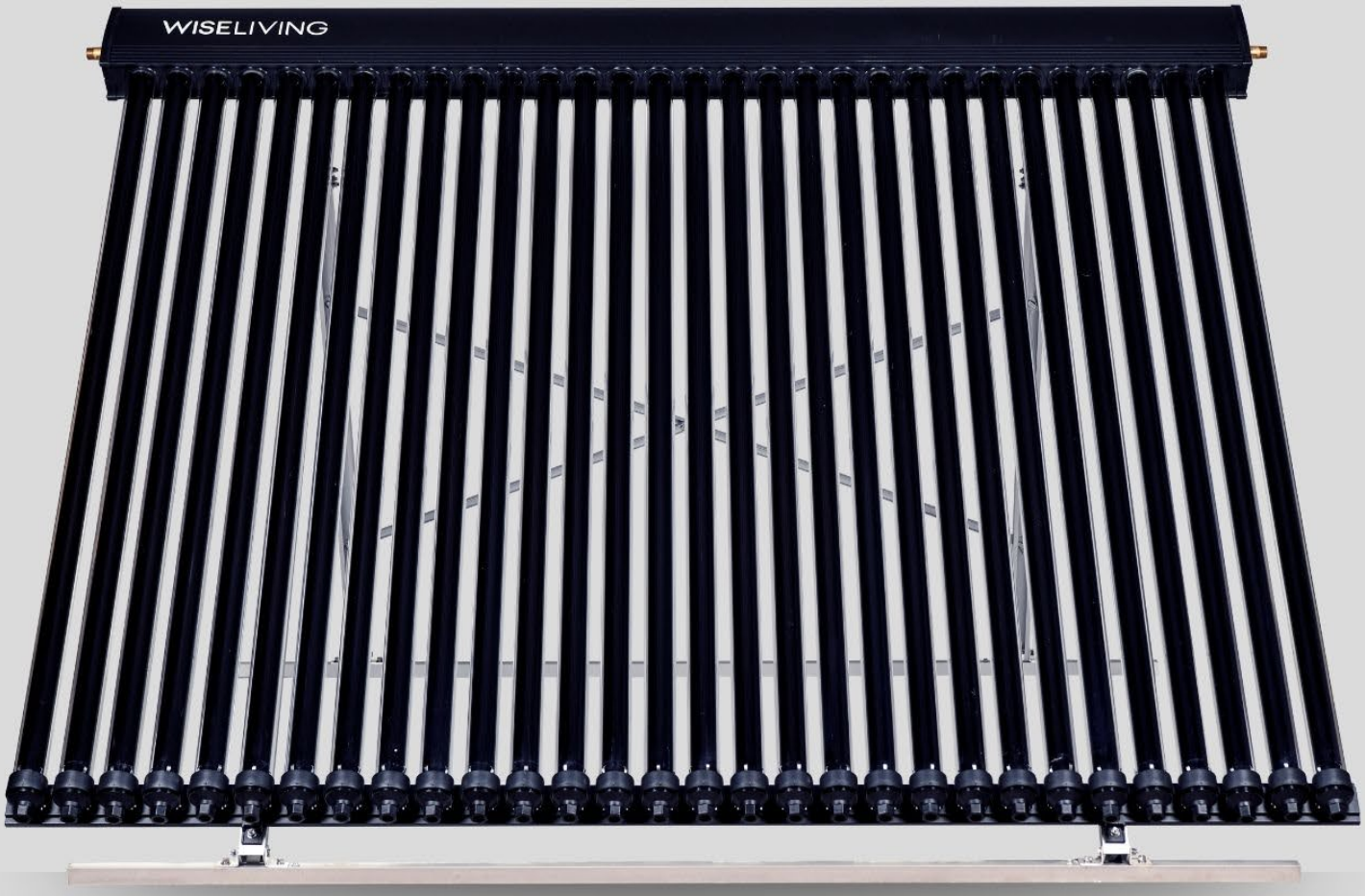
WISELIVING

Sustainable Heating, Cooking & Hot Water

SOLAR HOT WATER

20 / 30 / 40 SOLAR EVACUATED TUBES, SETS,
MANIFOLDS & FRAMES



TECHNICAL INSTALLATION & USER MANUAL

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CHAPTER 1: INTRODUCTION

1.1 TERMINOLOGY

- **Bank:** Multiple collectors in series (one after the other).
- **Boost:** The process where a heating component (such as an electric element or gas heater) is used to provide additional heating when solar-heated water is not of an adequate temperature
- **Clean Energy Regulator (CER):** Government body responsible for overseeing the implementation of the Large-scale Renewable Energy Target (LRET) and the Small-scale Renewable Energy Scheme (SRES).
- **Collector:** The WISELIVING solar collector includes the manifold with heat pipes and evacuated tubes inserted.
- **Expansion Control Valve (ECV):** Installed on the cold mains line to relieve excess pressure.
- **Evacuated Tube:** functions to harness the solar energy by capturing and retaining the heat due to the presence of the vacuum.
- **Flow Line:** The plumbing line running from tank solar flow port to the inlet of the collector. This line incorporates the circulation pump.
- **Heat Pipe:** A copper pipe that sits inside the evacuated tube and is inserted into the collector manifold. A small volume of liquid acts as a heat transfer fluid. It absorbs heat via evaporation, and transfers heat to the system fluid via condensation.
- **Header Pipes:** The copper "heat exchanger pipes" in the manifold of the WISELIVING collector through which the water flows.
- **Insolation:** Solar radiation level, expressed in kWh/m2/day.
- **Manifold:** Refers to the solar collector enclosure that contains the header pipes.
- **Pressure Temperature Relief Valve (PTRV):** installed on the hot water storage tank to relieve pressure, and excessive temperatures.
- **Return Line:** The plumbing line running from the solar collector to the solar return port on the tank.
- **Stagnation:** Stagnation is the maximum temperature a collector will reach, at which point the rate of heat gain and rate of heat loss is balanced.
- **Stratification:** the passive separation of water into distinct layers of different temperatures, where the temperature at the top of the tank can be significantly higher than the temperature at the bottom.

CHAPTER 2: WARNINGS AND PRECAUTIONS

2.1 INSTALLER REQUIREMENTS

Installation of a system must be completed by a licensed plumber and in accordance with the requirements listed below, as well as any relevant local standards and regulations.

- AS/NZS 3500.4 - National Plumbing and Drainage Code
- AS/NZS 2712.2007 - Solar and Heat Pump Water Heaters: Design and Construction
- AS/NZS 4234.2008 - Heated Water Systems - Calculation of Energy Consumption
- AS/NZS 5601.2004 - Gas Installations

2.2 OCCUPATIONAL HEALTH AND SAFETY

The installer must adhere to occupational health and safety guidelines and other relevant industry associations. Under no circumstances should any installer attempt to install a WISELIVING solar hot water system without reading and understanding this installation manual. For any queries WISELIVING staff may be contacted on 02 6021 2200

2.3 OVER PRESSURE AND TEMPERATURE PROTECTION

2.3.1 PTRV

Any system design must allow a means of pressure release at no more than 850kPa, using a PTRV. The PTRV must have a downward direction copper pipe connected that is open to the atmosphere, running the expelled hot water or air to a safe, frost free and appropriate drainage location. From time to time the PTRV may discharge small amounts of water under normal operations, this can be up to 10% of tank capacity. If the tank is installed indoors, a safe tray must be installed beneath the hot water tank to safely collect any water expelled from the PTRV.

2.3.2 MAINS PRESSURE CONTROL

Where the mains supply pressure can exceed or fluctuate beyond the pressure of 500kPa, a pressure-limiting valve must be fitted to the cold mains line. The device is installed after the duo valve (isolation valve and check valve) and should have a pressure limit of 500kPa.

In some states it is a mandatory requirement that an expansion control valve be fitted on the cold mains line to provide a form of pressure relief. A separate drain line must be run for this relief valve (as per AS/NZS 3500). If unsure, please check with the local authority.

2.4 WATER QUALITY

2.4.1 WATER QUALITY THRESHOLDS

Water quality is an important aspect of system lifetime. For the system to be warranted, the water used in the system must meet the requirements outlined in Table 1.

Table 1 Water Quality Threshold Values

Total Dissolved	< 600 mg/L or
Total Hardness	< 200 mg/L or
Electrical	< 850 µS/cm
Chloride	< 250 mg/L or
pH Level	Min 6.5 to Max.
Magnesium	< 10 mg/L or
Sodium	< 150 mg/L or

If in doubt, contact your local water authority or have a water test completed. In areas of poor water quality all major components will have a reduced life due to the hardness of the water. In areas with "hard water" (>200 mg/L or ppm), it is

advised to install a water softening device to ensure the long-term efficient operation of the system is met.

2.4.2 LEGIONELLA CONTROL

Legionella bacteria can be found naturally in the environment and thrives in warm water and damp places. It can weaken the body's immune system, which can increase the chances of developing Legionnaires' disease. To ensure legionella growth is inhibited, the boosting regime must meet the guidelines as shown in Chapter 8: Auxiliary Heating. This is in accordance with 'AS3498.2009 Authorisation requirements for plumbing products - water heater and hot-water storage tanks' It is, therefore, very important that the auxiliary boosting system remains on. It will only activate if the temperature falls below the temperatures outlined.

2.5 WEATHER RELATED ISSUES

2.5.1 FREEZE PROTECTION

All WISELIVING systems have freeze protection built in. This is provided by the controller which will circulate water through the collector once the temperature falls below 5°C. This freeze protection method has passed Frost Level 1 protection (down to -15°C) in line with AS/NZS 2712:2007.

WARNING
Freeze protection will not operate if there is no power supply to the controller or pump.

2.5.2 LIGHTNING PROTECTION

At installation locations that are prone to lightning strikes, it is advisable to earth/ground the copper circulation loop of the collector to avoid lightning related damage, or electrical safety issues. Refer also to local building codes regarding lightning safety and grounding.

The inclusion of a residual-current device (RCD) may be used in these lightning prone areas and is to be sourced from others.

2.5.3 HAIL RESISTANCE

The borosilicate glass evacuated tubes have been tested under the Australian Standards requirement (AS/NZS 2712:2007 - Solar and heat pump water heater - design and construction). The impact resistance test results indicate that the evacuated tubes can withstand impact from hailstones up to 25mm/1" in diameter at 25 m/s.

2.5.4 BROKEN OR DAMAGED TUBES

In the unlikely circumstance that an evacuated tube should become broken it can be easily replaced. The solar collector can still function properly with one or more broken tubes; however, it will result in a reduced heat output from the collector. A broken evacuated tube should be replaced only by a professional installer or service agent.

2.6 STAGNATION

2.6.1 INFORMATION ON STAGNATION

Stagnation is the maximum temperature a collector will reach, at which point the rate of heat gain and rate of heat loss is balanced. This typically occurs during clear skies and high insolation days when the pump may be off. The WISELIVING evacuated tube collectors will stagnate at 230°C.

During stagnation it may be observed that the pump stops running, due to the high tank temperature protection feature built into the controller, which turns the pump off.

