roof as possible to prevent the wind from catching the underside of panels
- 3) The stainless steel straps must allow for thermal movement of panels.

19.1 Single or Multi-Row Metal Roof Fixings Wind Region A



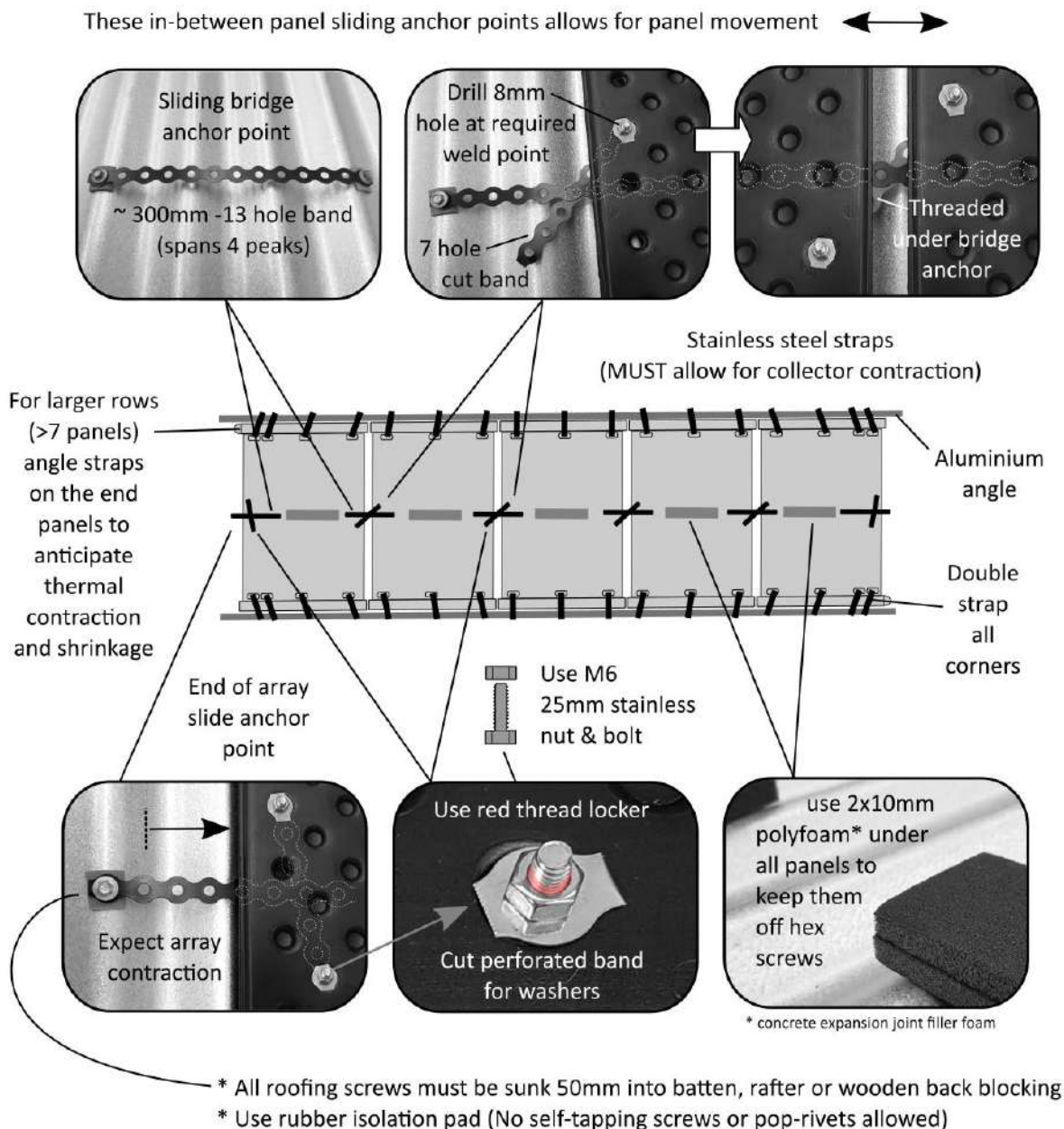
All roofing screws must be sunk 50mm into batten, rafter or wooden back blocking
Use rubber isolation pad (No self-tapping screws or pop-rivets allowed)



CAUTION

For row arrays **exceeding 15 panels** per row, **expansion joiners** MUST be used (contact info@EcoOnline.com.au)

19.2 Single or Multi-Row Metal Roof Fixings for Wind Regions B & C



WARNING

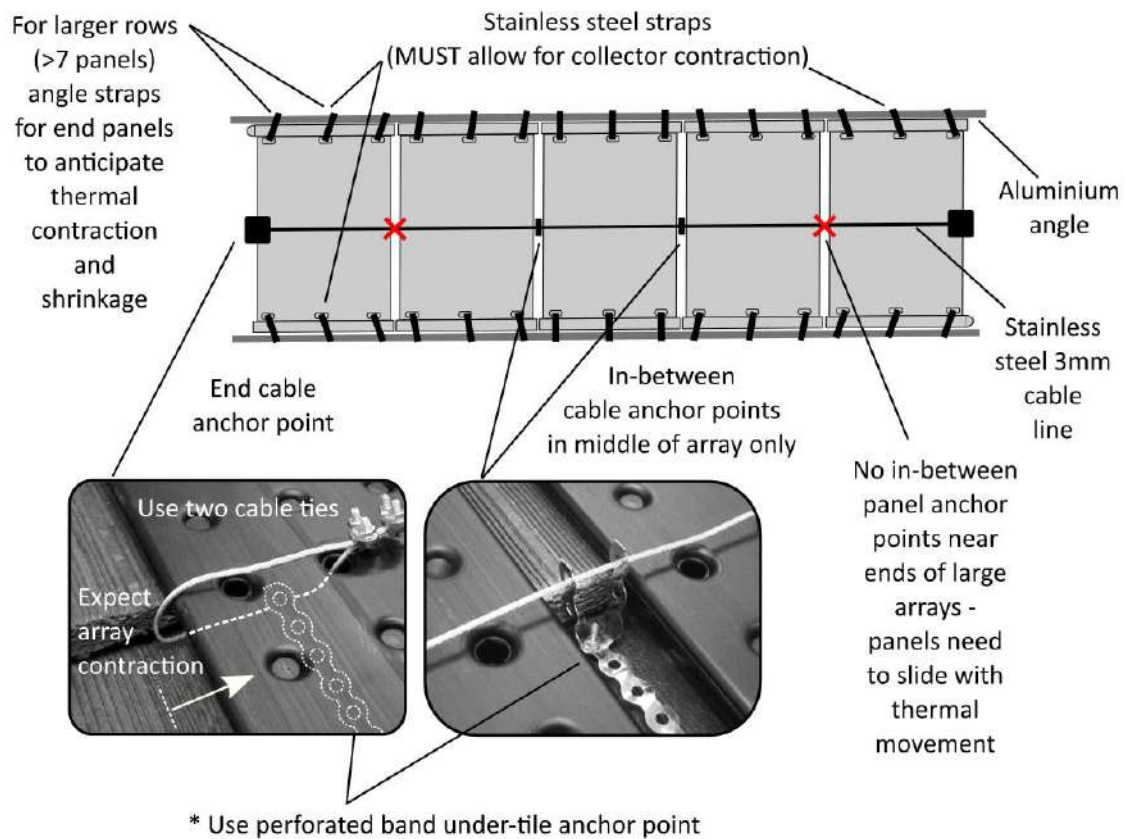
NOTE: For single or multi-row arrays in wind regions B or C, aluminium L-angle MUST be installed for top and bottom of each row. Mid-panel attachments must also be installed.



CAUTION

For row arrays **exceeding 15 panels** per row, **expansion joiners** MUST be used (contact info@EcoOnline.com.au)

19.3 Single or Multi-Row Tile Roof Fixings for Wind Region A & B



WARNING

For single or multi-row arrays in wind regions B, aluminium L-angle MUST be run for the top and bottom of each row.



CAUTION

For row arrays **exceeding 15 panels** per row, **expansion joiners** MUST be used (contact info@EcoOnline.com.au)

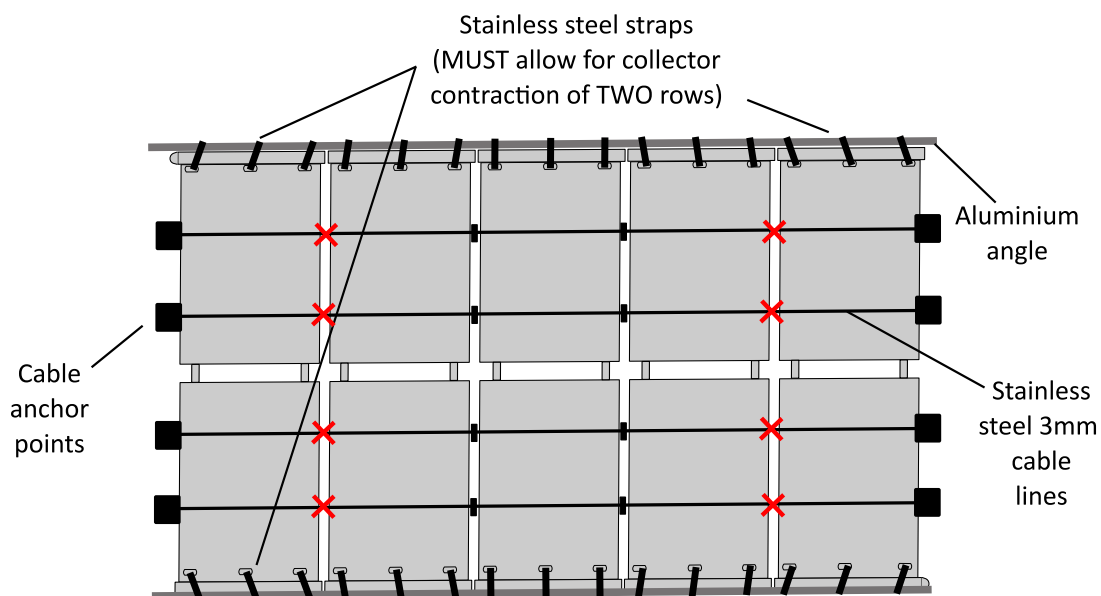
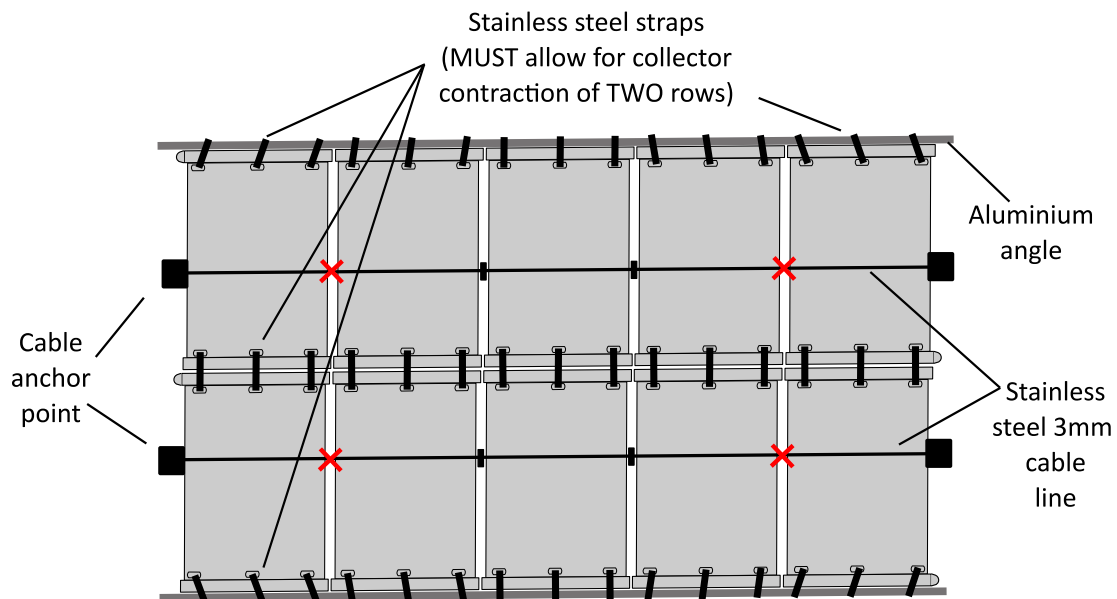
19.4 Low Wind Area Alternate Two Row Roof Fixings



