



Solar Hot Water Thermosyphon System

INSTALLERS MANUAL

WARNING: This water heater should be installed in accordance with the requirements of AS/NZS3500.4 and the SIA Code of Practice for the Manufacture and Installation of Solar Water Heating Systems.

WARNING: Frost Valve Disclaimer. On a clear night, good collectors are looking at a black sky temperature of below -25°C . This can add an extra 2°C of frost to ambient temperature. As frost valves are only suitable to -5°C owners must decide if their conditions meet this threshold. No responsibility for unusually hard frosts can be accepted.

Refer to **Frost-Tec System** for higher frost protection to prevent freezing of circulation water in Broady's Solapower Hot Water closed circuit and heat exchange systems.

The owner should also be aware of any limitation on the suitability of the solar heater for use with water of specified poor quality, and any need for water softening treatment as per AS/NZS 3500.4.

The Owners copy of this manual must be kept in a safe location and in close proximity to the hot water cylinder and/or pump/controller area at all times. It is to be referred to at times for scheduled maintenance checks and any warranty issues. It is to remain with the installed system, in its location and regardless of any house ownership changes.

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1. INTRODUCTION

General

This manual explains the installation requirements for Broady's SolaPower domestic hot water systems which use natural circulation ("thermosyphon") as the operating principle.

Recommendations from Standards AS/NZS2712, AS/NZS 3500.4 and the SIA Code of Practice for the Manufacture and Installation of Solar Water Heating Systems form the basis for this manual.

Where there is conflict between the manual and the requirements of any local territorial authority, the latter shall prevail.

It is recommended that only a licensed craftsman plumber and electrician do the installation.

Before Installation

Be sure before installation of the solar collectors that water will be connected once they are installed. Prolonged exposure to the sun without coolant water may result in damage and may void warranty.

Either an electric element or gas heater will be required for boosting the water temperature to 60°C during unfavourable solar conditions. A licensed electrician and gas fitter must perform all electrical and gas servicing.

Location of solar collectors

1. Shade - Collectors should be located so as to be clear of shade for at least 3 hours either side of solar noon (i.e. 12 a.m. standard time). Partial shading due to small objects e.g. antennas and flues is permissible during this period.
2. Position relative to hot water tank - Collectors should be as close as possible to the hot water tank (no more than 6 metres away) and placed such that the pipe carrying hot water from the collector to the tank grades up toward the tank with a minimum rise (gradient) of 1 in 10. **At no point should this pipe fall below its point of connection to the solar collectors.**
3. Orientation - Solar collectors should face ("orientate") true north in the Southern Hemisphere.

In New Zealand deviation from north will reduce performance depending on the amount of deviation and the latitude. Deviation up to 45° will reduce performance by up to 5%. Deviation greater than 60° is not recommended. If unavoidable incline collectors at less than 20°.
4. Inclination - Collectors theoretically should be inclined at a similar angle to the latitude angle of your location. Deviation from this angle by $\pm 20^\circ$ reduces performance by only 5%. Practical considerations therefore favour flush mounting the collectors on pitched roofs.
5. As inclination is reduced, summer performance is improved. Where solar collectors operate in conjunction with a solid fuel heater with a "wet back" it is preferable to reduce inclination to improve collector performance in Spring and Autumn, allowing the heater to provide the major input in Winter.
6. The minimum allowable inclination for solar collectors in thermosyphon systems is 10°.

2. Hot Water Cylinder Type – Select as Appropriate

Location of Hot Water Cylinder

1. The tank should be positioned as close as possible to the most frequently used outlet point or points and also minimise the distance to the solar collectors.
2. Be sure before positioning tank and stand that previous stipulations on gradient of pipe work to the collectors can be complied with.

The following table shows number of solar collectors required vs the size of hot water cylinders. General rule of thumb is 75ltrs of water for every square meter of solar collector.

Hot Water Cylinder Size	One Panel	Two Panels	Three Panels	Four Panels
Up to 180 litres	•			
180 ltr – 300 ltr		•		
300 ltr – 400 ltr			•	
400 ltr – 500 ltr				•

A: Low (Constant) Pressure Hot Water Cylinder. (see Figure 1, Page 8)

1. As the hot water flow produced by these hot water cylinders is proportional to their height above hot water outlets, they should be elevated as high as possible in the building and as close as possible to the hot water draw-off points. They are generally mounted in the ceiling space.
2. Hot water cylinders must be placed on a strongly constructed, flat, near level platform on a safe tray in accordance with AS/NZS3500.4 and NZS3604 having regard for the weight of the hot water cylinder plus water (1 litre of water weighs 1kg.). This platform should be positioned so that the load is supported over one or more soundly constructed load-bearing walls or a suitably designed beam, roof truss or similar substantial support. If there is any doubt consult with an engineer.
3. The hot water cylinder must be separated from a safe-tray with the use of H4 battens. The radial clearance between the safe tray and the cylinder shall be not less than 50mm. The tray shall be fitted with a drainpipe not less than 40mm in diameter discharging clear of the building.

B: Medium and Mains Hot Water Cylinder. (see Figure 2, Page 9)

In some circumstances this type of hot water cylinder may be installed in the roof in which case all of the above comments dealing with ceiling mounted hot water cylinders would apply.

3. Mounting Solar Collectors to Roof Structures

Collectors mounted onto the exterior surface of the roof shall be mounted in accordance with the New Zealand Building Code clauses B2 and E2 and AS/NZS3500.4. Where mounting frames are used for orientation and connection to the roof the mounting frame and its attachment to the roof structure will be designed for appropriate wind conditions in accordance with relevant structural standards.

Note: One (1) bracket is required per pair of Portrait Collectors and one (1) bracket per single landscape collector. A single panel installation uses a single short bracket. Where two or more brackets are required, overlap the brackets by approximately 100mm and ensure that they are in alignment. This will facilitate an easy connection of the collectors.

Pitched metal roof (see Figure 3, Page 10)

1. Position the black angle retaining bracket(s) on the roof so that the base of the collectors will rest against the upright edge of the bracket when installed. The bracket(s) **must not** be level but should rise 10mm for landscape collectors (and 5mm for portrait collectors) towards the hot water outlet end of the collector bank(s) so as to eliminate possible air locks and promote thermosyphoning. Fix the black angle retaining bracket to structural rafters or perlins with three (3) hex head self driving screws provided. Brackets should not be fastened solely to the metal roofing material. Screws positioned on the high part of ridges should be used for fixing and then sealed with silicone. Silicone should also be used between metal/metal interfaces to prevent corrosion.

2. Place the collectors on the roof and let them rest against the bracket. Join all the collectors together with the 1" connectors before securing them to the roof.