The system is designed to allow stagnation to prevent the tank from overheating. This

means that the collector and plumbing in proximity may reach temperatures of up to 220°C; therefore, components that may be exposed to the high temperatures such as valves, plumbing or insulation, should be suitably rated.

The system designs listed in the 'CER' Register meet the No-load system requirements detailed in AS/NZS 2712:2007. This means that they will not dump large volumes of water from the PTRV and do not require an auto air-vent.

During periods of extended stagnation, condensation pressure shocks can occur in the tank. When the tank is topped out and suddenly a hot water load is drawn from the tank this can lead to rapid mixing of cold water and superheated steam in the return line. This can produce a "gurgling" noise, as the steam collapses on itself upon rapidly cooling and condensing. This is a normal occurrence in any hot water storage system and does not affect the system's operation.

2.6.3 WATER BOILING TEMPERATURES

The boiling point of water varies based on the pressure within the hot water system. Under stagnation and no-load conditions, the solar collector has the potential to reach temperatures well above 100°C. As the water temperature rises and water expands this creates pressure within the system. As the pressure rises, so too does the boiling point of water. This is why the solar hot water system will not boil at 100°C, but at a pressure and temperature as listed in

Table *2*. Note that if the system does boil, it is not detrimental to the system's lifetime or performance, see section 'Information on Stagnation' for further detail.

Table 2 Relationship between pressure and boiling point

Pressure (kPa)	Boiling point (°C)
101	100
203	120
304	133
405	143
507	151
608	158
709	164
811	170

CHAPTER 3: SITE INSPECTION

3.1 SOLAR COLLECTOR

3.1.1 COLLECTOR LOCATION

The location of the solar collector is crucial to achieving optimal system performance. Several factors need to be considered when determining the placement of the collectors on the roof of a building. These are detailed below:

- Solar collector vicinity to tank: The collector(s) should be positioned as close as possible to the storage tank to avoid long pipe runs and minimise heat loss.
- Collector orientation with respect to the sun: To ensure optimal heat output, the collector should face the equator, which in Australia and New Zealand (Southern hemisphere) is due north. As per AS/NZS3500.4:2015, the collector orientation shall not deviate more than 45° from due north.
- Collector plane: Both sides of the manifold can be used interchangeably as the inlet and outlet ports. However, if the manifold is not level horizontally, the higher side must be used as the outlet as hot water rises.
- Collector angle: For the collector(s) to achieve maximum solar exposure, collector(s) are to be installed at an angle of the location's latitude +/- 20° as per AS/NZS3500.4:2015. A minimum install angle of 20° is required for flush-mounting the collectors. Refer to table below for major cities and their latitudes and see Chapter 4: Framing for more details on installation angles.

Table 3 Latitudes of major Australian cities

Location	Latitude, degrees
Adelaide	35
Brisbane	27
Canberra	35
Hobart	43
Melbourne	37
Perth	32
Sydney	34

3.1.2 STRUCTURAL DESIGN OF MOUNTING SYSTEM

For mounting frame certification to apply, the installation conditions from Chapter 5: Framing must be met.

3.1.2.1 MOUNTING FRAME WEIGHTS

Table 4 mounting frame weights

No, of Tubes	Flush Mount	Tilt Frame
20	14.75kg	15.05kg
30	18.35kg	23.95kg
40	29.50kg	30.10kg

3.1.2.2 COLLECTOR WEIGHTS (DRY AND WET)

Table 5 collector weights

No. Tubes	Collector Weights (kg)	
	Dry	Wet
20	71	72
30	109	110
40	142	144

IMPORTANT

Installers must ensure that the installation of the solar water heater does not compromise the structural integrity of the building and that the roof can carry the full weight of the solar collectors, if in doubt it is advised to consult with a structural engineer.

3.1.4 ROOF SPACE AND COLLECTOR SHADING

When placing the collector(s) on the roof, consider the maximum area required for a single WISELIVING collector. Refer to the table below for these values.

Table 6 Coverage of single collector

Collector (Tubes)	Width (mm)	Length (mm)	Area (m^2)
20	1722	2020	3.1
30	2502	2020	4.5
40	3444	2020	6.1

Shading is another factor that needs to be considered. It is recommended that shading from nearby objects, buildings or trees is avoided to optimize the amount of sun the collector receives.

3.2 STORAGE TANK LOCATION

- The storage tanks can be installed indoors or outdoors.
- The storage tanks are to be installed at ground or floor level and must stand vertically upright as the manufacturer has intended.
- The storage tank should be located as close as possible to the most frequent draw off points in the building such as the bathroom or kitchen. If the storage tank is located a long way from hot water draw points, a hot water circulation loop on a timer may be considered to reduce the time-lag for water to heat up and resultant water wastage.
- Consideration should be given to the location of the storage tank respective to the auxiliary boosting where applicable.
- The tank should not obstruct any windows, doors or exits and should cause minimal intrusion to the existing site. Clearances must be allowed for to make servicing and maintenance convenient without the need for ladder or scaffold. For servicing, the PTRV must also be easily accessible.
- For glass-lined tanks, consider the positioning of the tank to allow room for anode removal and replacement maintenance.
- The storage tank must be installed in a properly drained safe tray where leakage may otherwise cause damage. The installation of the storage tank and safe tray must comply with AS/NZS 3500.4 and all local codes and regulatory authority requirements with regards to its construction, installation and draining. Tanks installed outside must be installed on a suitable concrete slab.
- The tank label must be clearly visible.

3.3 TRANSPORTATION AND UNPACKING

3.3.1 TRANSPORTATION OF COMPONENTS

- When transporting boxes, note the orientation of the "THIS WAY UP" arrows.
- Ensure all boxes are strapped and secured to prevent movement during transit.
- All tanks must be transported upright. Stacking is not recommended for any tanks.
- Products should always be handled with care. Damage incurred during the transportation is not covered under product warranty.

3.3.2 UNPACKING OF COMPONENTS

- When unpacking, take care to ensure that the components are not damaged in the process.
- Avoid using sharp blades or knives as this can scratch the surfaces of the products particularly the evacuated tubes and tanks.
- For evacuated tubes and heat pipes, tear open both ends of the box(es) to allow inspection of the vacuum at the bottom and for the heat pipes to be exposed for the application of heat transfer paste.

3.4 OTHER COMPONENTS

3.4.1 GAS WATER HEATER LOCATION

The gas water heater must be installed over a properly drained safe tray where leakage may cause damage. The installation of the water heater and safe tray must comply with AS/NZS 3500.4 and all local codes and regulatory authority requirements with regards to its construction, installation and draining.

CHAPTER 4: COMPONENT INSPECTION

4.1 COMPONENTS PROVIDED BY WISELIVING WITH THE SYSTEM

Upon receiving the system prior to installation, check that the following components have been provided. Any concerns must be brought to the attention of WISELIVING immediately.

4.1.1 MANIFOLD

- Ensure that the manifold inlet and outlets show no signs of damage.

4.1.2 TUBES & HEAT PIPES

- Ensure that the evacuated tubes are all intact, the bottom of each tube should be silver. If a tube has a white or clear bottom, it has lost its vacuum and should be replaced. In this case, the heat pipe should be removed and inserted into the replacement tube.
- The evacuated tubes have plastic caps to go on the ends. Check you have the right number of caps for number of tubes.
- Heat pipes are bright and shiny when newly manufactured but will dull and may form dark grey surface discoloration over time. This is due to mild surface oxidation (when exposed to air) and does not affect the heat pipe's operation.
- Do not remove and/or expose the tubes to sunlight until ready to install, otherwise the heat pipe tip will become very hot, sufficient to cause serious skin burns. Note: The outer glass surface will not become hot.

WARNING

NEVER touch the inside of the evacuated tube or heat pipe tip after exposure to sunlight. WEAR thick leather gloves if handling the heat pipe. WEAR safety glasses always when handling the glass tubes.

4.1.3 FLUSH MOUNT FRAME

- Ensure that all necessary components required for installation have been received in the packaging. Refer to Chapter 5: Framing.

4.1.4 STORAGE TANK AND PTRV

- Ensure the tank is accompanied by an appropriate PTRV.
- Ensure that electric tanks have an electric element.

4.1.5 PUMP STATION KIT

The WISELIVING Pump Station Kit comes bundled with the essential components required for installation of a solar hot water system. The kit comes pre-packaged and can easily be connected to plumbing.

Pump station components include:

- This manual and pump station kit manual
- Check valve, pump unions
- Circulation pump
- Controller and two sensor leads
- Pump station housing lid and base

4.1.6 GAS BOOSTER

Ensure the gas booster shows no signs of damage.

4.2 NECESSARY COMPONENTS

Ensure that the following components have been sourced for the installation. These are not provided as a standard with the system.

- Duo valve
- Cold water expansion control valve (mandatory in certain states)
- Pressure reducing valve (if pressure over 500kpa)
- Tempering Valve Solar Rated

CHAPTER 5: FRAMING

5.1 FRAMING OPTIONS

There are four easy to install mounting options:

- Flush mounted with roof rail, suitable for tin roofs
- Flush mounted with roof straps, suitable for tiled roofs
- Tilt frame 30°

Refer to the sections below for more detail on the frames. Ensure all installations are compliant with AS/NZS 3500.4:2015 and other relevant local codes and standards.

Where systems are supported on roof battens crossing rafters, the battens shall be continuous across not less than three rafters or trusses.

Additionally, for tilt mounted frame systems, there are two screws required per front track for the front roof rail.

The frame systems come pre-packaged to ensure the most streamlined and simple assembly process. Follow the assembly instructions provided with the frame.

5.2.3.2 ROOF FIXING GUIDE

To proceed with attaching the mounting frame to the roof, follow all fixing rules as per the Installation conditions (for certification to apply).

Batten/Purlin Spacing is to be 600, 900, 1500 or 1800mm.

Batten/Purlin Screws are to be installed as follows:

- Timber Battens/Purlins: 14G Ø6.3mm timber screw, with minimum 35mm embedment into battens. Minimum joint group J4.
- Steel Battens/Purlins: 14G Ø6.3mm Tek screw. Minimum steel thickness 0.75mm, Grade G550.
- There is an even number of screws per roof rail, so fixing points should be equidistant from the roof rail. This will ensure that the wind loads are equally distributed across the roof rail. Line up the roof rails with battens accordingly. For tilt-mount systems the batten/purlin spacing can be increased where the angle of the tilt decreases.

Note that Battens and purlins are the same components and are usually located horizontal, or perpendicular to the roof pitch. This differs from rafters which are situated parallel to the roof pitch.

Maximum average building height of install: 10m above ground.

Flush Mount: roof pitch needs to be 20-45° to the horizontal.

Tilt Mount: roof pitch needs to be 0-10° to the horizontal. For efficient heat transfer of the evacuated tubes, they should be installed at a minimum overall pitch of 20°.