WARNING

Allowed for Region A, Terrain 3 Wind Loadings ONLY

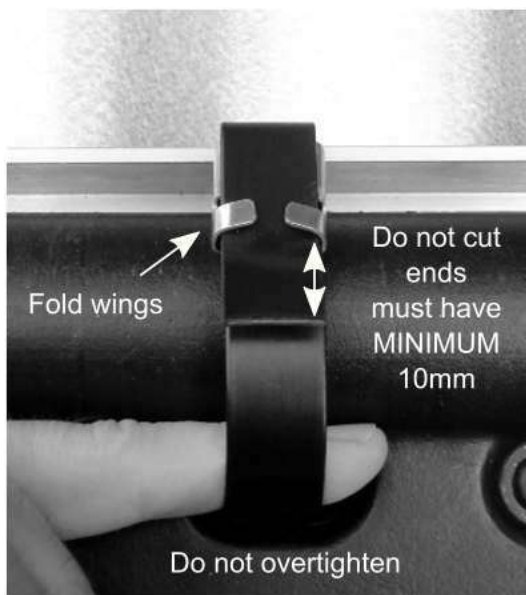
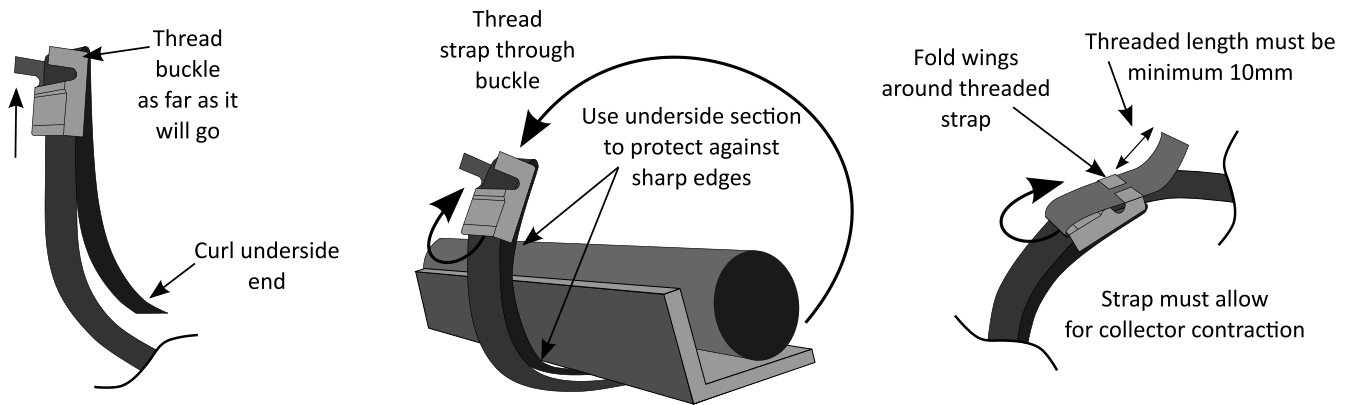
Installation of two rows between two aluminium angles will require twice the expansion gap in the stainless steel straps. **We also highly recommend you “season” the panels before installation to removed some of the permanent contraction the panels are prone to.** “Seasoning” the panels involves laying the panels out in the sun for half a day on one side, then flipping over for the other side.



CAUTION

For dual row array fixed between top and bottom array aluminium channels, **do not exceed 10 panels per row**. If you need to have more than 10 panels we recommend each row have aluminium railings. **Why?** Panels strapped top and bottom to an aluminium railing will have smaller side to side thermal movements.

19.5 Application of the PVC Coated Stainless Steel Straps



WARNING

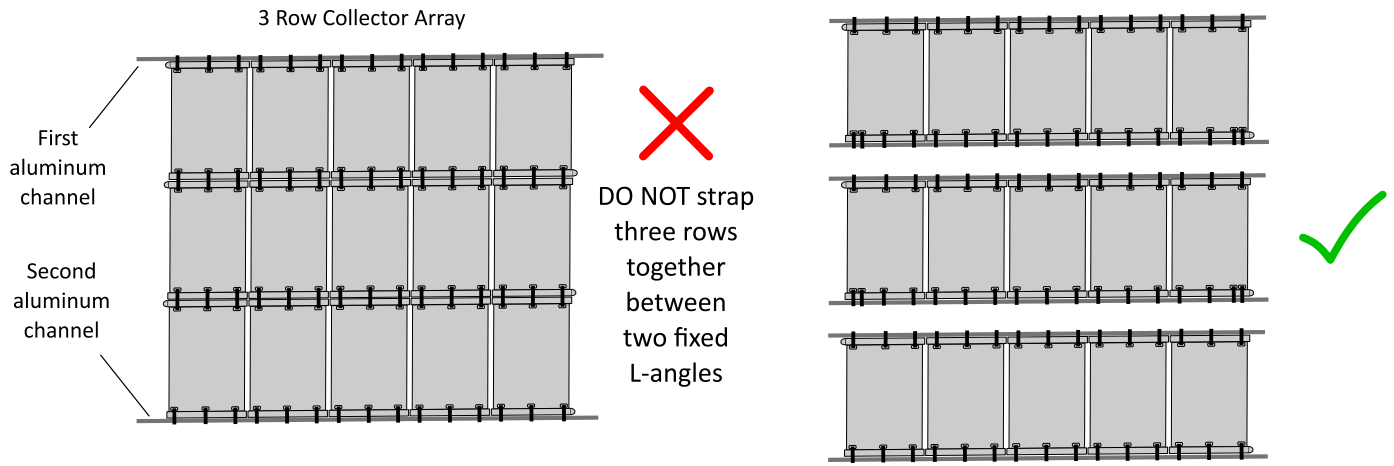
IMPORTANT: DO NOT over tighten stainless steel strapping. **Strapping must have sufficient play to allow for collector contraction.** For the installation of two rows between two aluminium channels top and bottom strapping should be loose enough to insert your **little finger** between the strapping and the header pipe. **Why?** *Over-tightened straps can experience tension and continual flexing of the metal due to the thermal contraction of the collectors. This can result in metal fatigue of roof fixings over time.*

19.6 Three or More Row Roof Fixings



WARNING

Due to the large potential thermal contraction across three rows the strapping of three or more rows of panels between one set of fixed top and bottom aluminium angles is not recommended. Collector arrays consisting of three or more rows must have a pair of aluminium L-angles top and bottom for each row of collectors or at least for each pair of rows to allow for contraction.



20 Tile Roof Aluminium Angle Mounting Options



WARNING

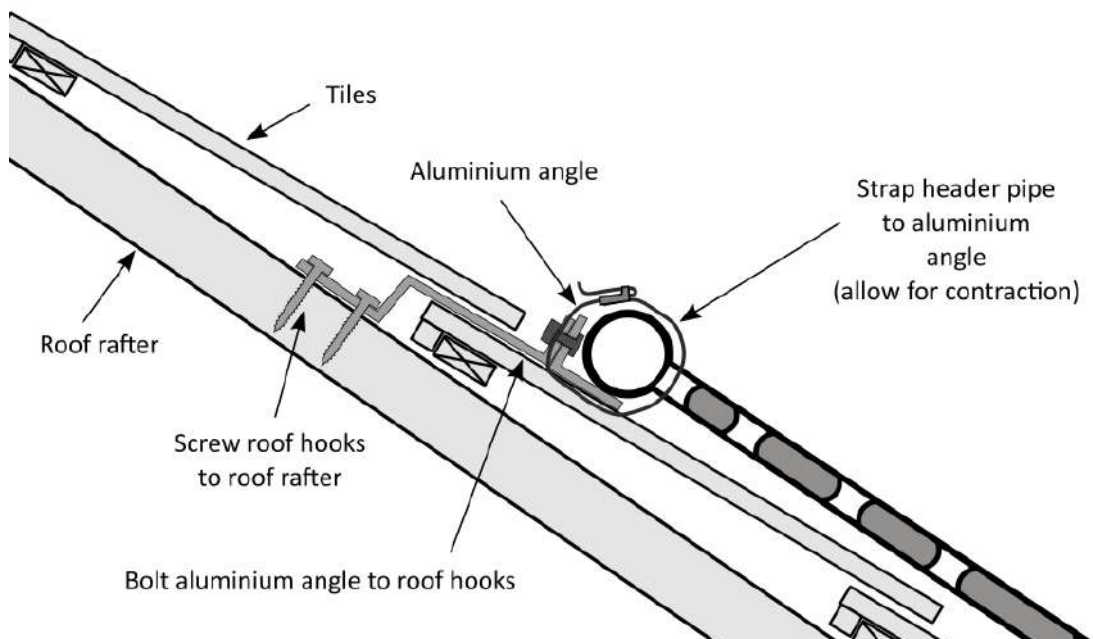
For tile roofs we recommend using a minimum roof hook spacing of 600mm in the top and bottom row. Depending on your wind loading (see “Wind Proofing” section), angle of install you may require a higher density of roof hooks and/or a stronger Aluminium L-angle, if unsure please seek advice.



WARNING

The collectors can be walked on without damage, however for tile roofs with solar roof hook care should be taken not to step on or near a roof hook as you may crack a tile.