3. Bolt the small "L" shaped tabs provided to the four corners of the collectors using the 6mm bolts provided. Use two (2) bolts per tab at the top of the collectors and one (1) bolt per tab through the top hole only on the bottom tabs. Attach the tab directly to the roof using hex head self driving roof screws.

4. Flow and return pipes can now be plumbed so as to rise continually from their connection points on the solar collectors, penetrating the roof whilst maintaining this rise.

5. Roof flashing the penetration points should be done as per standard practice using either lead or rubber dectite seal as appropriate.

Tiled roof fixing (see Figure 4 , Page 11)

1. Position the black angle retaining bracket(s) on the roof so that the base of the collectors will rest against the upright edge of the bracket when installed. The bracket(s) **must not** be level but rise 10mm for landscape collectors (and 5mm for portrait collectors) towards the hot water outlet end of the collector bank(s) so as to eliminate possible air locks and promote thermosyphoning. To fix the black angle retaining bracket to the roof, first push back or remove the roof tiles at the bracket location. Screw or nail Plumbers Galvanised Strapping to the roof rafters or battens. These straps should be positioned so as to attach as close as possible to the extreme ends of each bracket and one in the centre where required. They can then be led out between the tile overlaps and attached to the black angle retaining bracket with bolts or screws, or rivets if preferred. Ensure that the tiles are replaced and sit flush before positioning collectors.

2. Place the collectors on the roof and let them rest against the bracket. Join all the collectors together with the 1" connectors before securing them to the angle bracket.
3. Connect the bottom of the collector to the angle bracket with the "L" shaped tab. Bolt the tab using the top hole only on the collector and then bolt or screw the tab to the galvanised strapping (See Fig 5) **OR** turn the "L" shaped tab around and hook it under the angle retaining bracket to secure.
4. To secure the top of the collectors to the roof, bolt the remaining small "L" shaped tabs to the top corners of the collector(s) using the 6mm bolts. Attach galvanised strapping to rafter or battens above the collector(s) by removing the tiles as described above. Screw or bolt the tabs to the protruding galvanised strapping.
5. Flow and return pipes can now be plumbed so as to rise continually from their connection points on the solar collectors, penetrating the roof whilst maintaining this rise.
6. Roof flashing the penetration points should be done with lead.

Flat metal roof (see Figure 5, Page 12)

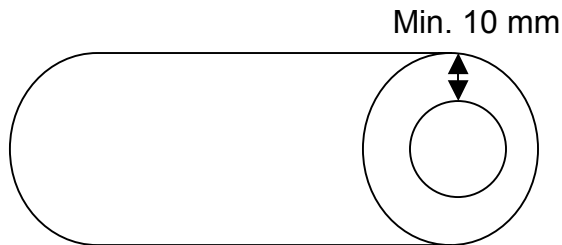
1. Installation of collectors operating on a thermosyphon principal on a flat roof will generally mean that pipe work will have to span the distance between collector and tank to maintain the required rise in the interconnecting pipe runs. Is this feasible?
2. Two uprights are required per collector in addition to the mounting brackets supplied as standard. These uprights may need to be cut to length to give the desired angle of inclination of the collectors.
3. Lay the collectors flat on the roof in the intended location, join them together with the copper connectors and attach the mounting brackets to the roof, adjacent to the proposed bottom edge of the collectors as shown in the diagram.
4. Fix the collectors to these brackets with the tabs provided.
5. Raise the collectors to the desired angle and bolt the uprights (2 per collector) to them, support them evenly while the uprights are positioned so as not to over stress the connections. The remaining brackets can then be positioned along the roof to follow the line defined by the bottom end of the uprights.
6. Bolt the uprights to the brackets thus positioned.

4. Pipe Work and Fittings (see fig.1 or 2 as is relevant)

1. With solar collectors and tank fixed in position, pipe runs can be fitted off using lagged weatherproof 3/4" copper pipe. Keep pipe runs as short as possible to reduce heat losses.
2. All connections to the collectors are by rubber "O" ring -minimal torque is required to be applied to the connections to achieve a seal- do not use teflon or hemp.
3. The hot water outlet end of the collectors should be connected to the highest nipple on the tank designated for solar connection and the cold water inlet end connected to the lower nipple.
4. As previously stated, a continuous rise should be maintained in the lines even as they penetrate the roof. Do not elbow down through the roof at the connection point to the collectors: thermosyphon action will be stopped.
5. An anti-reverse circulation valve should be attached directly to the tank as shown with the directional arrows on the valve observed. Its function is to prevent reverse circulation through the collectors at night, thus cooling the stored hot water.
6. Frost valves should be installed on all systems. Once installed the valve body should be swivelled downwards until as near vertical as possible to permit total drainage. During frosty conditions these valves open and allow a slow flow of water through the collectors until the water temperature rises sufficient to close them.

5. Pipe Insulation

To achieve the maximum efficiency and benefit of this solar system it is crucial that all pipes are well insulated, both inside and outside pipe runs. This includes the 1" (25mm) panel connectors and all elbow connections and fittings. The following materials provide the best in pipe insulation:



- Closed cell tube insulation for hot and cold pipes, ie. 20mm Rubberflex or similar.
- Heavy duty weather proof electrical tape should be used on any lagging joins.
- **Important:** where pipe runs are exposed outside to the weather the insulation tubing needs to be weather resistant. Apply approved outdoor paint with undercoat and top colour coat to best match the roof.

6. Frost Valves

Frost valves should be installed on all systems where frosts occur. On a clear night, good collectors are looking at a black sky temperature of below -25°C . This can add an extra 2°C of frost to ambient temperature. As frost valves are only suitable to -5°C owners must decide if their conditions meet this threshold. No responsibility for unusual hard frosts can be accepted.

Once installed the valve body should be swivelled downwards until as near vertical as possible to permit total drainage. During frosty conditions these valves open and allow a slow flow of water through the collectors until the water temperature rises sufficient to close them. They provide backup for the freeze protection facility on the controller in the event of power failure.

7. Commissioning and Hand Over to Customer

1. Once all connections are made, fill the system and check for leaks. If the weather is fair, warm water will be felt leaving the collectors at the outlet end and cold water entering at the inlet end. If the plumbing has been carried out as described above then air in the solar collectors will automatically purge away as the system is filled so no bleeding is required.