- **Regions A and B:** Maximum tilt angle 45° to the horizontal
- **Region C:** Maximum tilt angle 30° to the horizontal

Existing roof check: the structural adequacy of supporting roof members must be confirmed by a practicing structural engineer prior to all installations unless a roof rail is used for every batten location.

IMPORTANT

Ensure all roof penetrations are watertight.

Use the following examples as a guide for installation for different roof types.

5.2.3.3 TIN ROOF INSTALLATION

For corrugated/tin roofs, place fixings on the peak of the roofing sheet material to minimise the risk of leaks. Fixings are to be screwed into the batten with minimum 35 mm embedment.

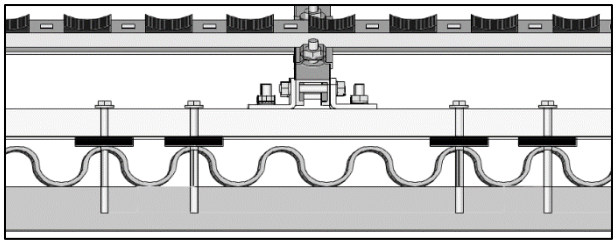


Figure 1 35 mm embedment into the batten/purlin [rear view]

5.2.3.4 TILED ROOF INSTALLATION

For tiled roofs (where drilling is undesirable) use WISELIVING roof straps to attach the frame to the battens/purlins. Roof straps shall pass beneath the tiles and be securely fixed directly to the rafters or trusses with a minimum of three screws 40 mm long per fixing. Roof straps can also be attached to roof rails by drilling through them.

IMPORTANT

Tilt mount frame systems installed on tiled roofs are not certified under AS/NZS 1170.2.

Figure 2 Roof attachment strap example

5.2.3.5 ADJUSTING TILT MOUNT ANGLE

When installing tilt-mount systems, the mounting frame can be modified to achieve a reduced tilt angle. This would be preferable where the optimal tilt angle is not achievable for the given roof pitch and tilt leg.

To reduce the installation angle of the collectors, the aluminium legs should be cut to a reduced length and a new hole should be drilled to allow for securing. By reducing the length of the aluminium tilt leg, the frame is brought closer to the roof and the angle is reduced. The total pitch of the collectors should not be reduced below 20°.

Note that decreasing the tilt angle will consequently decrease the wind loading on the system and as such will not impact the structural integrity of the system.

5.3 MOUNTING FRAMES

5.3.1 FLUSH MOUNT FRAME

The figure below shows a standard flush mount frame suitable for use in all wind regions with: 2x front tracks. Note the image also shows the roof rails and bottom track.

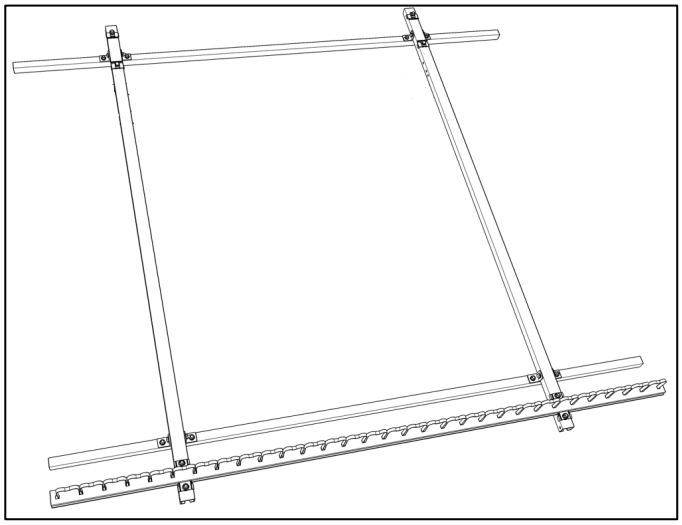


Figure 3 Flush mount frame

5.3.2 TILT MOUNT FRAME

The figure below shows the tilt frame configuration for use in all wind regions: 2x front tracks and 2x Rear Legs. Note the image below also shows the roof rails and X brace.

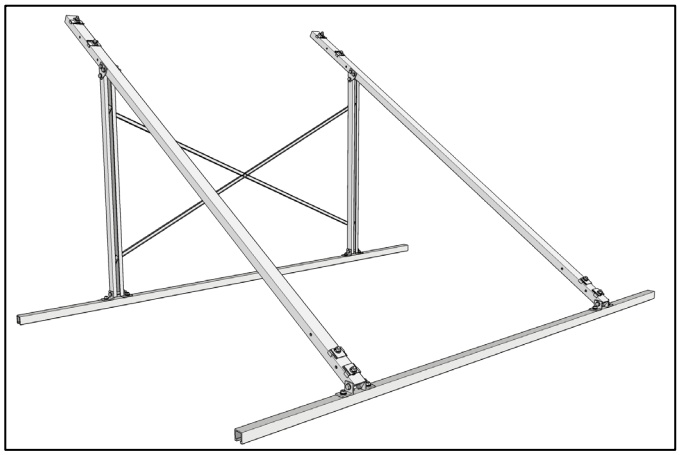


Figure 4 Tilt-mount frame

5.3.3 INSTALLATION CONDITIONS

5.3.3.1 FRAME FIXTURES

The installer is to provide the fixings for the frame to the roof, ensuring the fixings are applied in accordance with the table of fixtures provided below. Holes can easily be drilled into the extruded aluminium components. They are to be no larger than ø10 mm and not closer than 30mm centre to centre.

Note for the tables below showing the number of fixtures required; 'TB' is an abbreviation for Timber Batten, and 'SB' for Steel Batten.

Table 7 Number of screw fixings required per front track (on each end), on the front and rear roof rails for Flush Mounted frames.

No. Tubes	Wind Regions							
	A		B		C		D	
	TB	SB	TB	SB	TB	SB	TB	SB
22	2	2	2	2	2	2	2	2
30	2	2	2	2	3	3	4	4
40	4	4	4	4	4	4	4	4

Table 8 Number of screw fixings required per front track, on the front roof rail for Tilt Mounted frames.

No. Tubes	Wind Regions							
	A		B		C		D	
	TB	SB	TB	SB	TB	SB	TB	SB
20	2	2	2	2	2	2	2	2
30	2	2	2	2	2	2	2	2
40	2	2	2	2	2	2	N/A	N/A

Table 9 Number of screw fixings required per rear leg, on the rear roof rail for Tilt Mounted frames.

No. Tubes	Wind Regions							
	A		B		C		D	
	TB	SB	TB	SB	TB	SB	TB	SB
20	2	2	2	2	2	2	2	2
30	2	2	2	2	2	2	2	N/A
40	4	4	4	4	4	4	N/A	N/A

Bolt assemblies come with spring washers to maintain long-term tension.

The frame systems come pre-packaged to ensure the most streamlined and simple assembly process. Follow the assembly instructions provided with the frame.

5.3.3.2 ROOF FIXING GUIDE

To proceed with attaching the mounting frame to the roof, follow all fixing rules as per the Installation Conditions provided below.

Batten/Purlin Spacing is to be 600, 900, 1500 or 1800mm.

Batten/Purlin Screws are to be installed as follows:

- Timber Battens/Purlins: 14G Ø6.3mm timber screw, with minimum 35mm embedment into battens. Minimum joint group J4.
- Steel Battens/Purlins: 14G Ø6.3mm Tek screw. Minimum steel thickness 0.75mm, Grade G550.
- There is an even number of screws per roof rail, so fixing points should be equidistant from the roof rail. This will ensure that the wind loads are equally distributed across the roof rail. Line up the roof rails with battens accordingly. For tilt-mount systems the batten/purlin spacing can be increased where the angle of the tilt decreases.
- **Table 7** to
- **Table** 9 show the number of screws required per frame for flush mounted and tilt mounted frames respectively.

Note that Battens and purlins are the same components and are usually located horizontal, or perpendicular to the roof pitch. This differs from rafters which are situated parallel to the roof pitch.

Maximum average building height of install: 15m above ground.

Flush Mount: roof pitch needs to be 0-30° to the horizontal. Although the wind loading conditions allow for a horizontal pitch at 0°, for efficient heat transfer of **the evacuated tubes should be installed at a minimum overall pitch of 20°**.

Tilt Mount: roof pitch needs to be 0-20° to the horizontal.

- **Regions A, B, C and D:** the maximum tilt angle is 30° to the horizontal.

Existing roof check: the structural adequacy of supporting roof members must be confirmed by a practicing structural engineer prior to all installations.

IMPORTANT
Ensure all roof penetrations are watertight.

Use the following examples as a guide for installation for different roof types.

5.3.3.3 TIN ROOF INSTALLATION

For corrugated/tin roofs, place fixings on the peak of the roofing sheet material to minimise the risk of leaks. Fixings are to be screwed into the batten with minimum 35mm embedment. Refer to Figure 1.

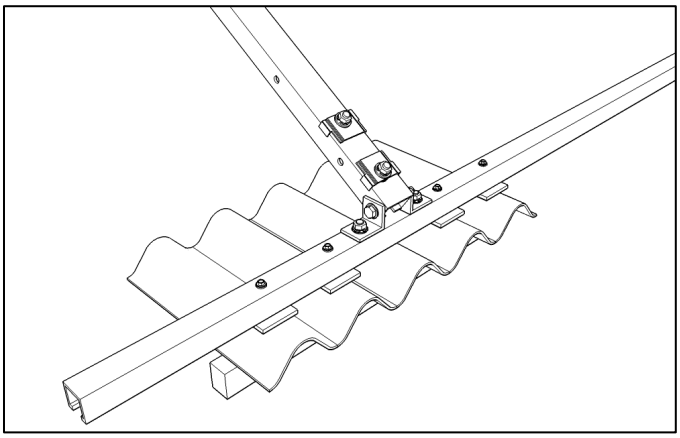


Figure 5 Close-up of front track connection to roof rail, and fixings on peaks of tin roof equidistant from front track.

5.3.3.4 TILED ROOF INSTALLATION

For tiled roofs (where drilling is undesirable) use WISELIVING roof straps to attach the frame to the battens/purlins. Roof straps shall pass beneath the tiles and be securely fixed directly to the rafters or trusses with a minimum of three screws 40 mm long per fixing. Roof straps can also be attached to roof rails by drilling through them. Refer to Figure 2.

IMPORTANT

Tilt mount frame systems installed on tiled roofs are not certified under AS/NZS 1170.2.

5.3.3.5 ADJUSTING TILT MOUNT ANGLE

When installing tilt-mount systems, the mounting frame can be modified to achieve a reduced tilt angle. This would be preferable where the optimal tilt angle is not achievable for the given roof pitch and tilt leg.

To reduce the installation angle of the collectors, the aluminium legs should be cut to a reduced length and a new hole should be drilled to allow for securing. By reducing the length of the aluminium tilt leg, the frame is brought closer to the roof and the angle is reduced. The total pitch of the collectors should not be reduced below 20°.

Note that decreasing the tilt angle will consequently decrease the wind loading on the system and as such will not impact the structural integrity of the system.