20.1 Top Panel Tile Attachment

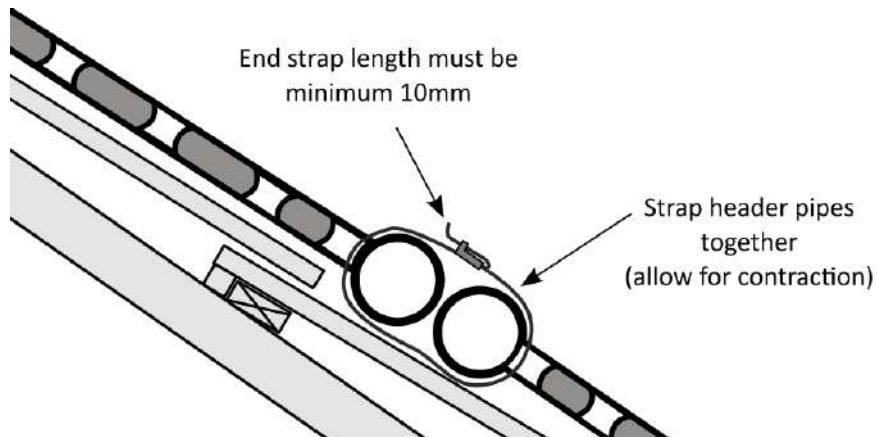


20.2 Two Row Panel to Panel Attachment

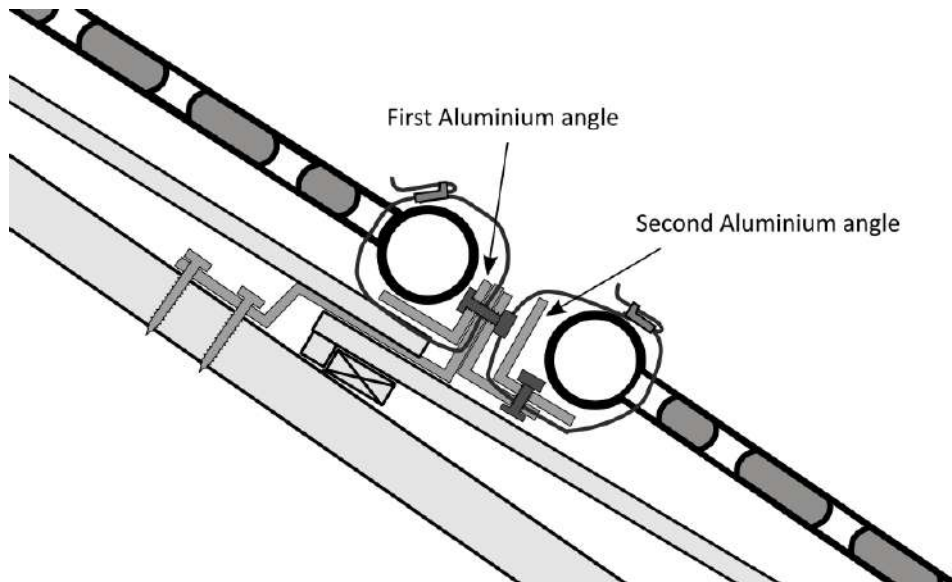


WARNING

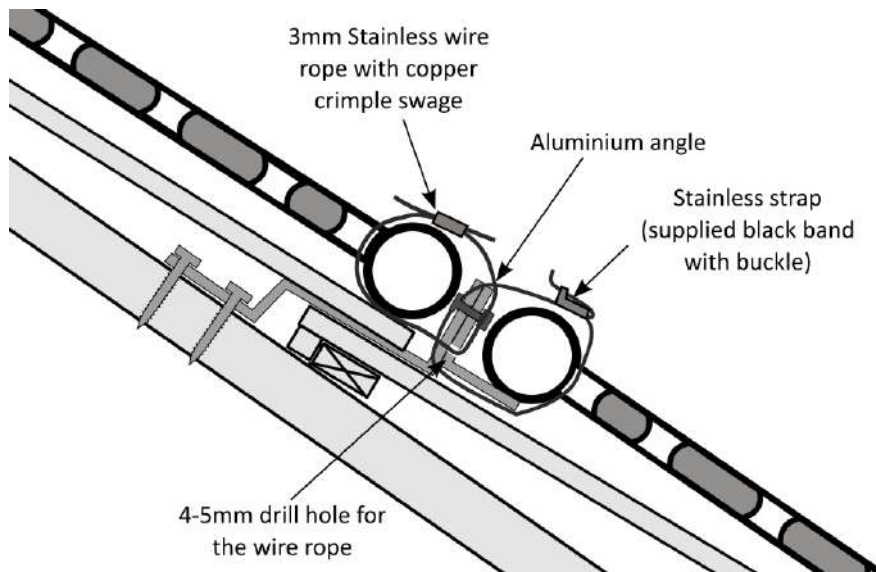
Region A, Terrain 3 Wind Loadings ONLY



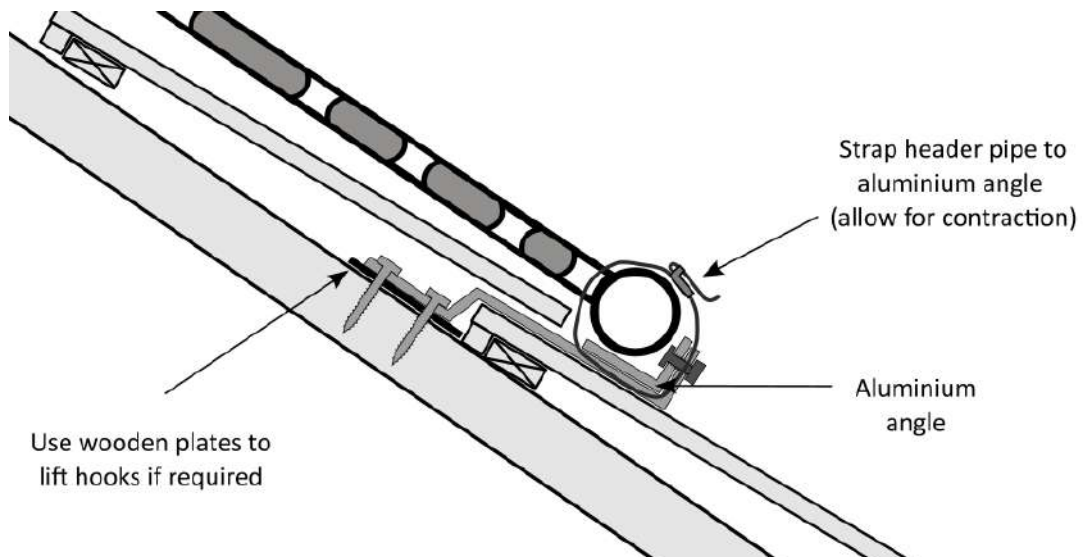
20.3 Two Row Mid Array Panel Attachment – Dual Aluminium Angle



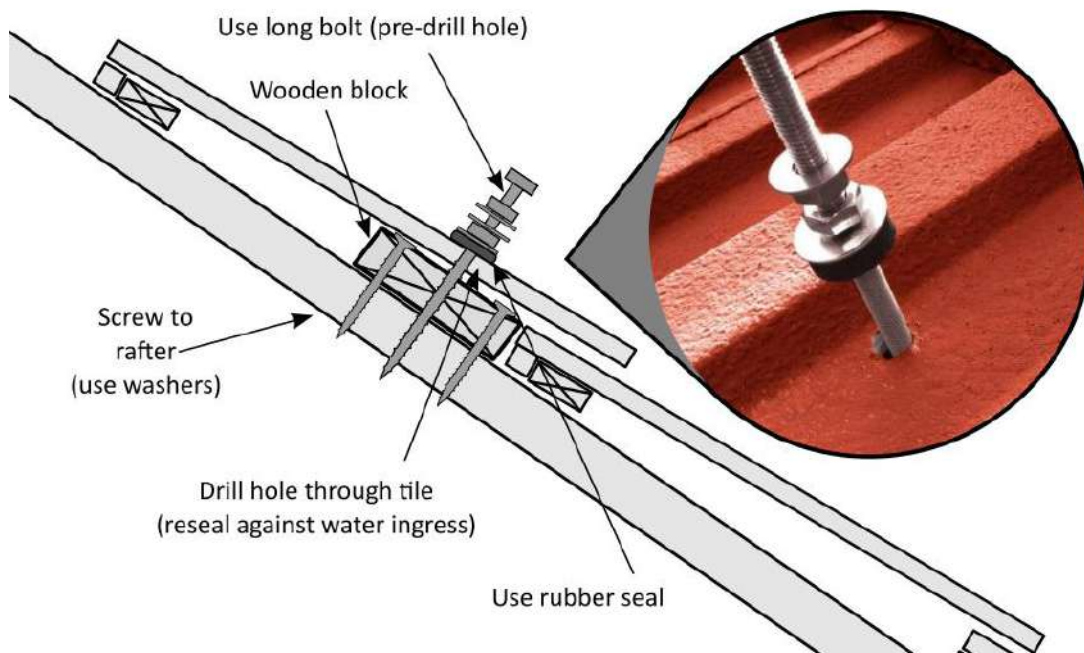
20.4 Two Row Mid Array Panel Attachment - Single Aluminium Angle