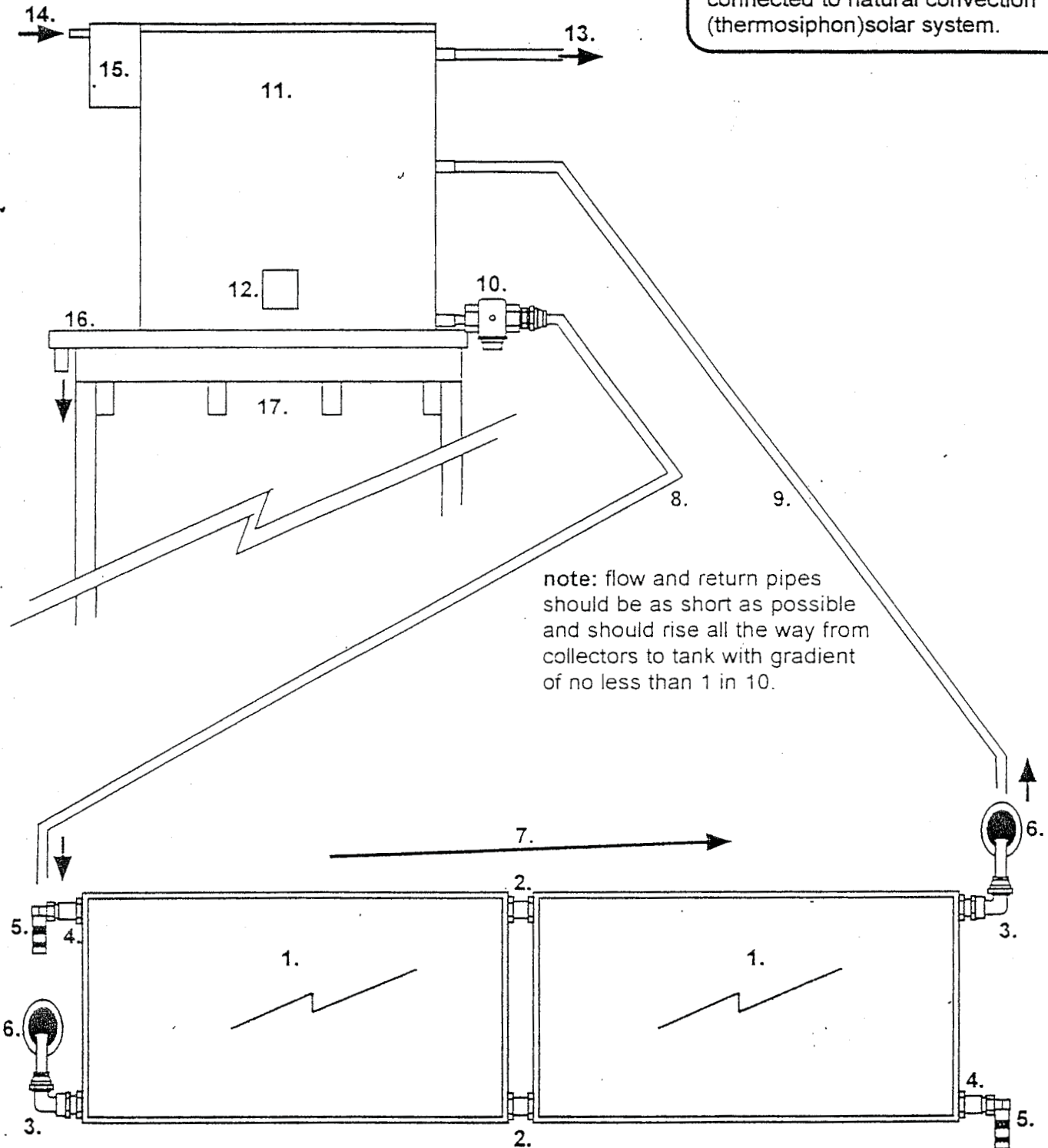
2. The most common installation fault is failure to maintain continual rise in the pipe work and collector circuit. This leads to entrapped air pockets or weak thermosyphon action, which in turn prevents water circulation causing the collectors to operate at or near boiling point. If boiling occurs in the collectors whilst the tank is merely warm or cold, check the flow and return pipe runs for down turns or restrictions.

3. The owner shall be instructed in the correct operation of the Broady's Solarpower water heater and be given this copy of the Owners Manual, outlining maintenance procedures, together with the 7 Year Warranty.

fig.1.

Solar-Mio

Ceiling (constant pressure) tank connected to natural convection (thermosiphon)solar system.



note: flow and return pipes should be as short as possible and should rise all the way from collectors to tank with gradient of no less than 1 in 10.

- 1. solar collector
- 2. 1" connector
- 3. 1" x 3/4" elbow
- 4. 1" x 1/2" union
- 5. frost valve
- 6. roof flashing

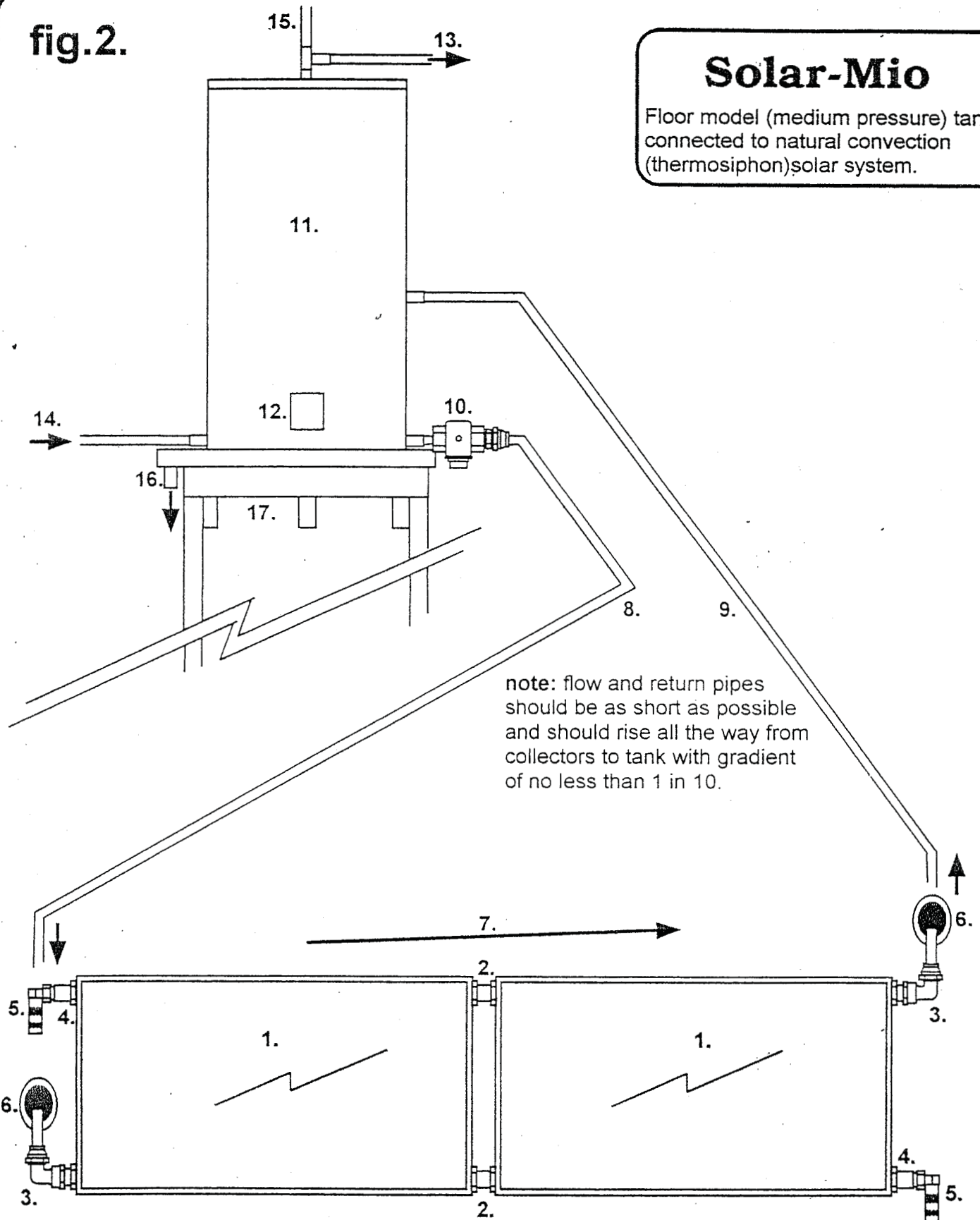
- 7. slight rise toward collector outlet
- 8. cold flow pipe (3/4")
- 9. hot return pipe (3/4")
- 10. anti reverse circulation (ARC) valve.