CHAPTER 6: SYSTEM PLUMBING

6.1 SYSTEM LAYOUT

The system components that are a part of a typical solar hot water system are depicted in the system schematics in Error! Reference source not found. and Error! Reference source not found. in Chapter 10: Appendix. Refer to the schematic to get an understanding of how the system should be set up.

See **Table 10** below for the corresponding numbered components to the schematic.

Table 10 Components that make up a typical Electric boosted solar hot water system.

No.	Component	Function
1	Evacuated tube collector	Solar energy collection
2	Circulation Pump	Circulates water from the tank to the manifold
	Controller	Monitors temperatures and controls the system
3	Tempering Valve	Tempers the hot water down to a safe outlet temperature
4	Tank	Stores hot water for when you need it
5	PTR Valve	Pressure Temperature Relief Valve
6	Auxiliary Heating	Provides a backup energy source for cloudy days and legionella protection
7	Mains line valves	Duo valve, cold water expansion control valve, pressure reducing valve

6.2 PIPING

6.2.1 PIPE MATERIAL AND PIPE SIZE

For domestic solar installations, the recommended pipe is copper, and the size is ½".

Two factors affect the choice of pipe sizing, the flow rate and pressure drop. These two factors are closely related; a higher-pressure drop will reduce the flow rate. Pressure drops increases with decreased pipe diameters as well as the presence of bends, elbows and other components that restrict flow.

It may be necessary for some installations with numerous pipe bends and significant pipe runs to increase the pipe diameter to reduce the pressure drop. All pipe work must be installed in accordance with AS/NZS 3500.4.

IMPORTANT

It is necessary that all valves, fittings and piping connections used are solar rated and can withstand temperatures of up to 230°C.

6.2.2 PIPE INSULATION

Insulate all pipes running to and from the manifold with insulation of at least 15mm thickness, or 25mm in cold climates. Also, ensure the insulation is tight against all ports (minimizing the loss of heat from any exposed areas).

IMPORTANT
All insulation needs to be solar rated. Any insulation exposed to sunlight must be UV-stabilized.

6.3 STORAGE TANK

6.3.1 STORAGE TANK PORTS

WISELIVING tanks are hot water storage tanks that contain seven ports.

1. Inlet (Mains): Inlet line from mains water supply
2. Solar Flow: Flow line to the collector
3. Solar Return: Return line from the collector
4. Outlet: Outlet line to tempering valve and load
5. Sensor 1 Port: Bottom temperature sensor
6. PTRV: Pressure temperature relief valve location

IMPORTANT
WISELIVING tanks must be installed in accordance to AS/NZS 3500.4 as well as any other relevant local/government standards.

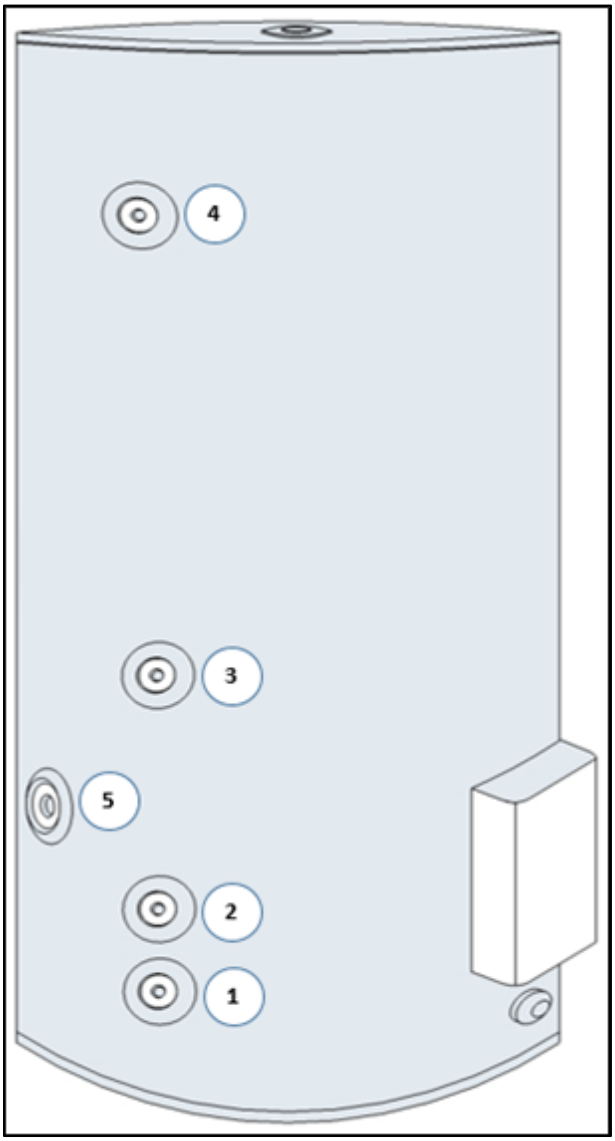


Figure 6 WISELIVING Stainless Steel Storage Tank. This drawing is for indicative purposes only.

All ports on a WISELIVING storage tank are of 20mm (3/4") BSP. Teflon tape must be used to seal any fitting. Copper olives must be used with all compression fittings.

6.3.1.1 INLET (MAINS)

The mains line should consist of the following brass components when installing:

- Duo valve
- Cold Water ECV (in states where mandatory)
- Pressure Reducing Valve (if pressure over 500kpa)

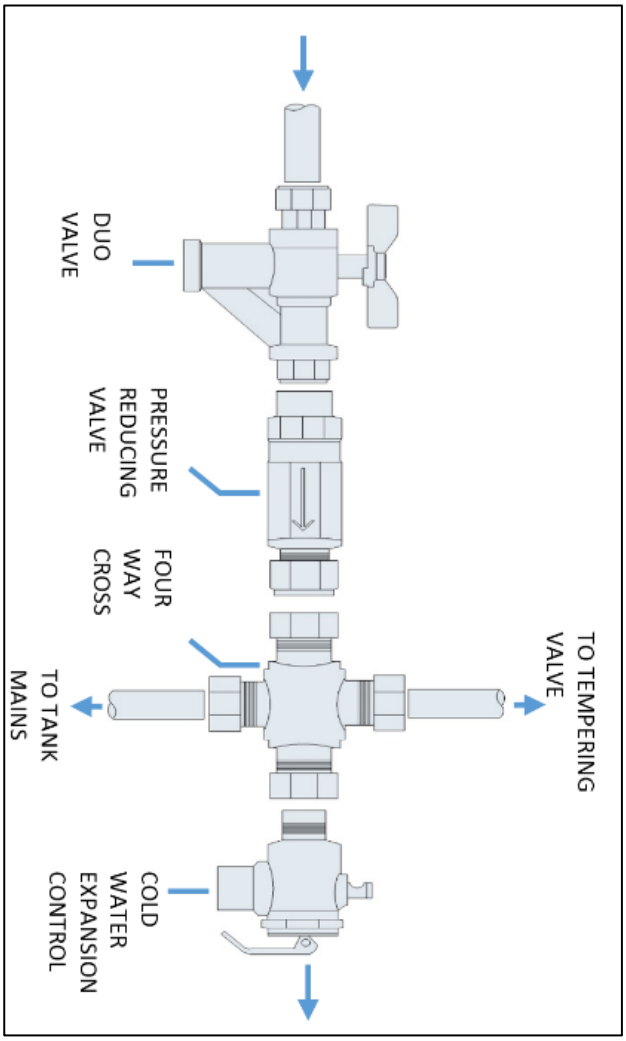


Figure 7 Mains Line Valves

IMPORTANT

The tempering valve must be the last downstream component installed before the hot water reaches the house.

6.3.1.2 SOLAR FLOW

This port is used for the water line directed up to the solar collectors to be heated. This line consists of the following components in order from closest to furthest away:

- Circulation Pump
- Check valve
- Collectors

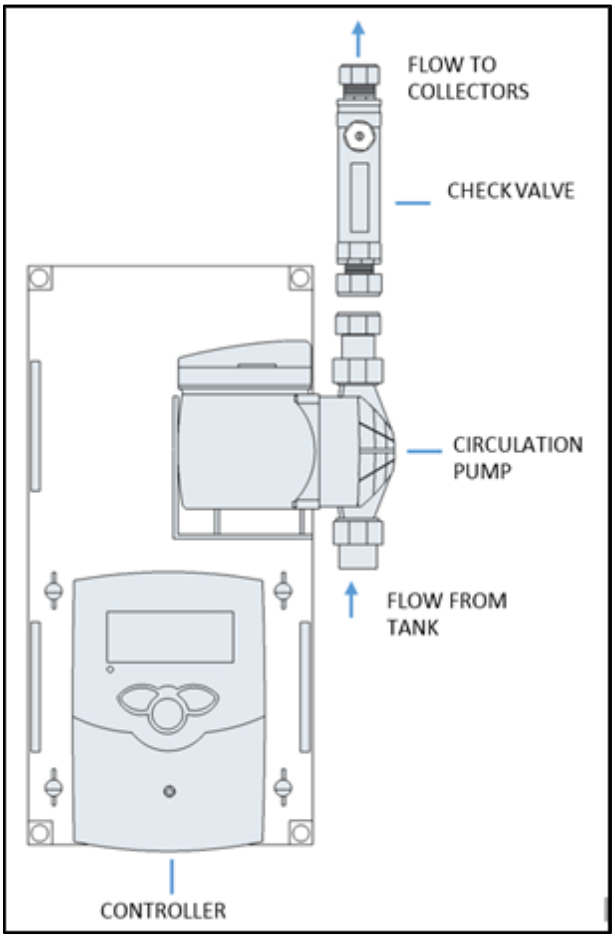


Figure 8 WISELIVING Pump Station Kit

6.3.1.3 SOLAR RETURN

This port is used for the water line returning from the solar collectors after being heated. This line does not require any additional components but should be run as short as possible and have continuous fall back to the solar return port.

On the solar return line near the tank port, it is recommended to include a U-shaped heat trap with an approximate uninsulated 25cm dip in the piping configuration to prevent reverse thermo-siphoning.

6.3.1.4 OUTLET

The outlet is where the hot water from the tank is extracted to be supplied to the auxiliary heater (for gas boosted systems) or household (for electric boosted systems).

6.3.1.5 SENSOR PORTS

The sensors must be coated with heat transfer paste and inserted through the cable gland into the appropriate sensor port and tightened. The bottom sensor port houses “L” sensor (2m long).

The WISELIVING controller requires two sensor leads be installed into the appropriate sensor ports in the solar system; this is vital for operation of the solar system.

The first temperature sensor port is located on the outlet return to tank side of the collector manifold. Sensor “R” (20m long) must be connected to the outlet of the manifold (the higher side). WISELIVING solar tanks come with one temperature sensor port. The bottom port connects to the Sensor (L) on tank, the second port connects to the Sensor (R) sensor on manifold.

6.3.1.6 PTRV PORT

The PTRV port is where the tank ‘pressure and temperature relief valve’ is to be installed. All PTRV’s must be fitted with a copper drainpipe to carry any discharge to an appropriate drain.