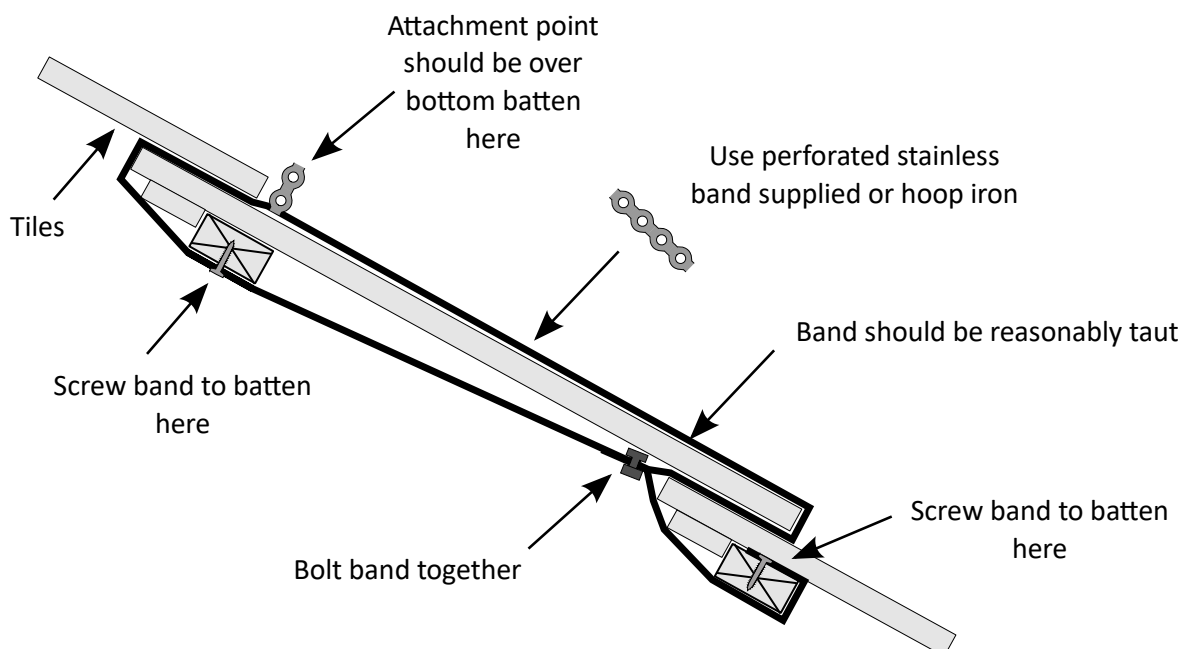
20.5 Bottom Panel Tile Attachment



20.6 Stainless Steel Cable Anchor Point Option



20.7 Perforated Band Under-Tile Anchor Point



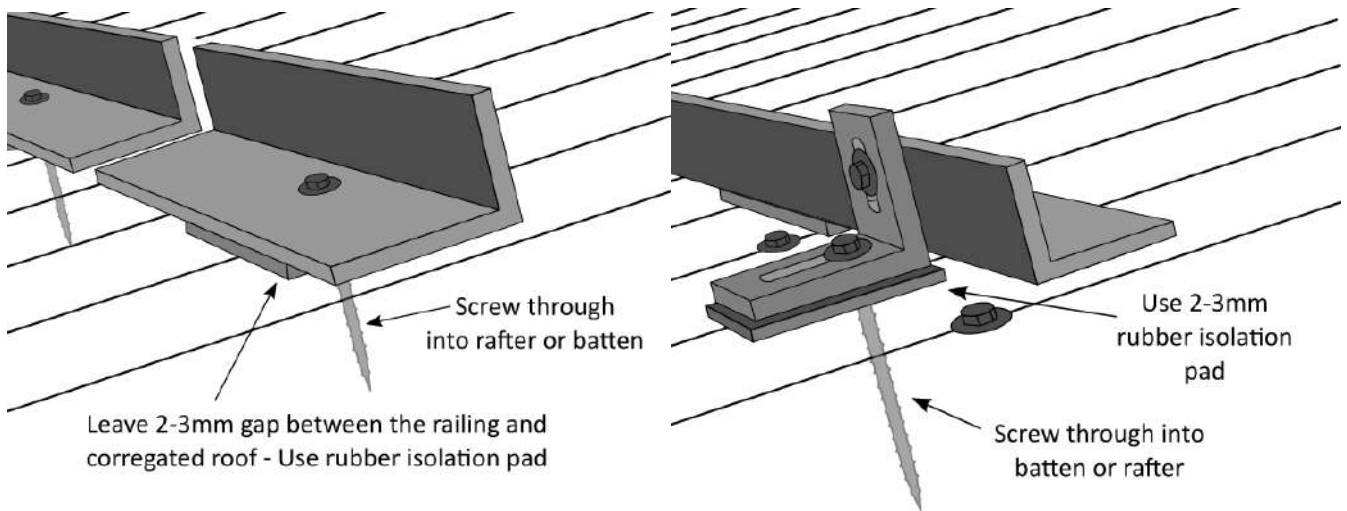
21 Corrugated Metal Roof Mounting Options



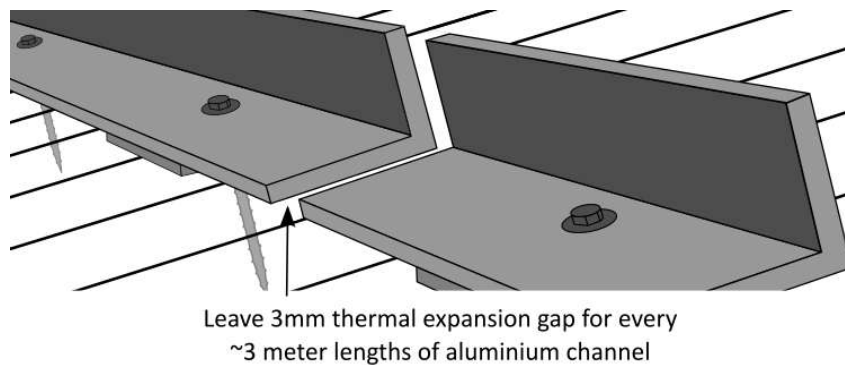
WARNING

For metal roofs we recommend using a minimum screw fixing space of 600mm when fixing the aluminium angle. Depending on your wind loading (see “Wind Proofing” section), angle of install, you may require a higher density of fixings and/or a stronger Aluminium angle, if unsure please seek advice.

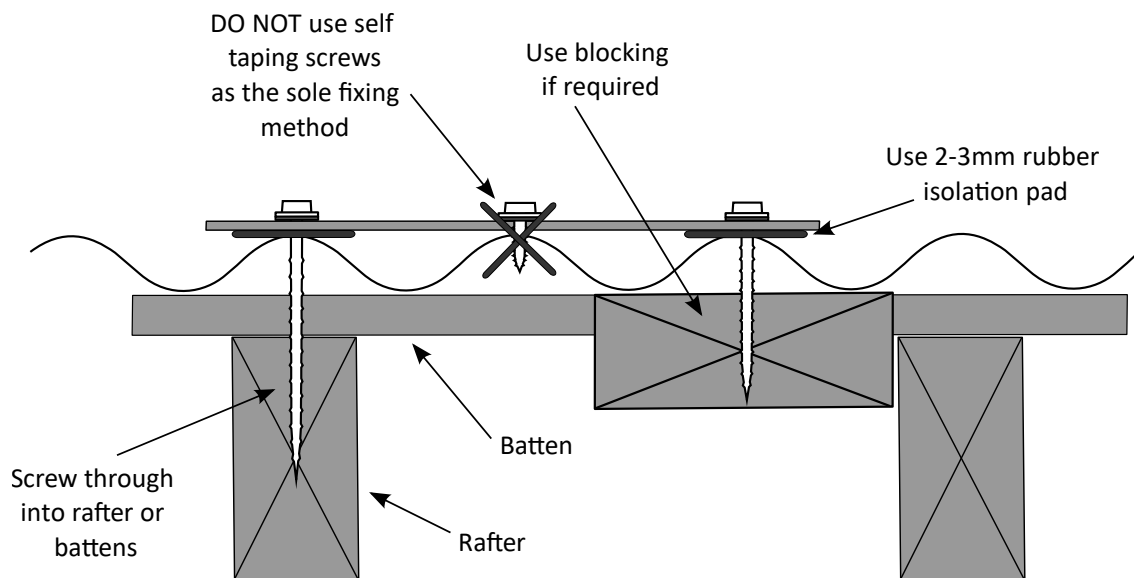
21.1 Mounting Options for Top or Bottom Angle Rail



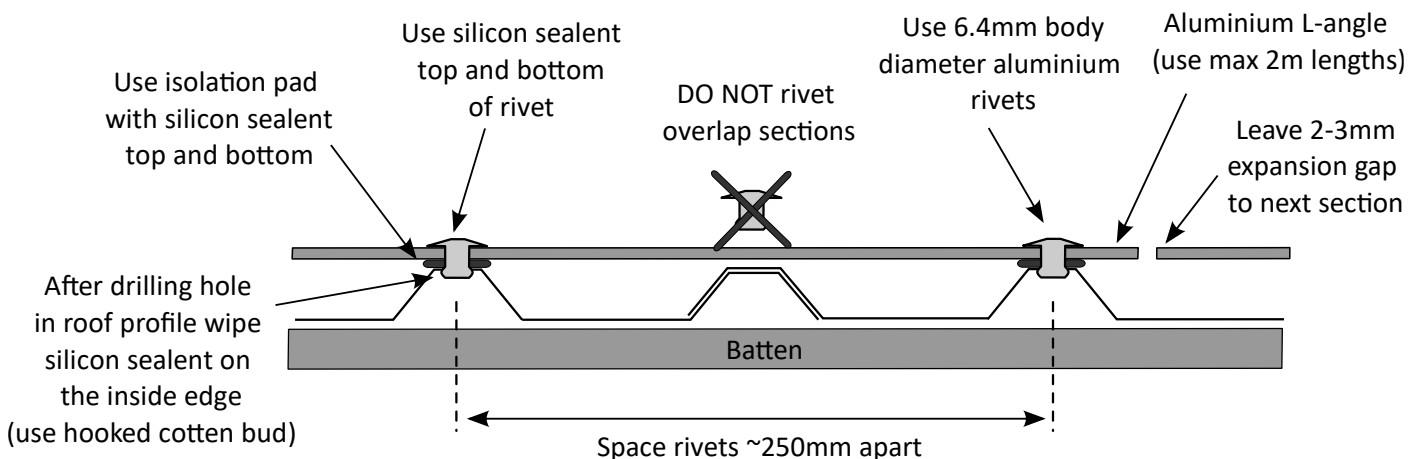
21.2 Thermal Expansion Gaps for Aluminium Channels



21.3 Metal Roof Screw Selection and Method



21.4 Metal Roof Rivet Fixing Method for Wind Region A Only



22 Wind Proofing

Note: roof installation of these panels in Wind Region D is not recommended. This section provides general advice on wind loadings. If you have any doubt about your wind loadings please contact info@EcoOnline.com.au

22.1 Ultimate Peak Wind Loadings per Panel

The following Tables specify the ultimate peak uplift any single panel can experience in a 1 in 500 year extreme storm or cyclone event according to Australian Standard 1170.2 - 2011 (Amend 2 Dec 2012). These tables assume:

- 1) Panels are mounted on (touching) the roof structure - or no more than 20mm off the roof surface
- 2) Panels are situated away from a roof edge or corner
- 3) Installation is on a first story roof
- 4) Shortest side length of the building is more than twice the average building height (i.e. flat building)

If your installation falls outside of these assumptions please contact info@EcoOnline.com.au for alternative loadings.

Ultimate Peak Uplift Loadings Per Panel in Wind Region A (Kg)					
Region A	< 10° Roof Pitch	12.5° Roof Pitch	15° Roof Pitch	17.5° Roof Pitch	> 20° Roof Pitch
Terrain Category 1	120 Kg	110 Kg	95 Kg	90 Kg	80 Kg
Terrain Category 2	100 Kg	90 Kg	80 Kg	70 Kg	65 Kg
Terrain Category 2.5	90 Kg	80 Kg	70 Kg	65 Kg	60 Kg
Terrain Category 3	85 Kg	75 Kg	65 Kg	60 Kg	55 Kg

Ultimate Peak Uplift Loadings Per Panel in Wind Region B (Kg)					
Region B	< 10° Roof Pitch	12.5° Roof Pitch	15° Roof Pitch	17.5° Roof Pitch	> 20° Roof Pitch
Terrain Category 1	195 Kg	175 Kg	150 Kg	140 Kg	130 Kg
Terrain Category 2	160 Kg	145 Kg	125 Kg	115 Kg	105 Kg
Terrain Category 2.5	150 Kg	130 Kg	115 Kg	105 Kg	100 Kg
Terrain Category 3	135 Kg	120 Kg	105 Kg	95 Kg	90 Kg

Ultimate Peak Uplift Loadings Per Panel in Wind Region C (Kg)					
Region C	< 10° Roof Pitch	12.5° Roof Pitch	15° Roof Pitch	17.5° Roof Pitch	> 20° Roof Pitch
Terrain Category 1	290 Kg	255 Kg	225 Kg	210 Kg	190 Kg
Terrain Category 2	240 Kg	215 Kg	185 Kg	170 Kg	160 Kg
Terrain Category 2.5	220 Kg	195 Kg	170 Kg	155 Kg	145 Kg
Terrain Category 3	200 Kg	175 Kg	155 Kg	145 Kg	130 Kg

As an example if you are in **Wind Region B** and **Terrain Category 3** and have a **roof pitch 12.5°** then any single panel in your collector system could experience momentary peak uplifts of **~120Kg** per panel. You should make sure your

panels and fixing components can withstand your relevant loadings. See below for Terrain Category definitions.