- 11. hot water tank
- 12. electric element
- 13. hot water outlet
- 14. cold water inlet
- 15. cold water feed tank
- 16. safe tray
- 17. tank stand

fig.2.

Solar-Mio

Floor model (medium pressure) tank connected to natural convection (thermosiphon) solar system.



note: flow and return pipes should be as short as possible and should rise all the way from collectors to tank with gradient of no less than 1 in 10.

- 1. solar collector
- 2. 1" connector
- 3. 1" x 3/4" elbow
- 4. 1" x 1/2" union
- 5. frost valve
- 6. roof flashing
- 7. slight rise toward collector outlet

- 8. cold flow pipe (3/4")
- 9. hot return pipe (3/4")
- 10. anti reverse circulation (ARC) valve.
- 11. hot water tank
- 12. electric element
- 13. hot water outlet

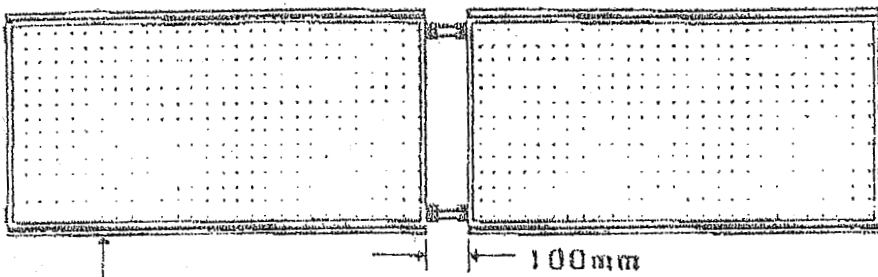
- 14. cold water inlet from feed tank or pressure reduction valve
- 15. open vent
- 16. safe tray
- 17. tank stand