IMPORTANT

All storage tanks include a PTRV, which is in the tank packaging, either in a box, vertical column or element cover.

6.4 SOLAR COLLECTORS

6.4.1 COLLECTOR PLUMBING

Solar collector(s) is/are to be installed in reverse return unless balancing valves are installed (sourced by others). This is important as the heat transfer rate is dependent on the flow rate. If the flow rate is unequal there will be uneven heating, this means you will not get the most out of your system.

IMPORTANT

Poor design of collector pipe runs will result in sub-optimal operation of the solar collectors. This will lead to uneven thermal cycling of your collectors. The result is reduced solar yield and potential reduction of system.

6.4.2 BRASSWARE

The residential solar manifolds require appropriate brassware to be used for plumbing.

6.5 GAS BOOSTER

Refer to the installation manual of the gas booster for detailed information about the cold inlet, hot water outlet and gas connections.

See Figure 9 for the WISELIVING gas booster rough-in diagram.

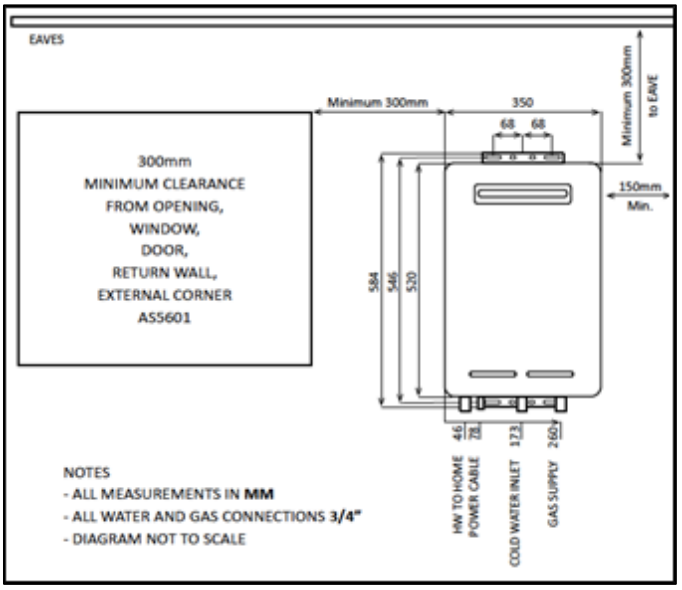


Figure 9 Gas Booster Rough-in diagram

CHAPTER 7: COMMISSIONING

7.1 SYSTEM FILLING AND AIR PURGE

After all the plumbing connections to the solar collector have been made, the solar hot water system needs to be filled with water and the collector loop purged of air. This should be completed prior to insertion of evacuated tubes and connection of the tank to the hot water load.

To fill the system:

1. Open the cold mains line and fill up the tank and open the hot water outlet or hot water taps.
2. Turn the pump dial to speed 3 and connect it directly to the electricity mains rather than the controller.
3. Open an outlet to drain the solar return line.
4. Close the drain when filling is completed, this is indicated by a constant stream of water exiting from the solar return line.
   If constant flow is not achieved, closing and opening the duo valve can force air back into the tank to be relieved at hot water fixtures.
5. Set the pump back to speed 1 and reconnect the pump to the controller.

7.2 CONTROLLER

1. Connect all sensor leads to the appropriate ports in the tank and manifold.
2. Plug in the controller power adaptor to the wall socket and ensure all sensor leads are connected to the correct sensor ports.
3. Test for water leaks around the pipe works and brassware.
4. Check that all temperature readings on the controller are functioning with the parameters of the product.

7.4 SOLAR COLLECTORS

7.4.1 FRAMES

Refer to the Frame Assembly Guide provided with the frame.

1. Assemble the frame according to the relevant frame assembly guide.
2. Align the roof rails of the completed frame with the batten/purlin on the roof.
3. Drill holes through the roof rails and secure the frame to the roof using suitable screws. Number of fixtures required can be found in Chapter 5: Framing.
4. Mount the manifold onto the front tracks, ensuring alignment with bottom track.
5. Ensure that the attachment plate sits in the front groove of the manifold and the rear attachment plates sit in the rear groove.

After installation of the frame and manifold, return to complete the plumbing of the system, tank and pump station.

WARNING

DO NOT insert the evacuated tubes into the manifold until the system has been filled with water and all other steps are complete.

7.4.2 PIPING AND SENSOR CONNECTION

Refer to the Basic Installation Guide provided with the manifold.

1. Insert the sensor into the sensor port on manifold.
2. Piping insulation will need to be done all the way up to the manifold.

7.4.3 EVACUATED TUBES AND HEAT PIPES

Refer to the Basic Installation Guide provided with the manifold.

1. If weather conditions are dusty, take care to ensure heat paste is not contaminated with impurities, as this may reduce thermal conductivity and efficiency of the heat paste. If weather conditions are wet, take care to ensure water does not enter the inside of the evacuated tube.

2. Open the evacuated tube box on the side with the heat pipes.

3. Pull the heat pipe out ~10cm and ensure to keep the rest of the tube shaded.

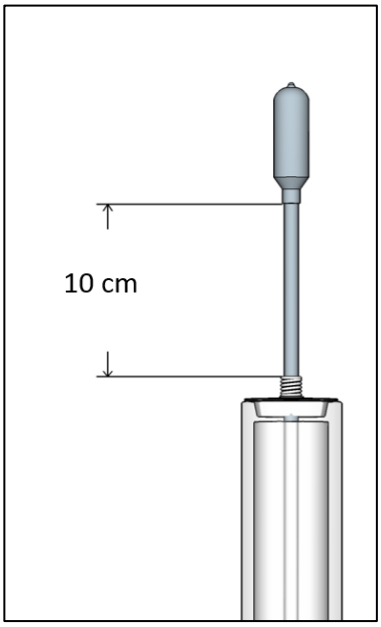


Figure 10 Heat pipe exposed

4. Coat the heat pipe bulb with heat transfer paste; this can be applied using a piece of foam insulation.
5. Place the supplied locator rings into the manifold tube openings to accept the evacuated tube.
6. Take the evacuated tube from the box and guide the heat pipe into the inside of the header port.

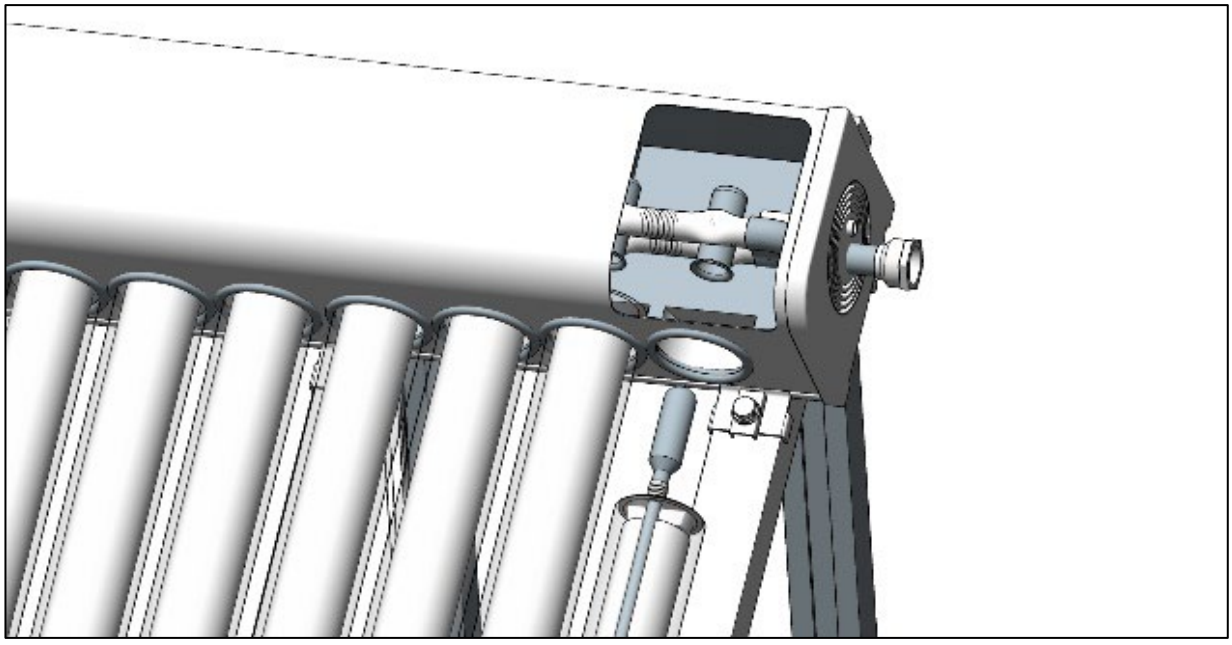


Figure 11 Guiding heat pipe into manifold

7. Push the heat pipe in full depth.

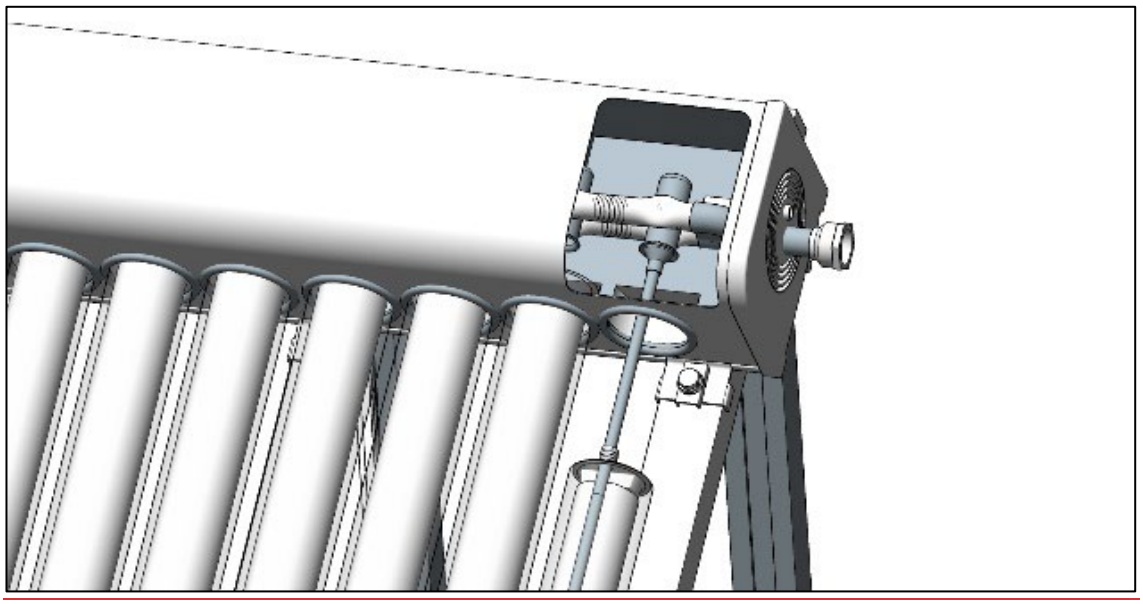


Figure 12 Pushing heat pipe into manifold

8. Use a damp cloth to lubricate the outer surface of the evacuated tube and the rubber ring in the manifold to minimize friction during insertion.