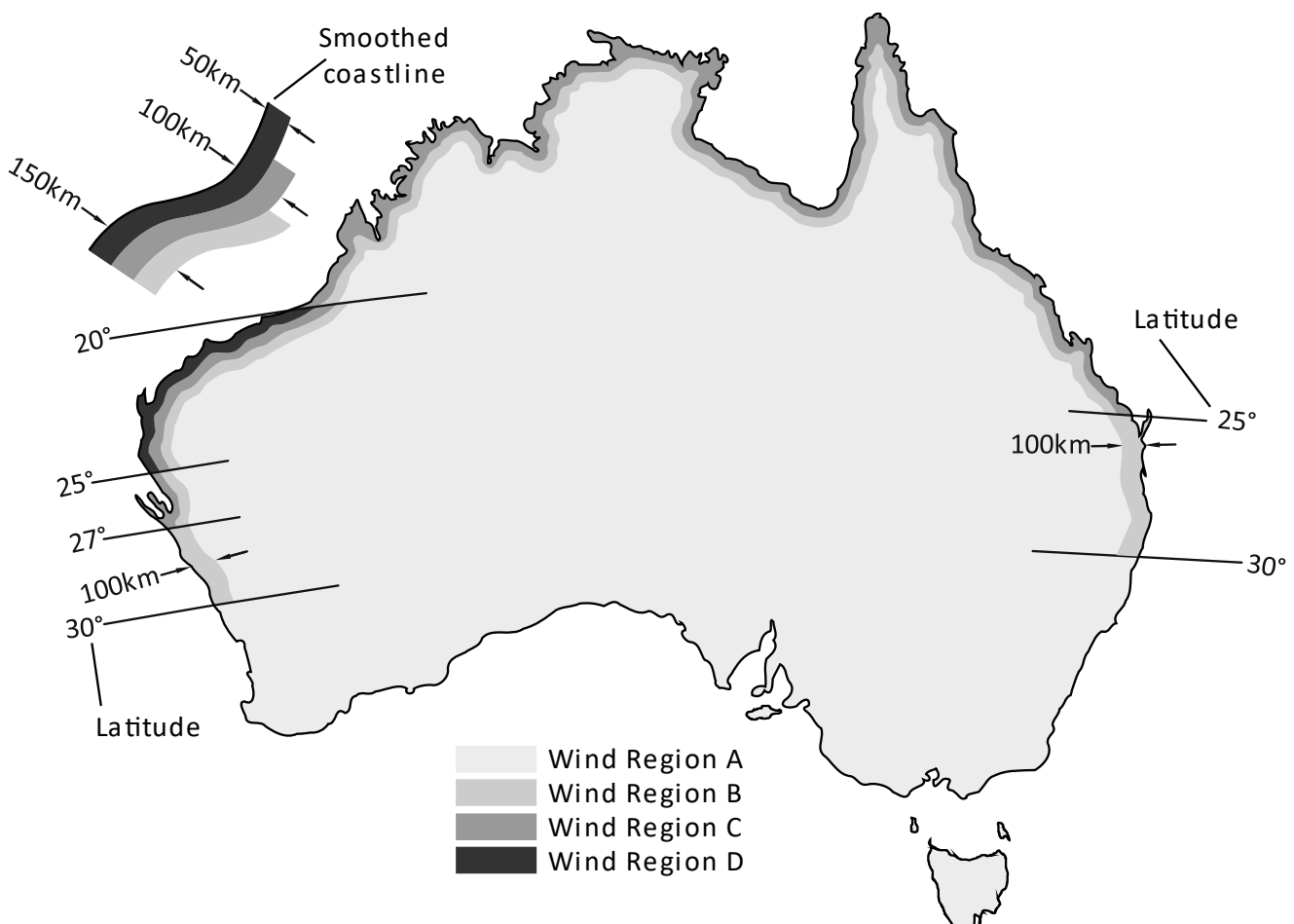
WARNING

Note: Installations involving a second story roof or higher, or houses on hills, or panels mounted 50mm or greater above the roof structure have higher potential wind loadings. Please contact info@EcoOnline.com.au for ultimate wind loadings based on your details.

22.2 Terrain Category Definitions

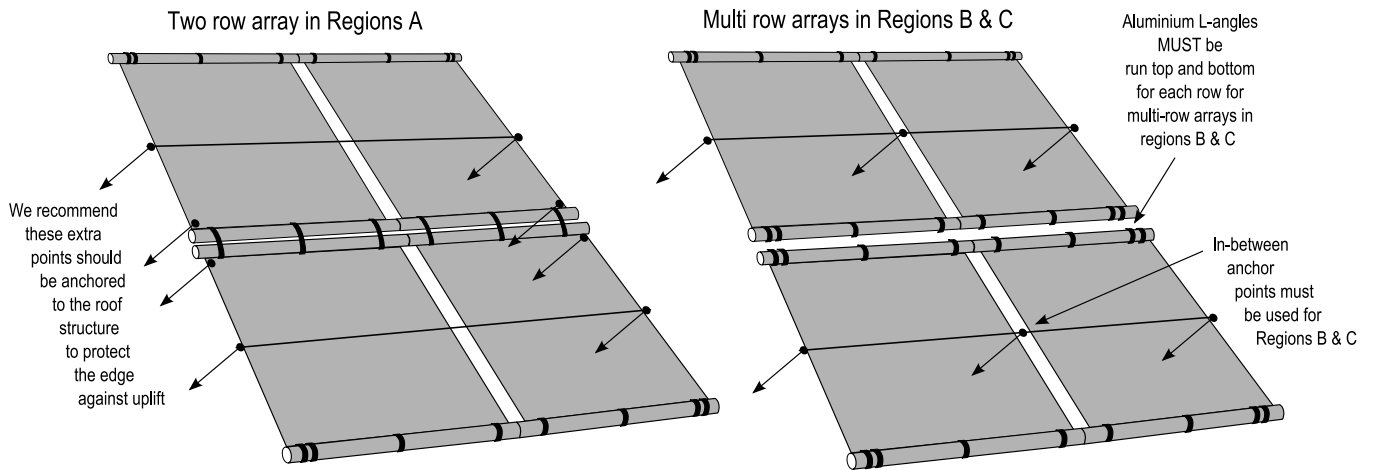
- **Terrain Category 1:** Open terrain few obstructions. Example flat, treeless, poorly grassed plains.
- **Terrain Category 2:** Open terrain with scattered obstructions having heights from 1 .5m to 5m, with at least two building type obstructions per hectare. Example farmland and cleared subdivisions with isolated trees.
- **Terrain Category 2.5:** Averaged intermediate between Terrain Category 2 and Terrain Category 3
- **Terrain Category 3:** Numerous closely spaced building obstructions having heights from 3m to 10m with at least 10 house-size obstructions per hectare. For example a fully developed suburb or light industrial estates.

22.3 Wind Region Definitions



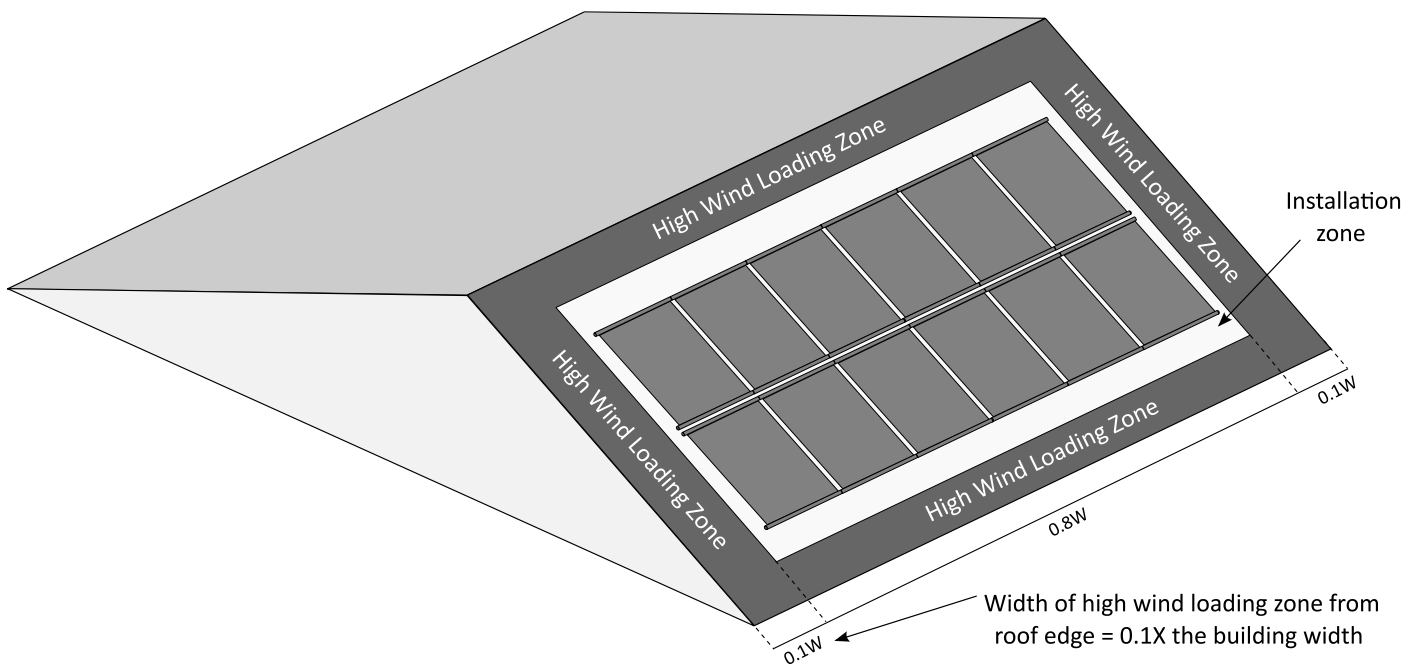
Coastal region boundaries are smooth lines set in from a smoothed coastline by 50km, 100km or 150km lines.