Fig. 3. FIXING COLLECTORS TO A PITCHED METAL ROOF

front view

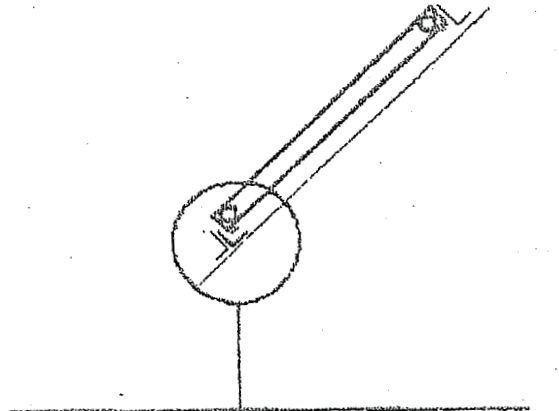
side view

slight rise toward outlet end

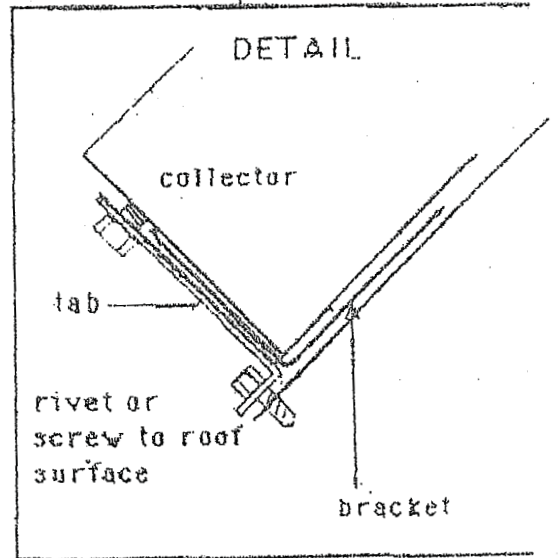


bracket

100mm

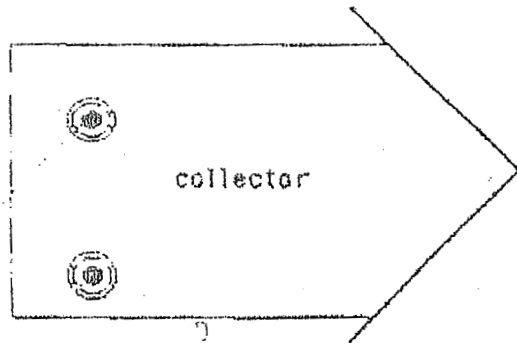


DETAIL

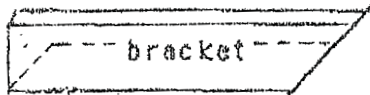


MOUNTING BRACKET ASSEMBLY DRAWING

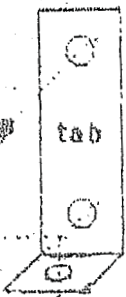
front view



collector



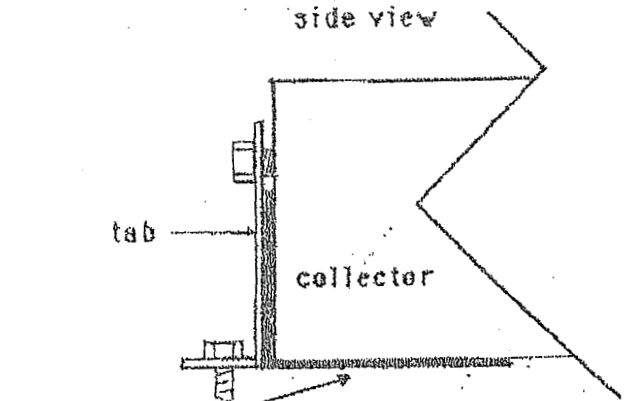
bracket



tab

bolts and nuts provided

side view

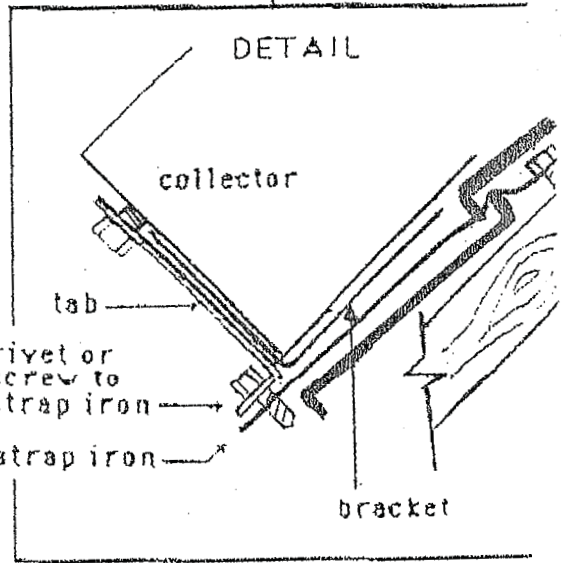
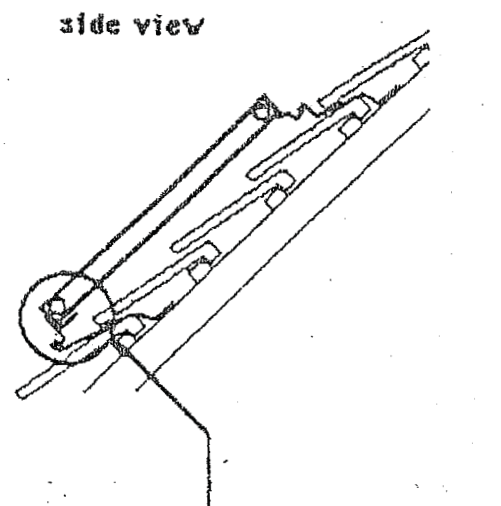
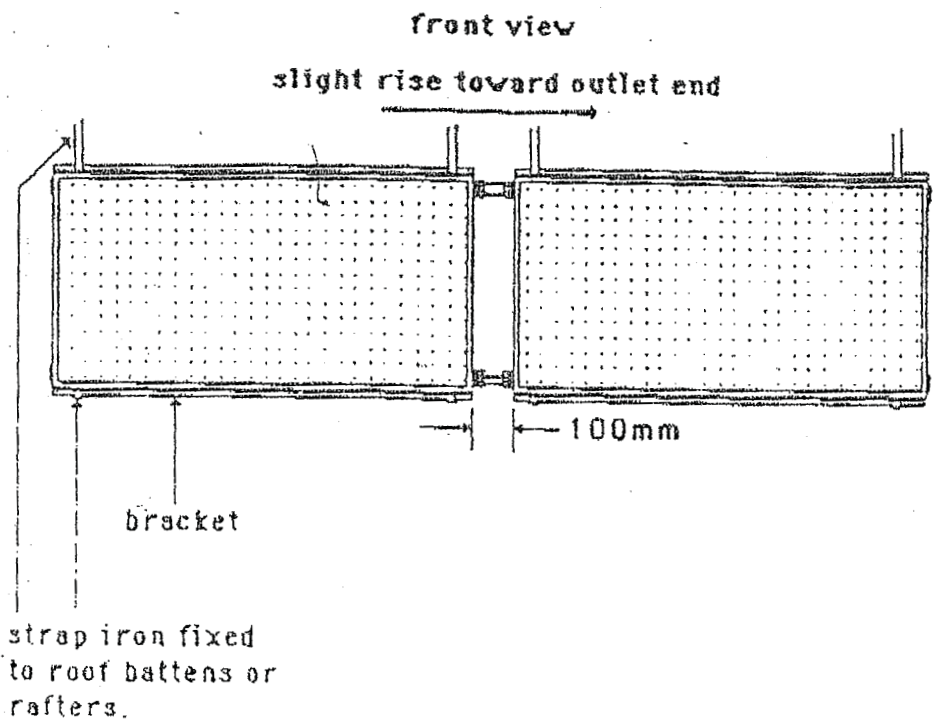