9. Insert the evacuated tube using a slight twist and pushing action.

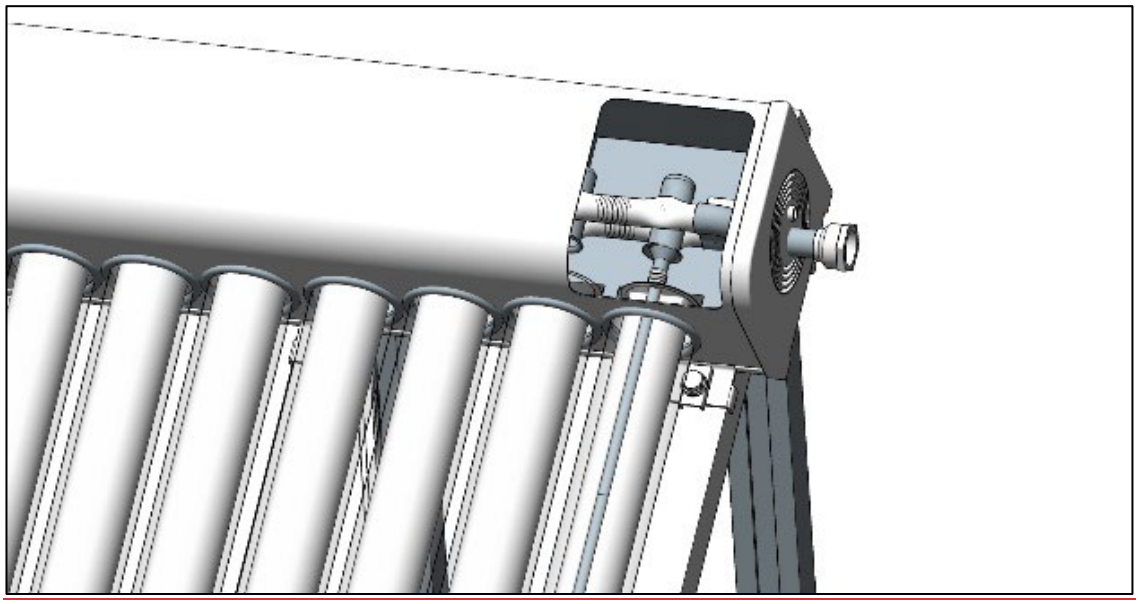
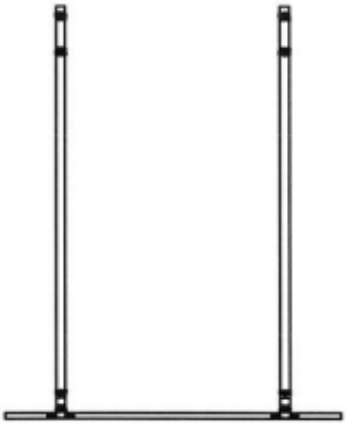


Figure 13 Inserting tube into manifold

10. Repeat steps 2-6 for the remainder of the tubes.
11. Using provided tube clips, secure the evacuated tubes into the bottom track of the frame.
12. Wipe down each evacuated tube with a damp cloth to ensure a polished and clean installation.

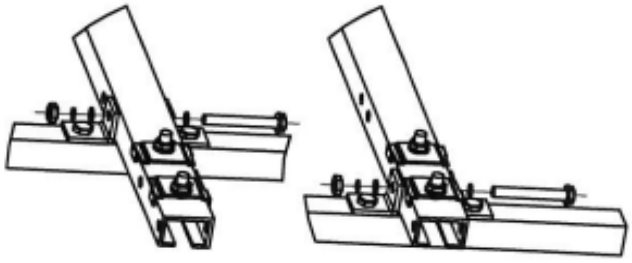
Flush Mount Frame Guide

The Mounting Frame systems come pre-packaged to ensure the most streamlined and simple assembly process. Follow the steps below to assemble the flush mount frame.



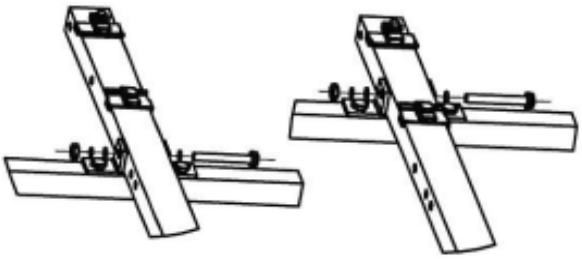
Step 1:
Lay the first roof rail down horizontally and align the two front tracks in parallel to one another, and perpendicular to the bottom roof rail.

For Tilt mount frames, refer to the Tilt Mount Frame Assembly Guide.



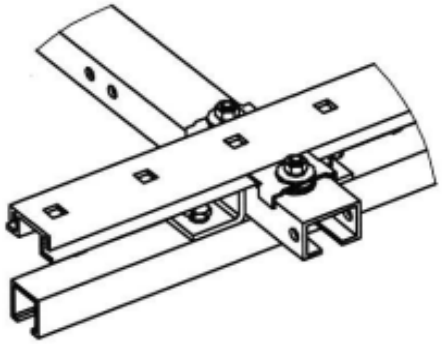
1500mm spacing (bottom) *1800mm spacing (bottom)*

Step 2:
Attach the front tracks perpendicular to the bottom roof rail using L-brackets. Finger tighten all nuts and bolts. Ensure the track is placed in the right location based on the batten/purlin, spaced either 1500mm or 1800 apart.

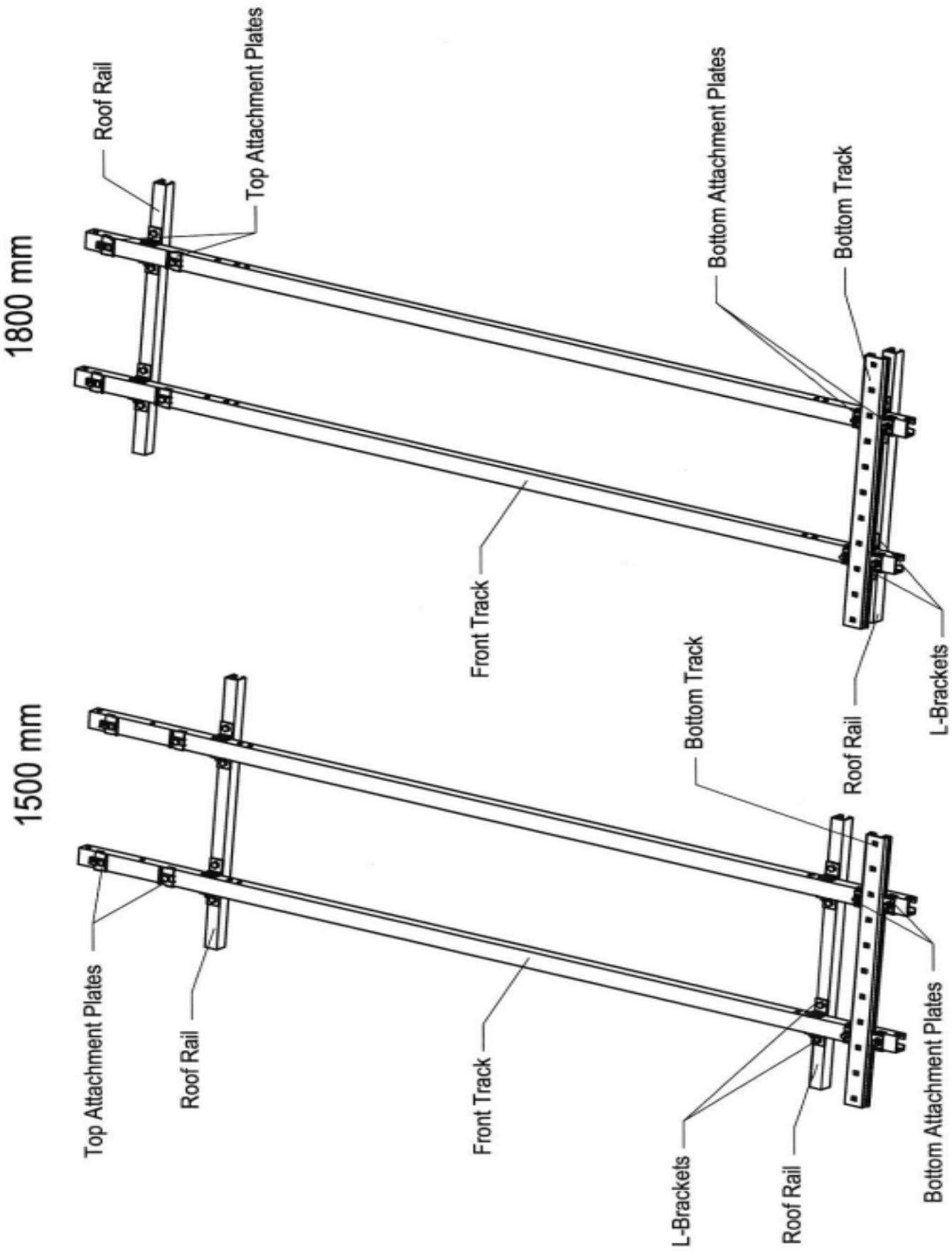


1500mm spacing (top) *1800mm spacing (top)*

Step 3:
Lay the top roof rail in parallel to the bottom roof rail, and attach the opposite ends of the front tracks to it using L-brackets. Finger tighten all nuts and bolts.

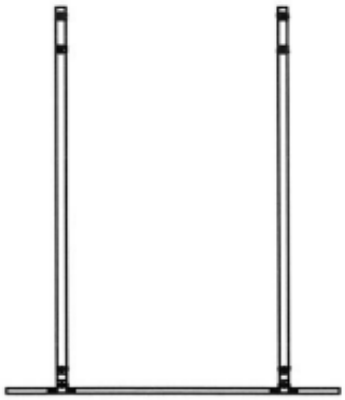


Step 4:
Slide the bottom track into the bottom attachment plates.
Using a spanner, tighten all nuts and bolts used for attachments for all steps 1-4.

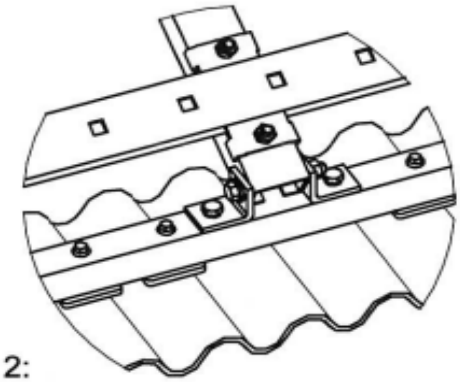

1800 mm
Roof Rail
Top Attachment Plates
Bottom Attachment Plates
Bottom Track
Front Track
L-Brackets
Roof Rail
1500 mm
Top Attachment Plates
Roof Rail
Front Track
Bottom Track
L-Brackets
Roof Rail
Bottom Attachment Plates

Tilt Mount Frame Guide

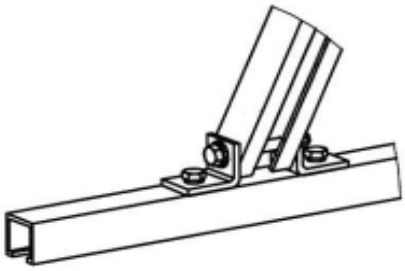
The Mounting Frame systems come pre-packaged to ensure the most streamlined and simple assembly process. Follow the steps below to assemble the tilt mount frame.