22.4 Frequency of Extra Fixings for Different Regions



For ultimate wind loadings (see Tables above):	Extra Fixings Required
Less than 70Kg per panel	Stainless guide line is not required (but still recommended)
Greater than 70Kg per panel	Stainless guide line is required across each row
Greater than 120kg per panel	Stainless guide line is required with in-between anchor points

22.5 Roof Edge High Wind Loading Zones



WARNING

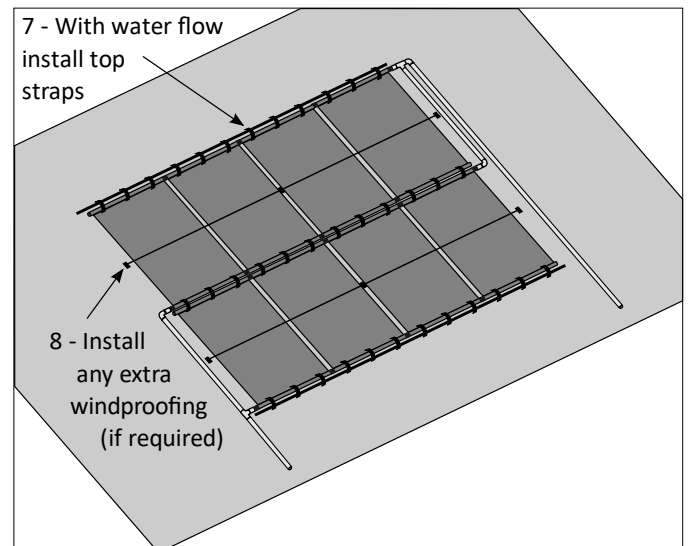
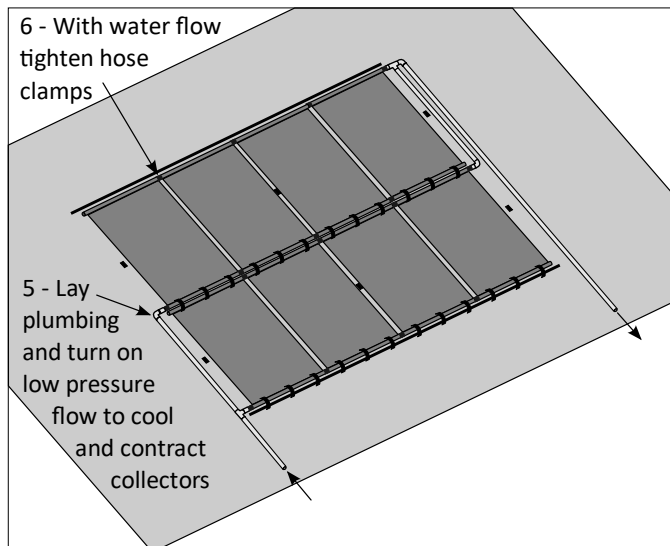
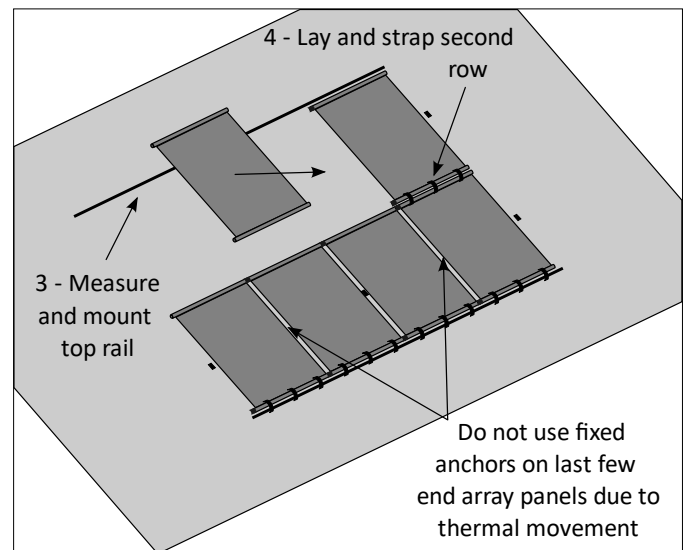
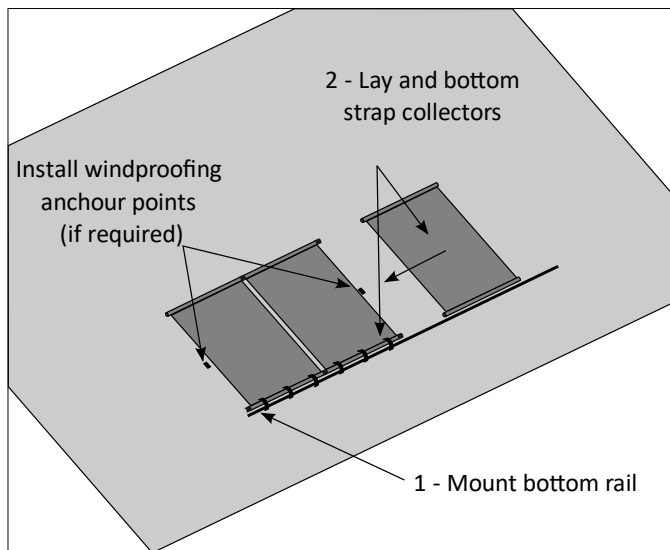
Note: Collector installations within a roof edge high wind loading zone will require **2 X** the fixing strength in that local area. Collector installations within a roof corner high wind loading zone will require **3 X** the fixing strength in that local area.

23 Seasoning Panels and Minimizing Contraction Issues

Please be aware, collectors will **naturally age and contract by up to 10mm in length (and proportionally in width) per panel** in the first 1-4 years. Collectors will also **thermally contract on a daily basis from a hot panel (80°) to a cold panel (~0°) by up to 12mm in length (and proportionally in width) per panel**. No special care need be taken for single row array with 6 or less panels in one row as the straps supplied can accommodate these thermal changes, for other arrays please follow the below procedures.

23.1 Mounting Procedure for Arrays 10 or Less Panels per Row

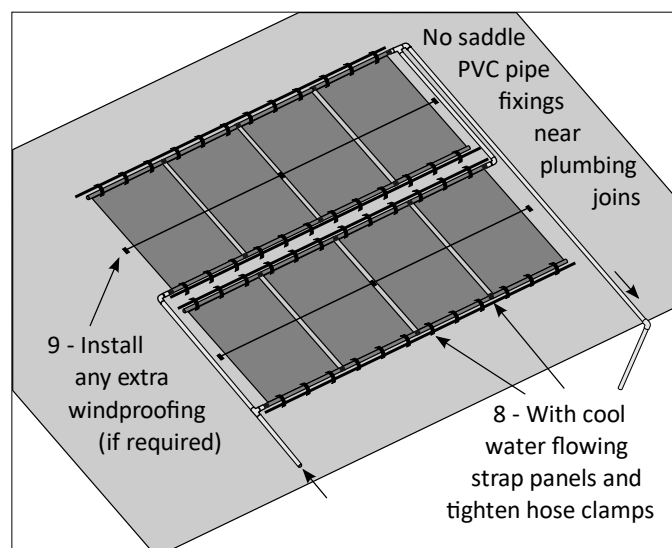
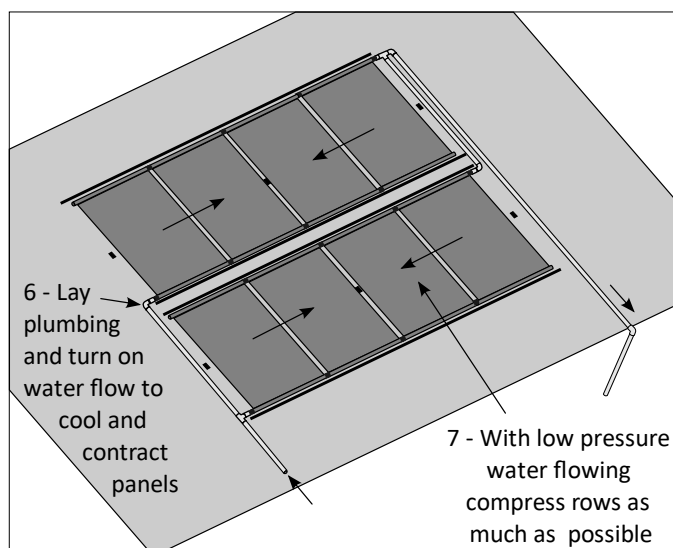
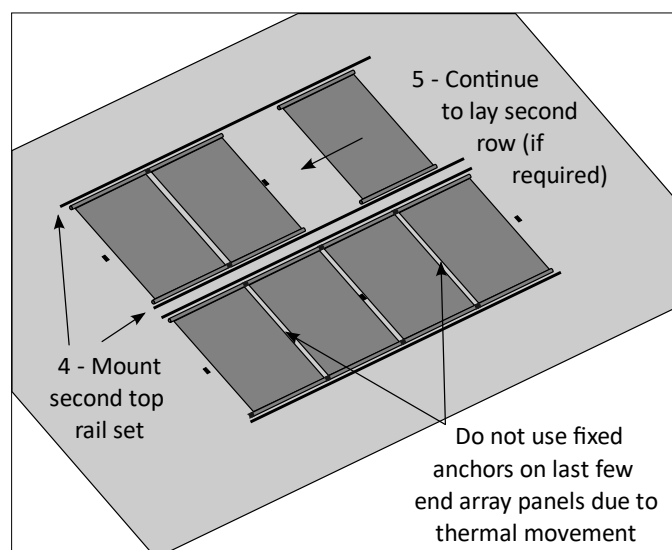
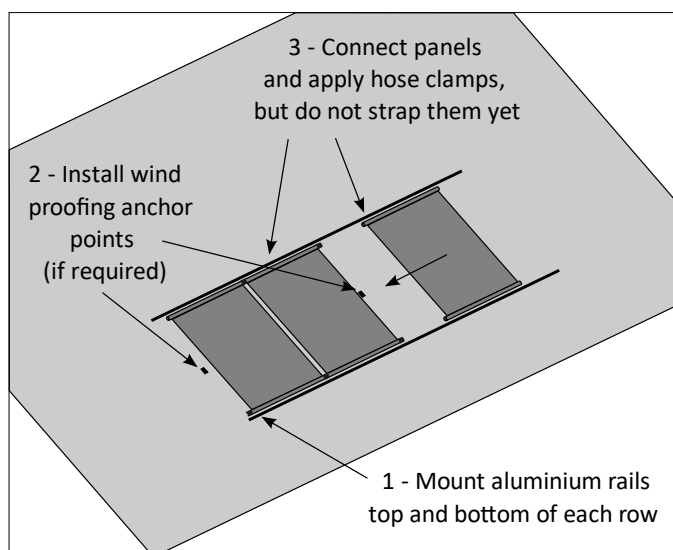
We recommend you “**Season**” the panels by placing them in the hot sun for half a day on one side and half a day on the other side to minimize any age contraction issues later. Then follow this mounting procedure:



Apply and tighten hose clamps and fixing straps to cool panels only (and/or with cool water running at low pressures, see Pressure Optimization section below) and never hot panels. **Why?** Applying straps/clamps to hot panels can cause issues for large arrays when the collector array contracts significantly in the cool of the night and over time.

23.2 Mounting Procedure for Arrays 15 or Less Panels per Row

You MUST “Season” the panels by placing them in the hot sun for half a day on one side and half a day on the other side to minimize any age contraction issues later. Then follow this mounting procedure:



CAUTION

Compact panels pipe to pipe, tighten clamps and apply fixing straps to cool panels only (and/or with cool water running at low pressures, see Pressure Optimization section below), and never hot panels. **Why?** Applying straps/clamps to hot panels can cause issues for large arrays when the collector array contracts significantly in the cool of the night and over time.



CAUTION

For these arrays we recommend you locate the vacuum release off the roof and run the system at a slight negative pressure. **Why?** A slight negative pressure will help reduce side to side thermal movement, help compact panels during installation and guard against pool drain events caused by a joiner pulling out.