tab

collector

bracket

Fig. 4 FIXING COLLECTORS TO A TILED ROOF



MOUNTING BRACKET ASSEMBLY DRAWING

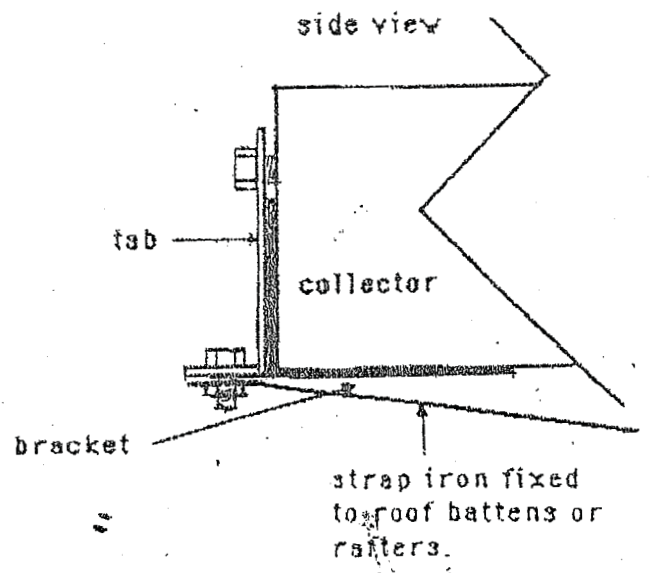
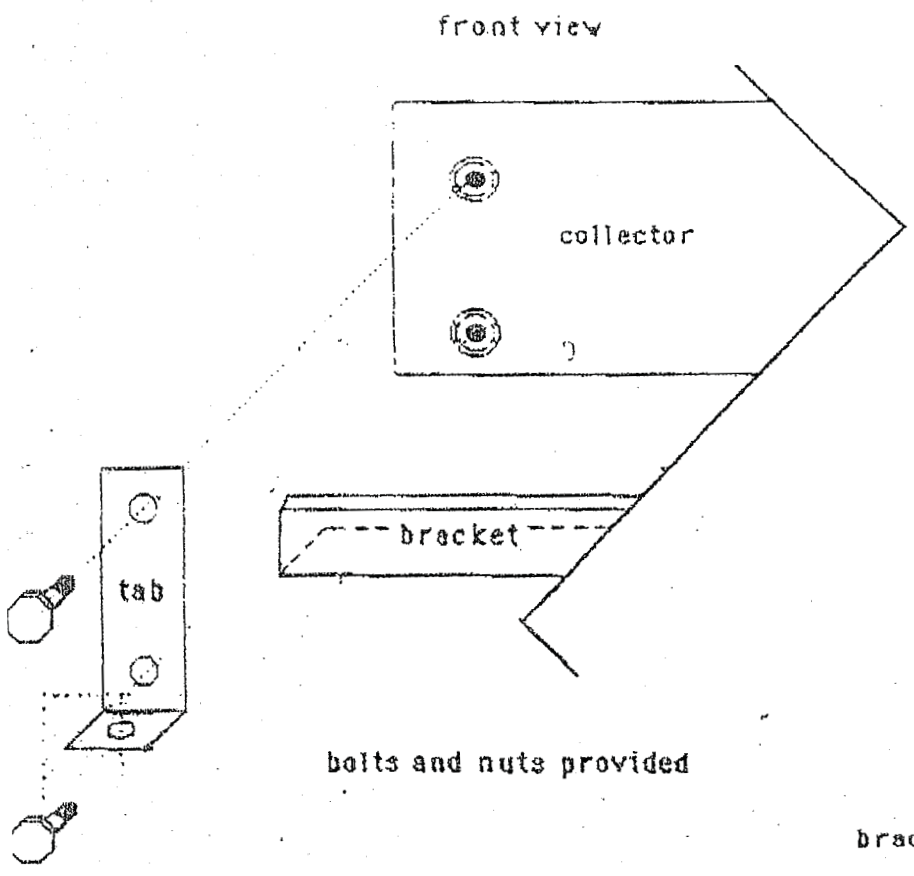
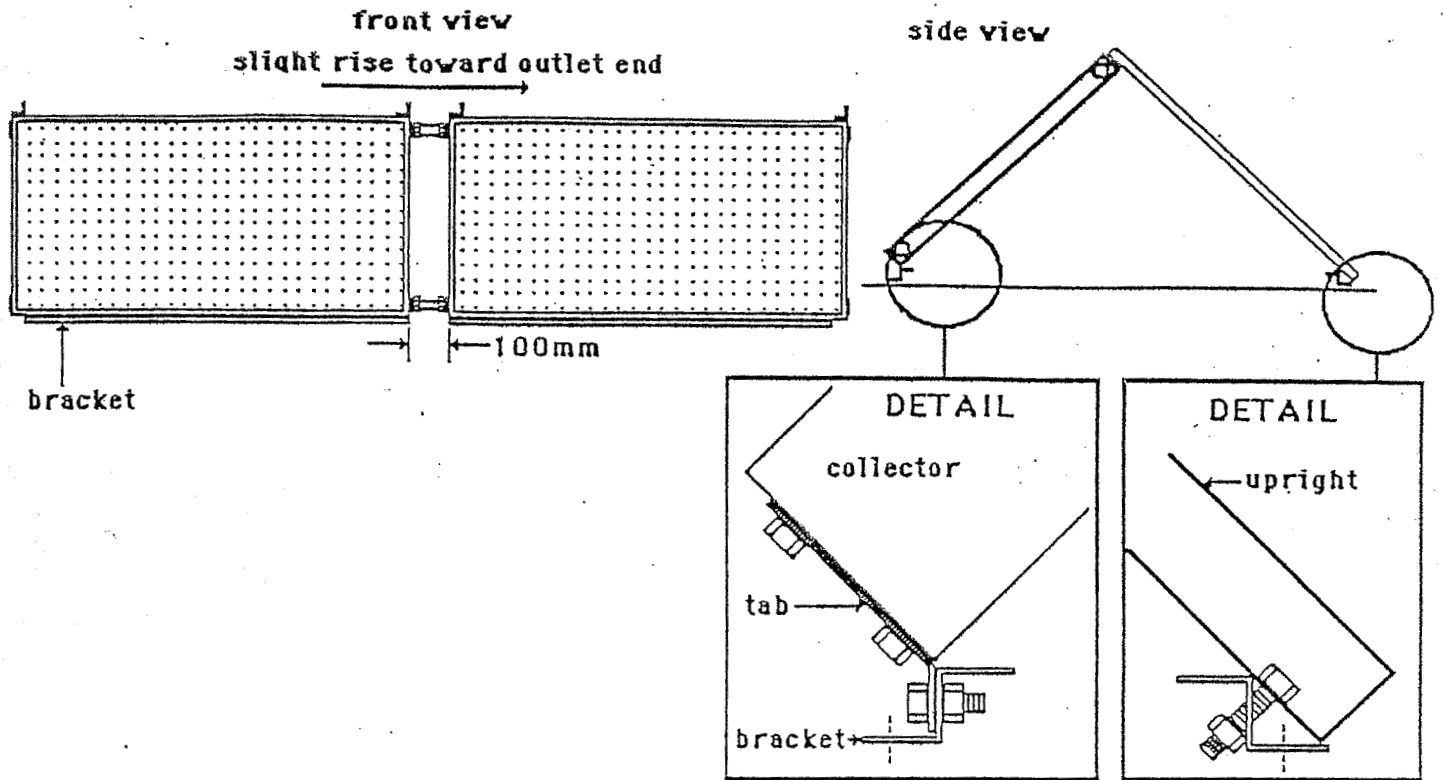
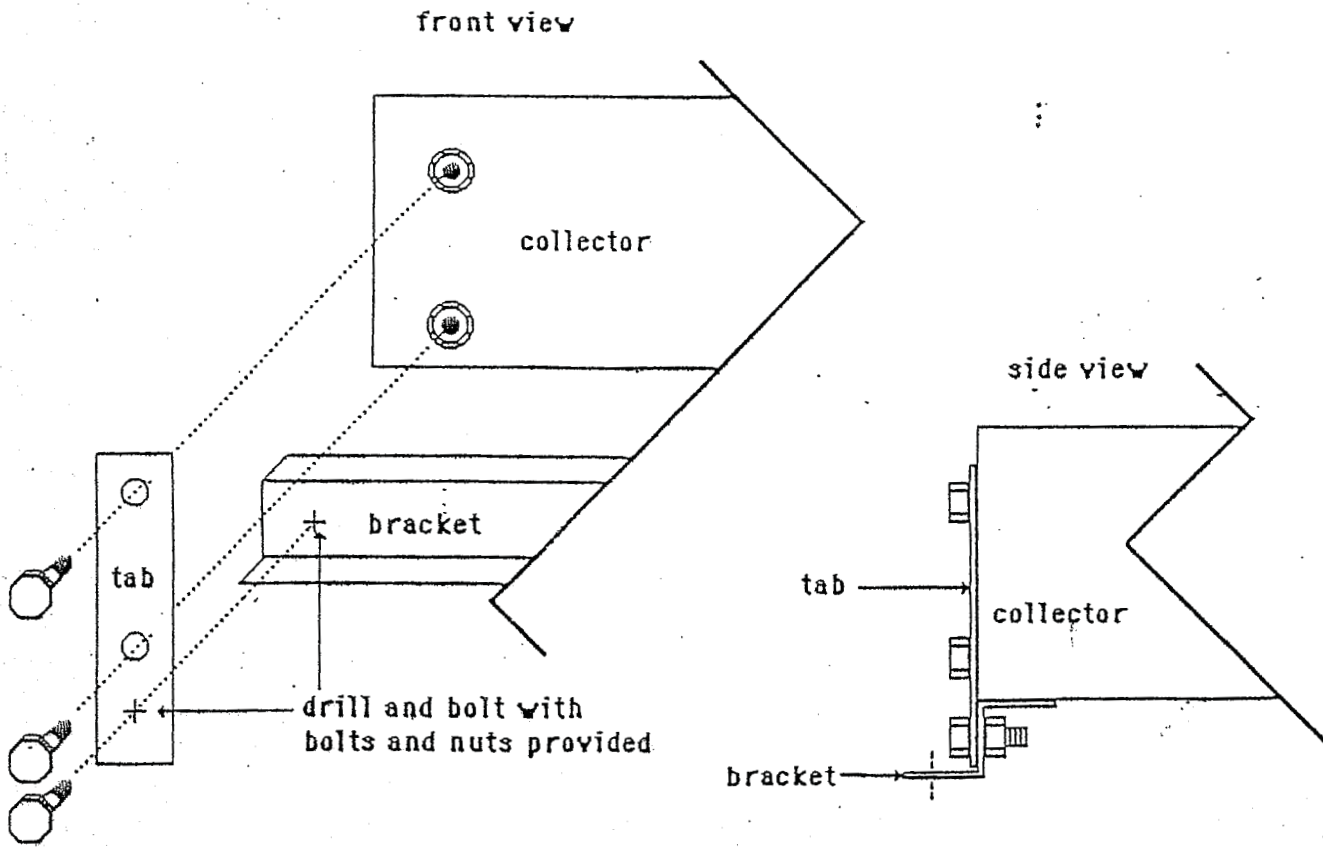