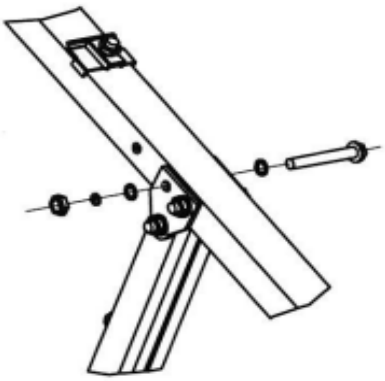
Step 1:
Ensure that you do the following:
Lay the first roof rail down horizontally as well as align the two front tracks in parallel to one another, and perpendicular to the bottom roof rail.



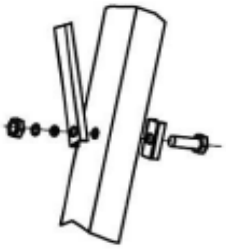
Step 2:
Attach the front tracks perpendicular to the bottom roof rail using L brackets. Finger tighten all nuts and bolts. Ensure the track is placed in the right location based on the batten/purlin, spaced either 1500mm or 1800mm apart.



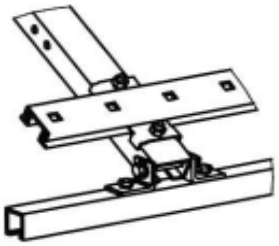
Step 3:
Lay the top roof rail in parallel to the bottom roof rail, and attach the rear legs using L-brackets. Finger tighten all nuts and bolts.



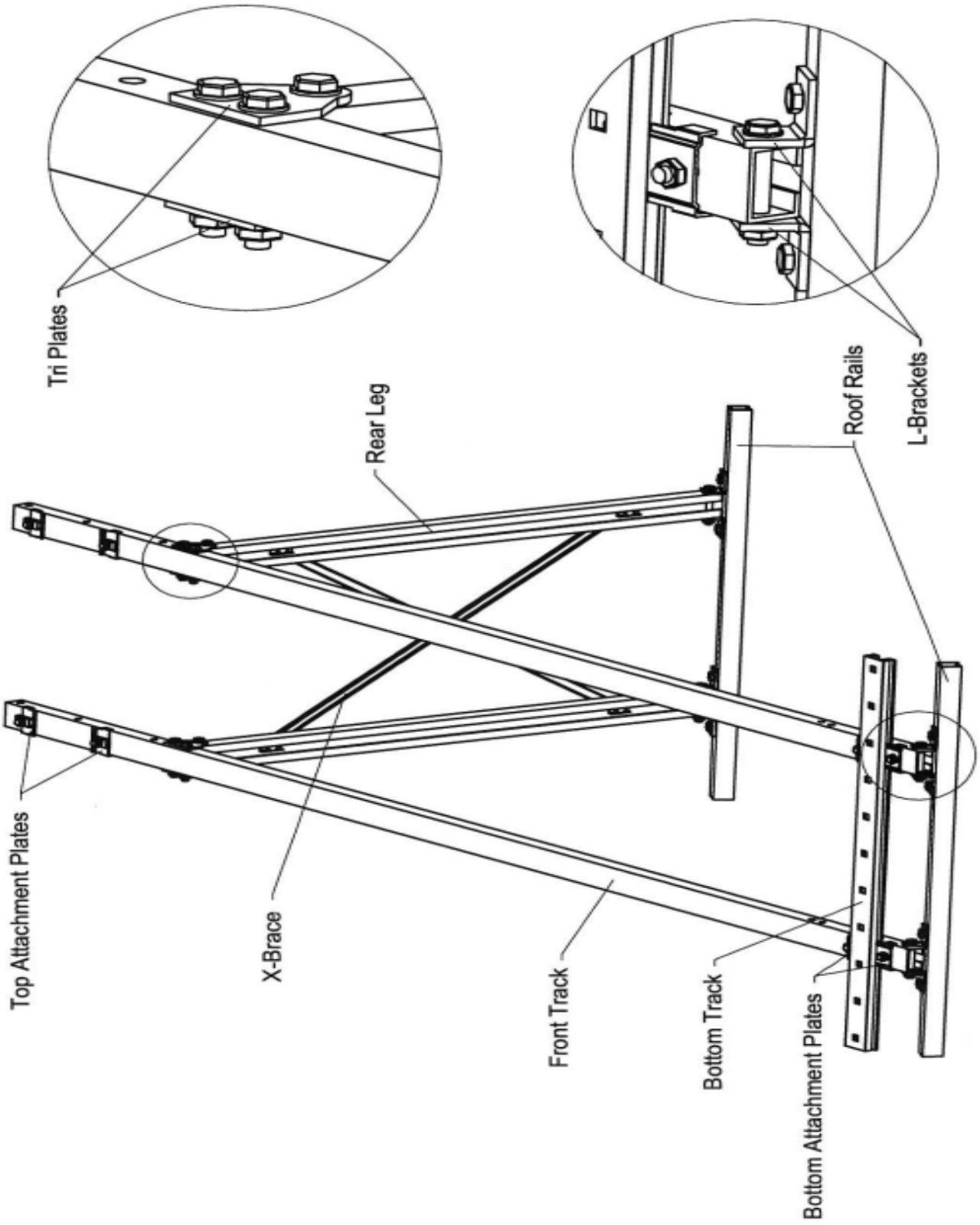
Step 4:
Attach the front tracks to the rear legs using tri-attachment plates (top) and finger tighten all nuts and bolts.



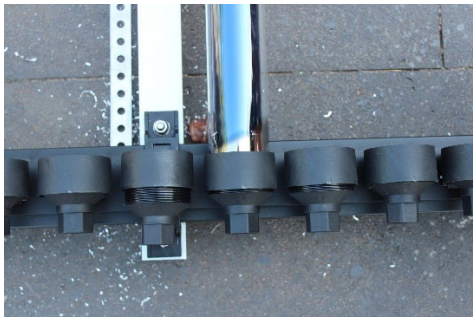
Step 5:
Attach the X Brace to the rear legs and finger tighten all nuts and bolts.

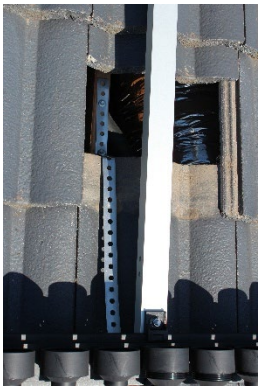


Step 6:
Slide the bottom track into the bottom attachment plates.
Using a spanner, tighten all nuts and bolts used for attachments for all steps 1-6.


Tri Plates
L-Brackets
Roof Rails
Rear Leg
Top Attachment Plates
X-Brace
Front Track
Bottom Track
Bottom Attachment Plates

FIXING FRAME TO TILE ROOF WITH STAINLESS STEEL STRAPS

1. Attach Stainless Steel straps to underside of “L” bracket to each corer side of frame.
    a. Top attachment
    b. Bottom attachment 
2. Place on roof and slide tile up where the straps will enter roof space.
    a. Fold tile strap to follow tile shape and attach to roof batten or truss.



3. Slide tile back to completely weather seal roof, do same for all other 3 (total of 4) Stainless Steel strap fixings.

CHAPTER 8: AUXILIARY HEATING

8.1 BOOSTING EXPLAINED

If the solar contribution during the day is not enough to raise the water to a suitable temperature the electric element (for electric boosted systems) or the gas booster (for gas boosted systems) can provide additional heating. During sufficiently sunny weather, the solar collector will normally be able to provide enough hot water, but during winter months and overcast days boosting may be required.

8.2 WATER HEATING REQUIREMENTS

It is a legal requirement that water be heated on a regular basis to kill Legionella bacteria that can lead to Legionnaires disease. The frequency this temperature must be reached varies and is explained in the table below.

Table 11 Minimum Heat Requirements

Type of WISELIVING System Installed	Minimum Heat Requirementnts
Bottom element electric boosted system	Once per week to 60°C for 32 minutes
Mid element electric boosted system	Once per day to 60°C
Gas Boosted Systems	70°C boost if less than 55°C each time water is used

Depending on the gas booster provided, the start-up temperatures can vary. For a WISELIVING gas booster, if the incoming water temperature is less than 55°C, the booster will activate and heat water to 70°C. If the incoming water is greater than 58°C the booster will not start, and water will flow directly to the outlets. Gas boosters are typically configured to heat any water below 70°C, to 70°C. Refer to the individual booster manual for more detailed information on these settings.

IMPORTANT

A solar-rated tempering valve must be installed after the gas booster as per AS3498.

8.3 CONNECTIONS

8.3.1 ELECTRICAL ELEMENT CONNECTIONS

IMPORTANT

All electrical connections must be completed by an authorized and licensed person.

The electrical element will be required to be directly connected to a 240V AC 50Hz mains power supply.

Flexible conduit is required to enclose any exposed electrical cables to the storage unit.

8.3.2 ELECTRIC ELEMENT THERMOSTAT SETTING

The thermostat should be set to 60°C or above as per AS/NZS 3498.

To adjust the temperature setting:

- Disconnect the electrical power supply to the tank
- Remove the element cover
- Using a screwdriver, rotate the thermostat dial to the desired temperature.

When the electric element is activated, it will heat up all the water above the element to 60°C (or the thermostat setting). This heating can take as long as 3-4 hours if the tank is cold.

Note: WISELIVING recommends that the electric booster is left on or controlled by a suitable timer.

8.3.3 GAS CONNECTIONS

IMPORTANT

All gas connections must be completed by an authorized and licensed person.

The gas inlets connection requires a manual gas valve. Before a gas connection is made, you will be required to check the gas type and gas inlet pressure. To check the gas pressure, remove the screw from the test plug, connect the manometer to the plug with a silicon tube, and measure the gas inlet pressure and confirm with the rating label on the appliance. Once completed, fasten the screw back into the test plug.

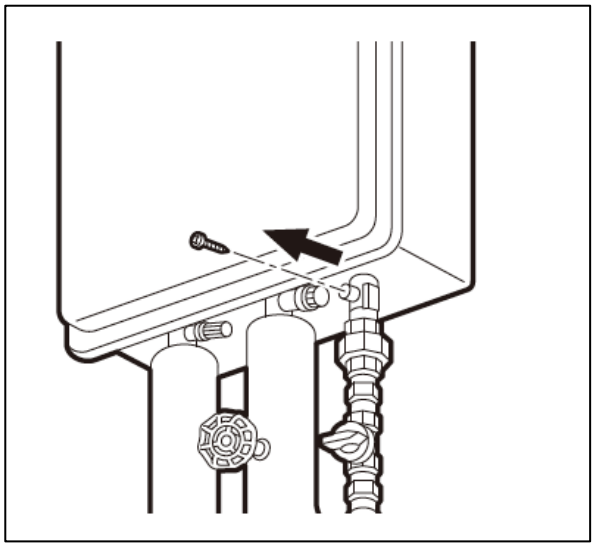


Figure 14 Gas Pressure Test

8.3.4 GAS HEATER ELECTRICAL CONNECTION

The gas booster requires a 240V AC 50Hz mains power supply. When power supply is off, remove any residual water in the unit, as the freeze protection in this device will not activate and may cause freeze damage.

8.3.5 GAS WATER HEATER TESTING OPERATION

1. Turn on power supply to the gas booster and allow approximately 30 seconds for the computer to perform a safety check.

2. Open a hot water fixture in the household and check the temperature of the hot water supplied. Note: the burner will not light if there is a low flow rate (~2.7L/min)

IMPORTANT

Under normal operations the gas booster will fire up automatically due to the colder water in the pipework and will switch off if water from the storage is greater than 55°C.

8.3.6 WATER CONNECTION

Unions should be used on both the hot and cold-water supply lines for connections and the water lines should be purged to remove all debris and air.

Once the hot and cold-water supply lines are connected correctly and the booster has been purged remove the filter to dispose any debris, and then place it back. Do not operate the booster without the filter in place.

CHAPTER 9: POST INSTALLATION

To ensure optimal operation and to maintain the integrity of WISELIVING solar hot water systems, commissioning is an essential process. Ensure that each of the following processes is carried out prior to leaving the site.

9.1 SYSTEM OPERATION CHECK

Given good sunlight, the evacuated tubes will begin to produce heat after a 5-10 minute "warm up" period. There should be an observable increase in the temperature reading at the roof sensor on the controller. When there is an 8°C temperature differential between ROOF and TANK sensors the circulation pump should turn on.

After initial completed installation of collector, watch the operation of the pump and controller for at least 5 ON/OFF cycles or 15 minutes as the system stabilises. This process may take longer in overcast or cold conditions.

IMPORTANT
When replacing damaged tubes follow all relevant OH&S policies. Protective clothing is to be always worn. WEAR thick leather gloves if handling the heat pipe. WEAR safety glasses always when handling the glass tubes.

9.2 CHECKLIST PRIOR TO LEAVING INSTALLATION SITE

- System check: Check all connections for leaks and that all components are installed as per this manual.
- Take photos of all system components for warranty purposes. This should include photos of the plumbing lines to and from the tank, collector and sensor port connections.
- Note down the Tank Serial Number
- Note down the WISELIVING System Model Number
- Note down the Collector Serial Number
- Fill out the installation record form supplied for system warranty and service issues.
- Submit your Installation Record Form via
  Email: info@WISELIVING.com.au
- OR
  Online: www.WISELIVING.com.au
  Complete the rebate form for the system prior to leaving the site, this will require the installer's signature.

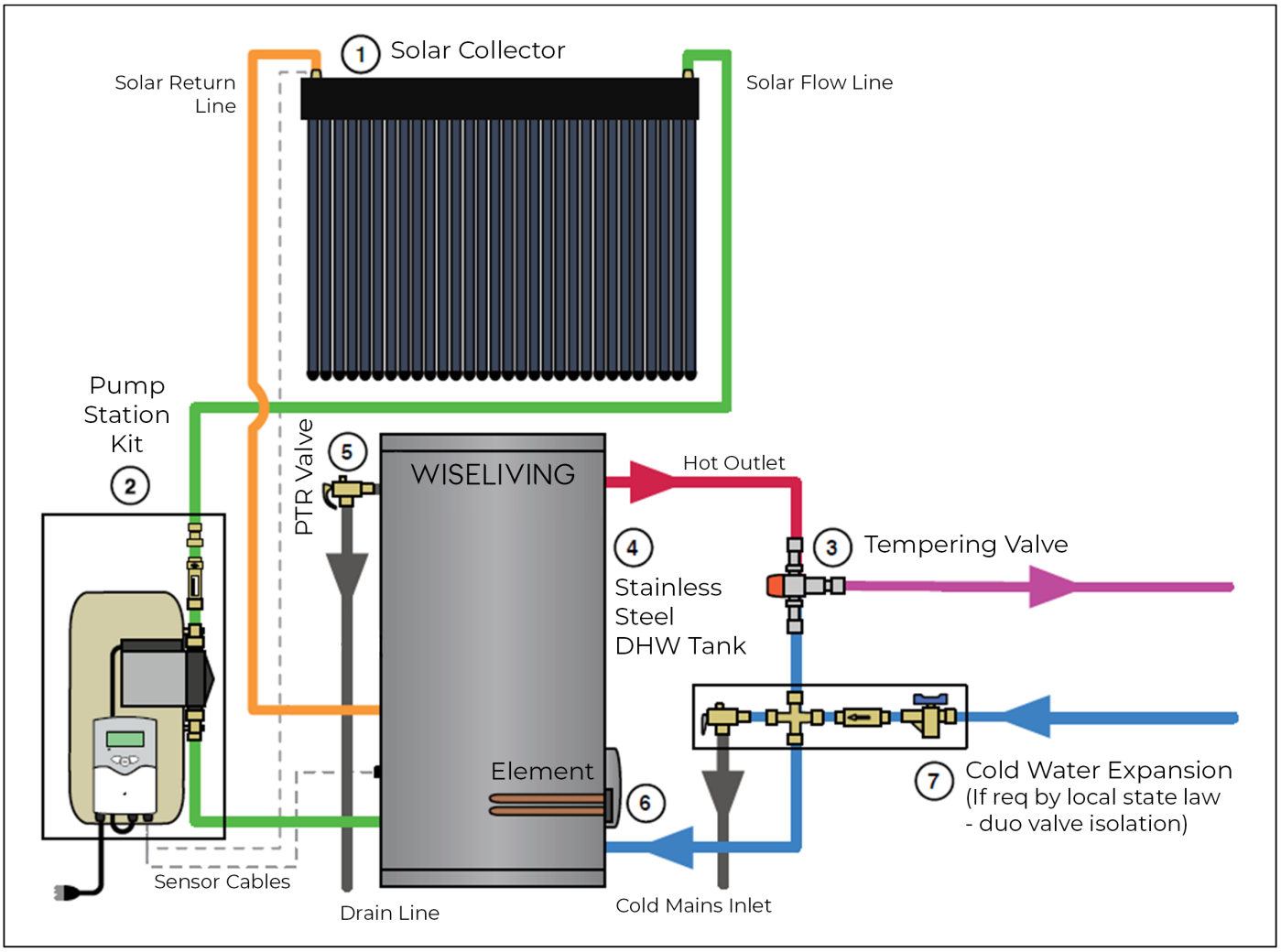


Figure 15 Typical Electric boosted solar hot water system

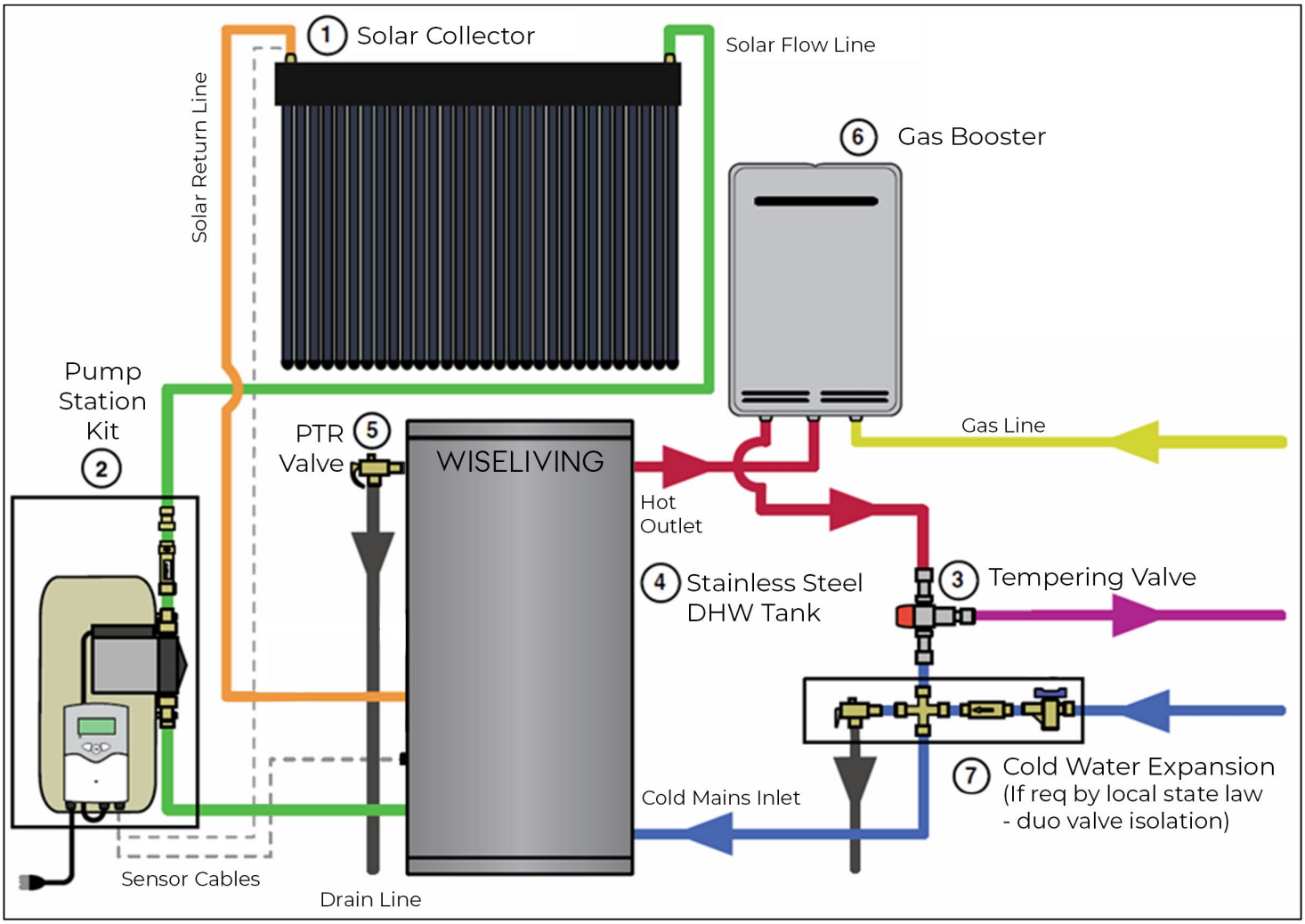


Figure 16 Typical Gas boosted solar hot water system.

WISELIVING

Sustainable Heating, Cooking & Hot Water

AUSTRALIAN MADE, OWNED & OPERATED

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