CAUTION

For arrays containing 11-15 panels in a single row we strongly recommend aluminium channels top and bottom for each row. **Why?** Panels strapped top and bottom to an aluminium railing will have smaller side to side thermal movements.



CAUTION

Arrays containing more than 16-20 panels in a row should only be installed with special expansion couplings in the middle of the row to account for the thermal movement. Arrays greater than 20 panels are allowed with extra expansion couplers; however a 100L/min flow rate limitation per row applies.

23.3 Mounting Arrays with 15 or More Panels per Row

Please contact info@EcoOnline.com.au for special expansion joiners if you need to run your array with > (greater than) 15 panels per row.

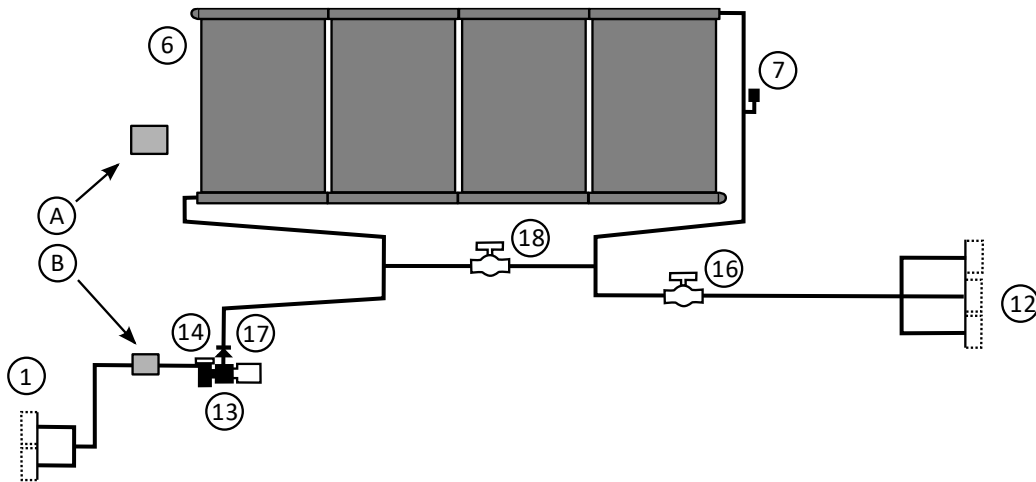
24 Plumbing Diagram Configurations



CAUTION

When installing PVC lines, attention should be given to the minimum spacing for pipe supports and thermal expansion of long length of pipe work and the stress this produces on joins. For complicated installations we recommend a professional installer install the system, unless you are confident of the work to be performed.

24.1 Configuration 1: Independent/Separate System



LEGEND:

A - Roof Temperature Sensor	7 - Vacuum release valve	15 - Main filter check valve
B - Pipe Temperature Sensor	12 - Pool return	16 - Ball valve brake (if required)
1 - Pool suction	13 - Dedicated solar pump	17 - Pump Integrated non-return
6 - Solar collector array	14 - Integrated strainer basket	18 - 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

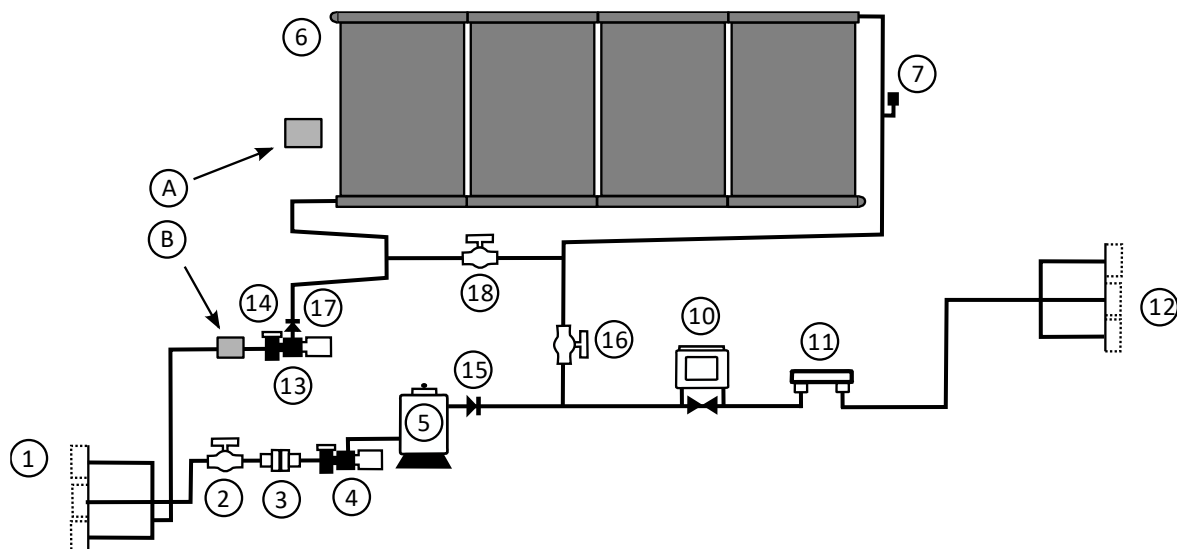
Advantages:	Disadvantages:
* More energy efficient as a small solar pump runs independent of the large main filter pump	* Requires separate solar suction provisions to be installed



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.**

24.2 Configuration 2: Integrated Independent System



LEGEND:

A - Roof Temperature Sensor	5 - Main pool filter	13 - Dedicated solar pump
B - Pipe Temperature Sensor	6 - Solar collector array	14 - Integrated strainer basket
1 - Pool suction	7 - Vacuum release valve	15 - Main filter check valve
2 - Ball valve	10 - Auxiliary heater	16 - Ball valve brake (if required)
3 - Union socket/join	11 - Chlorinator	17 - Pump Integrated non-return
4 - Filter pump	12 - Pool return	18 - 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.

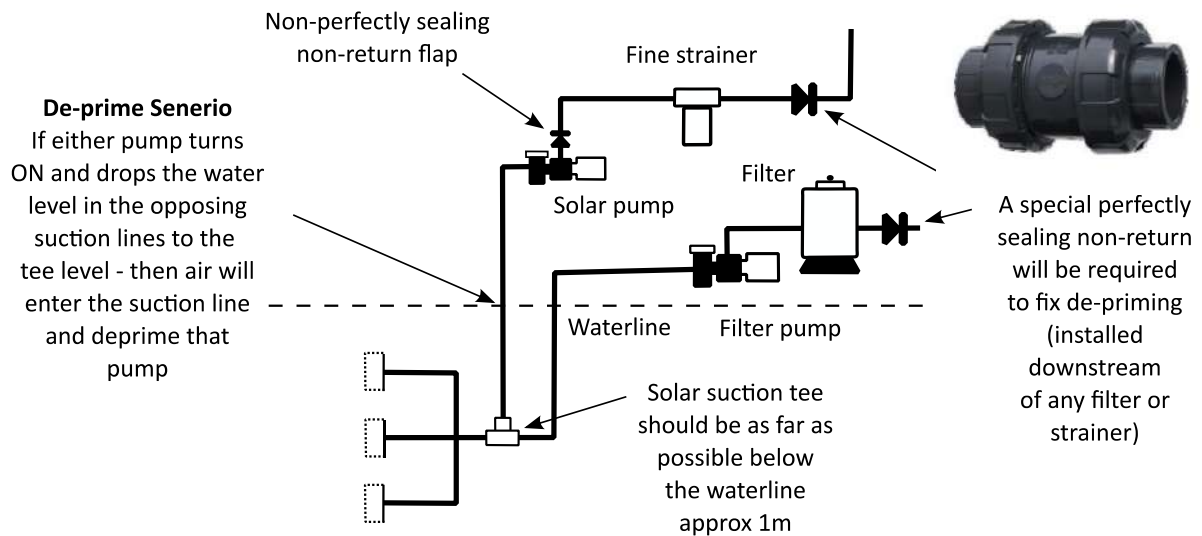
24.3 Notes on Teeing into the Suction Line for Configuration 2



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.

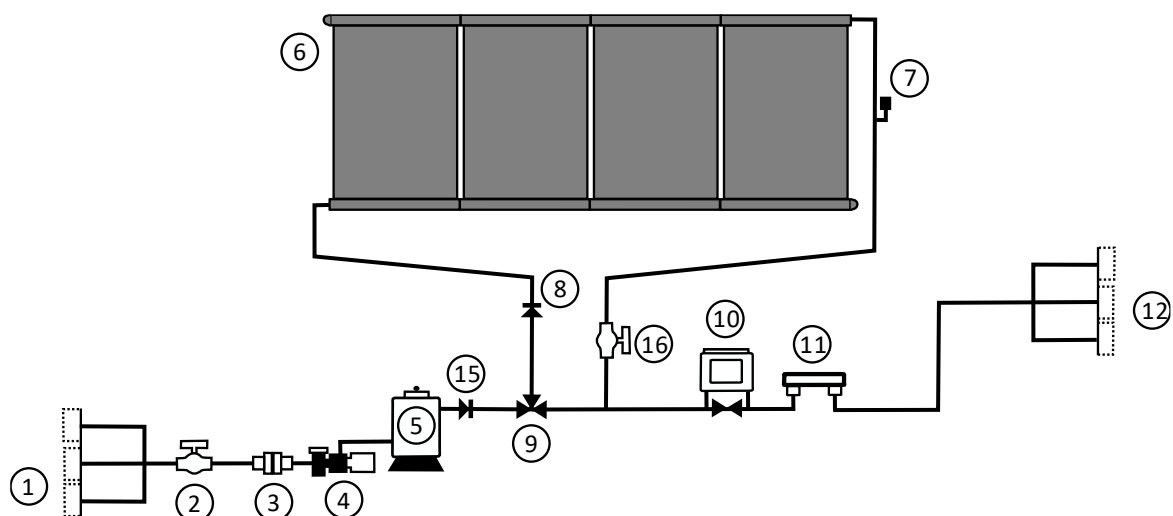
Please be aware, this is a special valve with a polished ball and rubber seat, contact us at info@ecoonline.com.au if you require it. A standard flap non-return will not suffice. Also note, such a system will need regular careful maintenance of the solar and filter line non-returns. Any failures or even 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.

24.4 Installing the Tuffman Fine Strainer



The above scenario you will require the Tuffman fine to protect the non-return from fine grit and twigs. 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.

24.5 Configuration 3: Manual/Timer/Motorized Valve System



LEGEND:	5 - Main pool filter	10 - Auxiliary heater
1 - Pool suction	6 - Solar collector array	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)

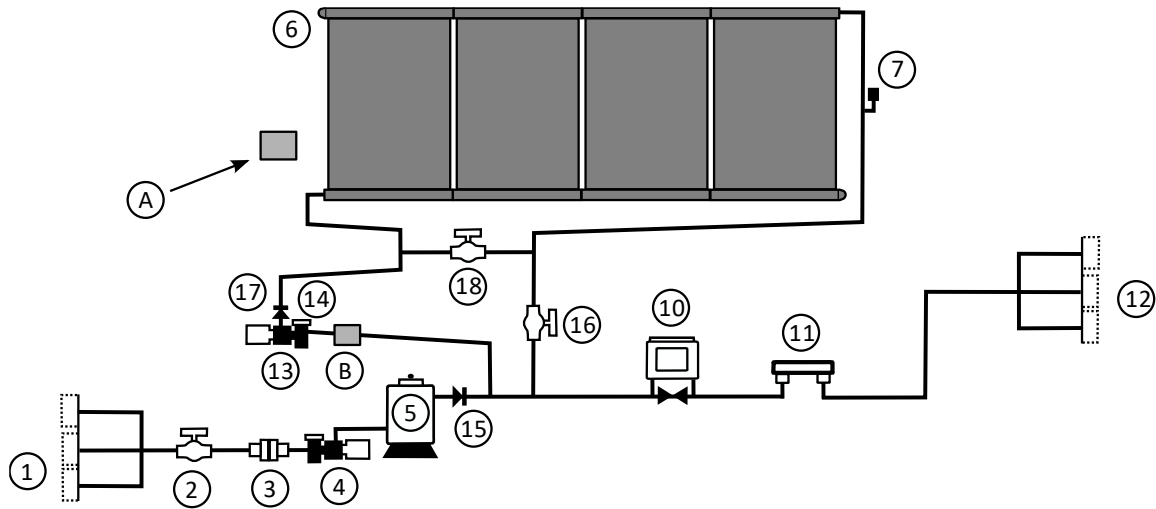
Notes: Manual or motorized three-way valve (9). (Note: automatic controls are omitted for clarity).

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



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.

24.6 Configuration 4: Booster/Retrofit System



LEGEND:

A - Roof Temperature Sensor	5 - Main pool filter	13 - Dedicated solar pump
B - Pipe Temperature Sensor	6 - Solar collector array	14 - Integrated strainer basket
1 - Pool suction	7 - Vacuum release valve	15 - Main filter check valve
2 - Ball valve	10 - Auxiliary heater	16 - Ball valve brake (if required)
3 - Union socket/join	11 - Chlorinator	17 - Pump Integrated non-return
4 - Filter pump	12 - Pool return	18 - 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.

25 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 website.

25.1 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 an OKU panel**. Ideal placement is within arm's length of the gutter.



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 panels to approximate the surface temperature of the roof itself. Alternatively, it can be extended see below.

25.2 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.



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.



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.

25.3 Extending Sensor Cords

The sensor cords can be extended using a 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 (but in a higher gauge) if extending it. Please contact Dontek or Ascon if unsure.



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.

26 Drain-Down, Frost Proofing and Winterization

26.1 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.*

26.2 Winterization

Please note, while your potable HPDE/Silicon collector array does not require regular winter flushing, **your solar booster pump may require winter flushing.** If this is the case and 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.

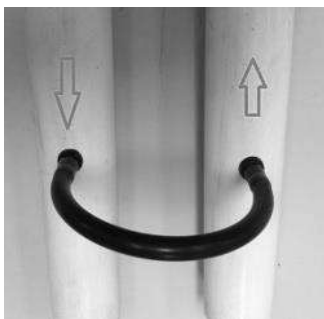


CAUTION

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.

26.3 Installing a By-Pass Tube or By-Pass Ball Valve (18)

A drain tube (or a by-pass ball valve 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.



Read Carefully

Independent systems with a drain tube anywhere in the system **MUST** be installed with a fine (<0.5mm) strainer, or else this tube may get blocked up.



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.

27 Optimizing Collector Pressure

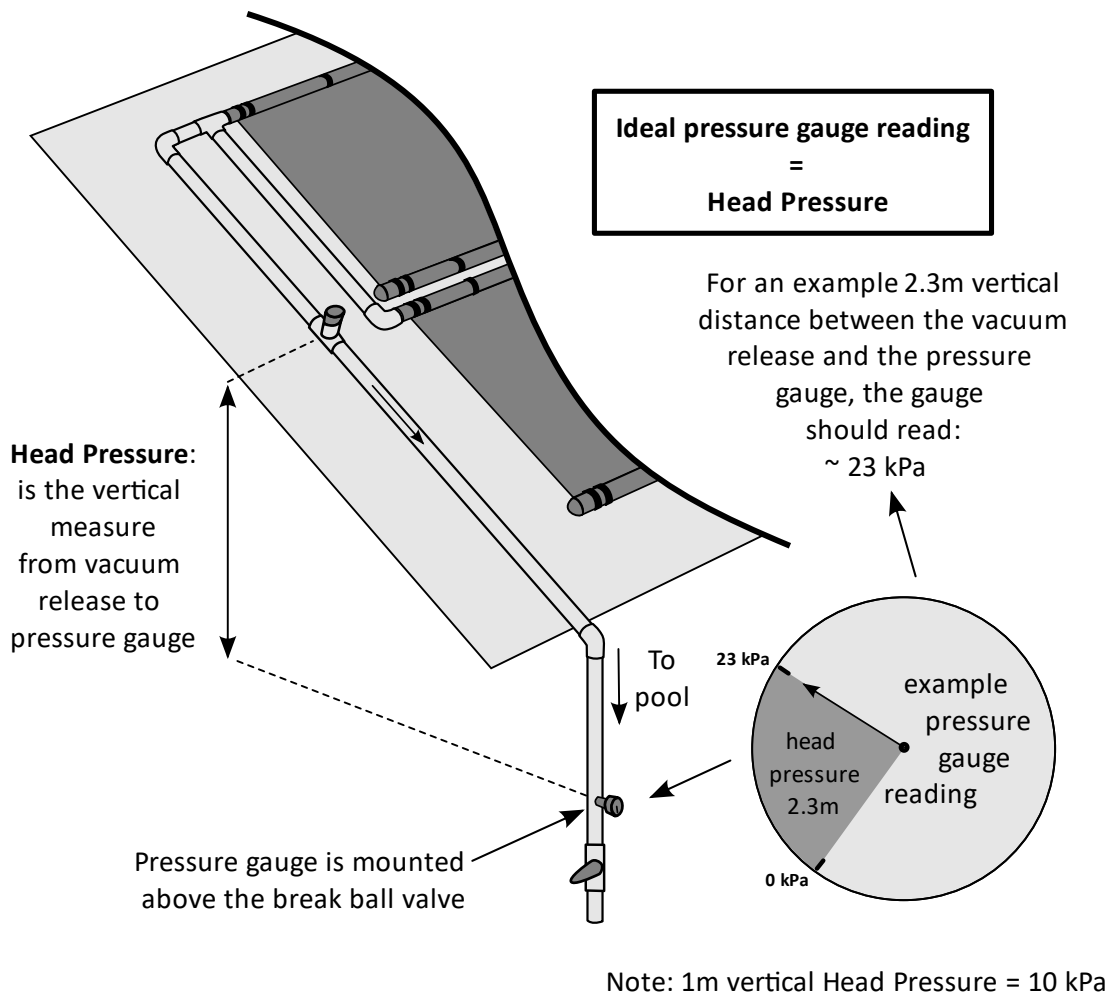
27.1 Installing the Pressure Gauge



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.**

27.2 Zero Pressure Panel 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 (18) 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 - 2 kPa	Install ball valve brake (16) (see plumbing diagrams) to increase back pressure in return line
Up to: Head Pressure + 4 kPa	Pressure is okay no action required
Greater than: head Pressure + 4 kPa	Excessive pressure - install extra pool returns or remove eyeballs from returns, or install by-pass (19) with ball valve



CAUTION

It's important OKU panels are run at near zero pressure up on the roof, however pressure \pm 4kPa are also acceptable. Larger pressure may limit collector lifetimes.

Why? Plastic longevity is strongly dependent on pressure fluctuations and temperatures.



CAUTION

Never expose the collector array to temporary pressures greater than 16 psi (110kPa).

Note: if for whatever reason water flow is fully blocked, a pump with a 15 meter head pressure will generate 150kPa at ground level, 100kPa at 5m and 50kPa at 10m.

27.3 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.

27.4 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.

27.5 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 (18) (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.

28 Checking for Balanced Water Flow

At midday with the sun shining on the collectors and the pump running, run your hand over every part of each collector in the array. The bottom face of each collector should be cool to the touch while the top of each collector maybe slightly warmer to the touch. No part of any collector should be hot to the touch. **Hot spots indicate that there is no water flow through this part of the collector.**



Tip

During operation the outlet water flow should be strong with a temperature no greater than about 1-2°C that of the inlet. **Why?** *Faster flows rates will result in lower temperature differences across the collector array and higher collector efficiencies; however this should be balanced against electricity usage and maximum allowable panel pressure.*

29 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	1st Month	1st Quarter	Annual Checks	After 5 Years
Plastic Barbs Relaxing - All the stainless steel hose clamps may need retightening as plastic relaxes overtime (hand tighten only).	X		X	

Silicon Joiner Chemical Attack – Disconnect a single silicon joiner, dry and check that the water exposed inside section has not turned grey or become unfirm to the touch. This would indicate chemical attack from a pH lower than 7. Replace as needed.		X	X	
Stainless Strap Fatigue - Inspect all stainless steel fixing straps for wear of PVC coating around the sharp Aluminium L-angle edge, which would indicate fatigue working of straps. Replace as needed.			X	
Mounting Frame - The integrity of the collector mounting frame and windproofing components should be checked for any degradation. Replace as needed.			X	
Plumbing Degradation – Plumbing lines and fittings should be checked for signs of UV and/or chemical damage. Replace as needed.			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	
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	
Collector Plastic Contraction – Collectors can relax and contract by 10mm in length over the initial first few years. It should be checked that the stainless steel straps or fixings have not become too tight as a result. If required, straps will need to be loosened slightly. This check should be carried out when the collectors are cool (water flowing).			X	
Debris Accumulation on Roof – Check that there is no build up of debris around pipework or collectors, and that water has a clear path to run down.			X	
Debris Accumulation in Collectors – Inspect the inner of the collectors. Depending on conditions collectors may need to be flushed with a suitable cleaning agent for debris accumulation after many years of use.				X

29.1 Collector Repair Procedure

Please contact info@EcoOnline.com.au

30 User Information

30.1 Notes on First Usage

After the system is switched ON for the first time, please be aware that it will take up to one 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.

30.2 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.

31 Important Installation Check List

Your installation must have the following elements.

- Correctly sized pump or pressure optimization carried out.
- The top header pipe for any row was installed with a very small slope toward the outlet or is at least level.
- Aluminium channel was laid top and bottom of each row or for a maximum of two rows.
- The stainless steel strapping was installed with sufficient play to allow for collector contraction.
- Ultimate uplift wind loadings were considered and panels secured appropriately.
- A hot spot check was performed. All collectors are cool during full sun exposure (top of panels may be warmer).
- Smooth flow is achieved; little air bubbling is present in pool after initial purging.
- Frost proofing was considered. All collectors and PVC lines are sloped and arranged such that water runs back into the pool at night.
- A vacuum release valve **MUST** be installed on the roof on the return line.
- A non-return valve was installed (with a small 6mm hole drilled in the flap).
- Solar controller roof sensor was mounted on the roof and not on a solar collector.
- User is aware of the maintenance schedule.