fig. 5 FIXING COLLECTORS TO A FLAT METAL ROOF



MOUNTING BRACKET ASSEMBLY DRAWING



13. Portrait Collector Specifications

Certification	AS/NZS 2712:2002 License to SMK 20279
Dimensions	1870 x 990 x 70mm
Collector Area m2	1.85m2
Weight - Dry	37kg
Weight - Wet	39kg
Liquid Volume	2L
Flow Volume	Variable
Test Pressure	1500kpa. Test 1000 kpa rated
Max. Work Pressure	1000kpa
Pressure Loss	N/A
Absorber Plate Material	Aluminium
Absorber Surface Coating	Black Nickel
Absorber bonding application	Chemically applied
Thermal Emmission	N/A
Water Piping	Copper
Header / Absorber Riser	Copper
Glazing (glass)	Pilkington 3.2mm Low Iron toughened Mist lite solar glass
Insulation	TBLX Performance Fibre 50mm thick
Weather Proofing	Silicone
Case Material	Colour Bond Steel
Heat Endurance	AS/NZS 2712:2002 Comply
Number of Risers	6 Vertical Collector 12 Horizontal Collector
Sensor to Absorber Fixing	Mechanical with Thermal Paste

14. OWNERS OPERATING and MAINTENANCE INSTRUCTIONS

1. It is the owner's responsibility to obtain a building consent from the local Territorial Authority by either filling out an appropriate consent form from your local/district council or referring to the Building Consent Application Requirements Form for Solar Hot Water Installations on page 23.
2. Following the completion of the installation ensure that your solar hot water system is filled with water at all times. If drained at any time then the solar collectors should be covered as prolonged exposure to the sun without a supply of coolant water may cause damage and may void the warranty.
3. Never allow trees, shrubs or other large obstacles to cast shade on the solar collectors. Collectors which are shaded will not function. This should be checked annually under both summer and winter conditions. Shading from newly erected buildings would also need to be considered and the collectors re-located if necessary.
4. Dirt, pollen and other airborne debris which settles on the solar collector glazing will also reduce performance. This seldom occurs, but if it does, water and detergent should be used. Carry out this cleaning operation only when the collectors are cool, that is, at the beginning or the end of the day or during overcast conditions.
5. Check for any leaks around the pipe work or collector connections. Gently tighten using two spanners if needed.
6. The thermostat on the hot water cylinder should be set at approximately 60°C but not lower.
7. **Summer Holidays** – As the Sun provides a seemingly infinite supply of solar heating it is not possible to turn off. If you are planning to be away from the house for extended periods between November and March, and not drawing any hot water from your cylinder we recommend covering the collectors with a suitable material (refer to Broady's for price of approved covers). This will protect the collectors from dumping hot water and running dry during long sunny periods, exposing them to potential damage.
8. In areas where the water supply carries sediment in suspension there will be a slow build up of sediment in the bottom of your tank and solar collectors. Depending on water quality this will take some years to accumulate and in extreme situations may block the solar collector which will then boil. Every 5 years the drain cock on the tank should be opened and water allowed to flow into the safe tray and thence to waste. To flush the collectors removal of the frost valves (each in turn) should be carried out. **Be sure that the water in the tank is not at scalding temperature when this is done and that the rubber washer in the frost valve is not lost as the water gushes out.** When the water flows clear replace the valves.

Six Monthly Maintenance Check

To remove possible airlocks and ensure correct operation gently raise the operating arm of the Pressure and Temperature Relief Valve. Water should flow through the discharge drain. If the temperature relief valve is seen to dump hot water frequently and yet the hot water cylinder is not operating at high temperature then one would suspect that the pump is not circulating. This could be due to the power supply being turned off to the pump and controller unit or the pump or controller malfunctioning. Refer to the Fault Finding section in the Pump and Controller section (page 9 of this manual). If no fault can be found service may be required. The Pressure and Temperature Relief Valve should be replaced every 5 years to ensure correct operation.

WARRANTY

Broady's Solarpower Collectors 7 Year Warranty

Broady's NZ Ltd warrants their solar collectors to be free from defects in materials and workmanship and under normal use and service in accordance with the attached installation and operating instructions and within 7 years from the date of original purchase on the terms herein shall repair or replace without cost to the original customer any part thereof which shall be returned to our factory or designated agent, transportation charges prepaid and which our inspection shows to be thus defective.

Broady's NZ Ltd warrants the Pressure Temperature Relief Valves, Anti Reverse Circulation Valves, Pumps and Controllers and Frost Valves, where fitted, to be free from defects in materials and workmanship and under normal use and service in accordance with the attached installation and operating instructions and within 12 Months from the date of original installation on the terms herein shall repair or replace without cost to the original customer any part thereof which shall be returned to our factory or designated agent, transportation charges prepaid and which our inspection shows to be thus defective. All valves, pumps and controllers require normal service to maintain them.

This warranty does not apply to glass breakage or the discolouration of the surface or tarnishing of fittings, all of which require normal service to maintain them.

This warranty does not apply to frost damage due to extreme conditions. On a clear night, good collectors are looking at a black sky temperature of below -250°C . This can add an extra 2°C of frost to ambient temperature. As frost valves are only suitable to -5°C owners must decide if their conditions meet this threshold. No responsibility for unusually hard frosts can be accepted.

Under the terms of this Warranty, Broady's NZ Ltd assumes no responsibility for the labour costs involved in removing or replacing the above items, nor shall Broady's NZ Ltd be liable for any injury, loss or damage (direct, indirect or consequential) arising out of the use or inability to use the product or its removal and replacement. All other Warranties expressed or implied are excluded to the extent possible at Law.

The retailers, or their agents, do not have authority to alter this warranty.

Building Consent for Installation of Solar Water Heating System

Application Requirements

Applications for Building Consent for Installation of Solar Water Heating Systems are to provide the following supporting information.

Council:.....

Customer or Installer Making Application:.....
(Suitably qualified solar water heating system installer)

Address of Installer:.....

Telephone Number for installer:.....

Product and model number installed:.....

Supplier of Product:.....

Craftsman Plumber:.....

Address of Property on which installed:.....

Location of installation:..... Property description: Lot.....DP.....

Owner of Property on which installed:.....

Confirmation from the Installer that:

- the system will be installed such that the requirements of the New Zealand Building Code have been met.
- Plumbing work has been installed to meet the requirements of standard AS/NZS3500.4.
- the system described will be installed on a dwelling on the named property according to the Code of Practice for Manufacture and Installation of Solar Water Heating Systems in New Zealand.
- A check will be made by a suitably qualified person to ensure that the system is located over suitably sound load bearing walls and strengthening of roof framing will be undertaken according to the guidelines provided by the system supplier and meets the requirements of Approved Document B1 of the New Zealand Building Code.
- the installation will be undertaken in terms of manuals and instructions from the Product Supplier
- The Product Supplier is a Solar Industries Association Accredited Supplier.
- The installer has been appropriately trained in the installation of the named Product by the Product Supplier and operate under that Supplier's accreditation.
- A tempering valve will be installed.
- The installer is covered by a current Public Liability Insurance Policy to a current value of \$.....

The Installer will provide clear sketch drawings showing the layout of the system and position with regard to roof framing and sound load bearing walls. Any strengthening required will be specified.

The seismic restraint system is to be shown on each application.

Installer Signature:.....

Date:.....

Model Producer Statement (PS3) Installation of Solar Water Heating System

Council:.....

Building Consent No:.....

Producer Statement Issued By:.....
(Suitably qualified solar water heating system installer)

Address of installer:.....

Telephone Number for Installer:.....

Product and Model Number Installed:.....

Supplier of Product:.....

Registered Plumber (if applicable):.....Registration No.....

Registered Electrician (if applicable):.....Registration No.....

Address of Property on which installed:.....

Location of installation:.....

Owner of Property on which installed:.....

Property description: Lot.....DP.....

The system has been installed such that the requirements of the New Zealand Building Code have been met. Plumbing work has been installed to meet the requirements of standard AS/NZS3500.4.

Registered Plumber Signature:.....

Date:.....

The solar water heating system described above has been installed on a dwelling on the named property according to the Code of Practice for Manufacture and Installation of Solar Water Heating Systems in New Zealand and the requirements of the Building Consent.

The system has been located as shown on the drawings provided with the Building Consent Application. A check has been made by a suitably qualified person to ensure that the system is located over suitably sound load bearing walls and strengthening of roof framing has been undertaken according to the guidelines provided by the system supplier and meets the requirements of Approved Document B1 of the New Zealand Building Code.

The installation has been undertaken in terms of manuals and instructions from the Product Supplier who is a Solar Industries Association Accredited Supplier.

I certify that I have been appropriately trained in the installation of the named Product by the Product Supplier and operate under that Supplier's accreditation. As an independent solar water heating system installer I am covered by a current Public Liability Insurance Policy to a current value of \$.....

The system has been tested to be free from leaks and operating correctly to the best of the available conditions at time of installation. The owner has been instructed as to the correct operation of the system and informed of the maintenance requirements needed to be performed.

Installer Signature:.....

Date:.....

Owner Signature:.....

Date:.....

INSTALLATION CHECKLIST – Thermosyphon Systems

PANELS	YES	NO	COMMENTS
Panels free from shade			
Orientation acceptable			
Inclination acceptable			
Collectors close as possible to Cylinder			
Panels securely fastened to Roof Structure			
All Pipe/Sensor penetrations through roof are sealed and adequately flashed			
Panels rise slightly to hot water outlet point			
All external pipe runs well lagged for insulation			
All internal pipe runs well lagged for insulation			
All connections tested for leaks			
CONNECTION TO HOT WATER CYLINDER			
ARC Valve installed			
All pipe runs well lagged for insulation			
All external lagging painted against weather elements			
All connections/valves tested for leaks			
All connections/valves free of leaks			
HAND OVER			
Owner has been instructed on correct operation			
Owner presented with Owners Manual			
Owners Manual secured next to Cylinder			
Owner has had warranty explained			

Signed – the Owner Date:

Signed – the Installer Date: