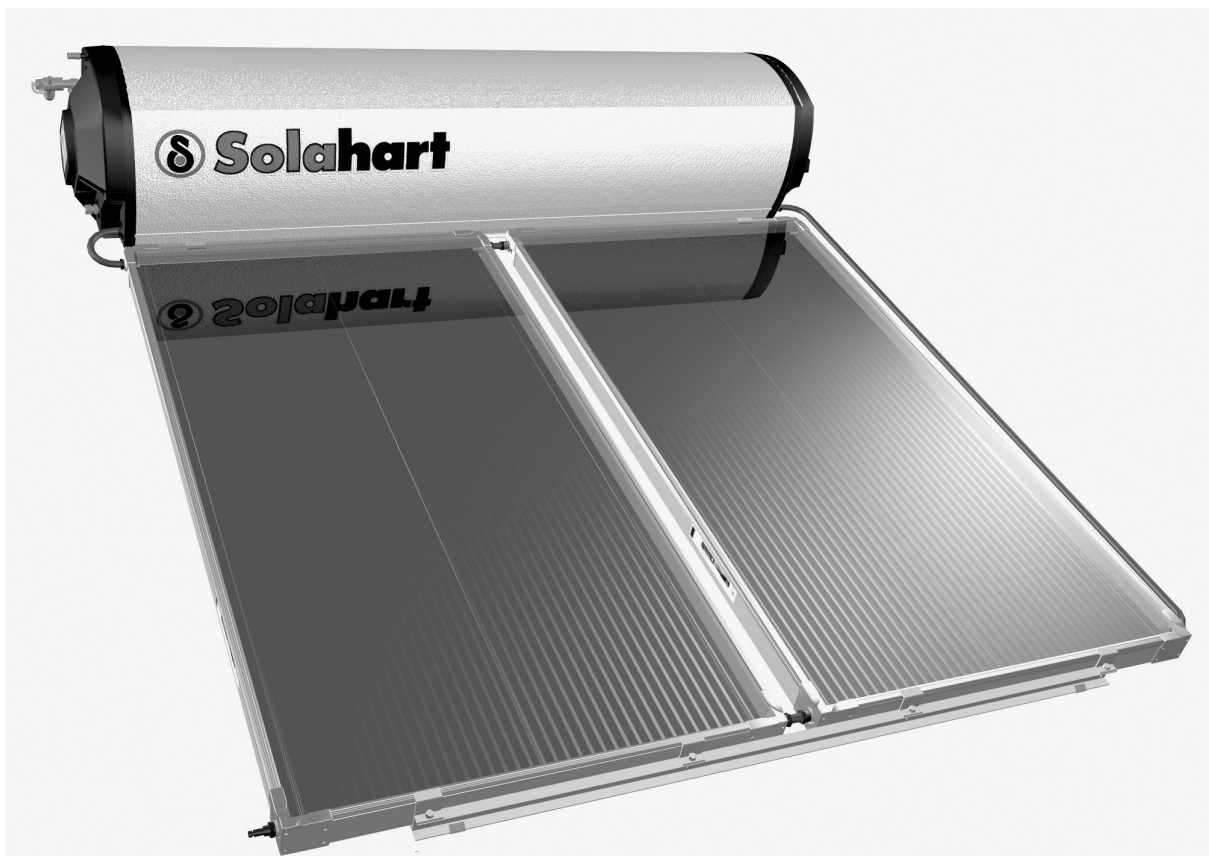




SOLAR WATER HEATER

**USA**

# INSTALLATION MANUAL



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## 1 0 INTRODUCTION

### 1.1 Use of Manual

This manual provides the manufacturers recommended procedures for Solahart Thermosiphon Series solar water-heating systems. The procedures are essential for correct installation, troubleshooting and maintenance.

Read each section of this manual thoroughly before beginning work on the system.

#### CAUTION

**CHANGES TO THE DESIGN OR INTENDED USE OF THE SOLAHART SYSTEM WILL VOID THE MANUFACTURERS WARRANTY. INSTALLATION, TROUBLESHOOTING, AND MAINTENANCE MUST BE PERFORMED BY A QUALIFIED TECHNICIAN.**

### 1.2 General Description

**The solar energy system described by this manual, when properly installed and maintained, meets the minimum standards established by the Solar Rating and Certification Corporation (SRCC). This certification does not imply endorsement or warranty of this product by the SRCC.**

**The solar energy system described by this manual, when properly installed and maintained, meets the minimum standards established by the Florida Solar Energy Center, in accordance with Section 377.705, Florida Statutes. This certification does not imply endorsement or warranty of this product by the Florida Solar Energy Center or the state of Florida.**

The Solahart J, KF and Free Heat systems operate on the passive thermosiphon principle and are revolutionary in their use of a 'closed circuit' to provide fail-safe freeze protection of the collector closed circuit. The closed circuit consists of the solar absorbers, a single wall heat exchanger around the outside of the storage tank, and plumbing attachments.

Radiant energy from the sun heats the special long-life fluid in the solar collectors. As the fluid is heated, it rises into the tank heat exchanger and heats the potable water stored within.

The hot potable water is stored in a well-insulated steel storage tank, which is lined with two coats of Primaglaze vitreous enamel for high temperature stability.

Flow of the closed circuit fluid, using the passive thermosiphon principle, is accomplished without pumps, sensors or moving parts.

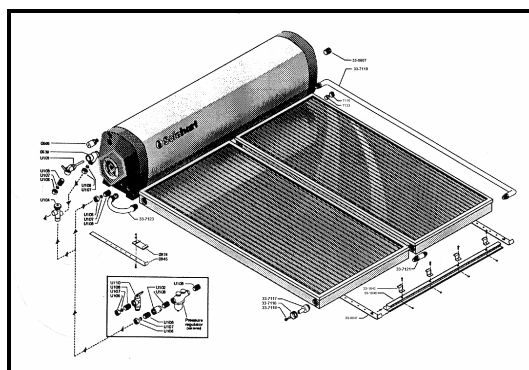
When installed in high radiation areas, high-performance KF and KF Free Heat systems may be fitted with an optional Hartstat over-temperature protection system, to assist in limiting the maximum temperature of the potable water in the tank.

Solahart L model systems also operate using the passive thermosiphon principle, without a closed circuit system. Instead, potable water is circulated directly from the solar collectors into the storage tank, Solahart L model systems are not suitable for locations that are prone to freeze conditions or where the air temperature can fall below 41°F.

#### NOTE

**FREEZE TOLERANCE LIMITS ARE BASED UPON AN ASSUMED SET OF ENVIRONMENTAL CONDITIONS.**

**Figure 1.1 Illustration of Typical System**



### 1.3 Specifications of Solahart Systems

#### STORAGE CYLINDER

Total Capacity (Nominal)	48 Gallons	80 Gallons	117 Gallons
Overall Size (L x W x H)	59" x 20" x 20"	90" x 20" x 20"	129" x 20" x 20"
Nominal Working Pressure	15 – 145 psi	15 - 145 psi	15 – 145 psi
Weight Empty	143 lbs.	216 lbs.	324 lbs.
Weight Installed	540 lbs.	877 lbs.	1294 lbs.
Immersion Element (Booster)	2.4 kW 220/240 V	2.4 kW 220/240 V	4.8 kW 220/240 V
Nominal Temperature Setting	120 - 140°F	120 - 140°F	120 - 140°F
Cylinder Material	12 gauge low-carbon steel		
Cylinder Lining	2 coats specially developed "Primaglaze" high temp vitreous enamel		
Insulation	Pressure injected Polyurethane foam		
Test Pressure	300 psi	300 psi	300 psi


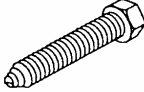

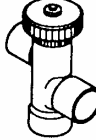

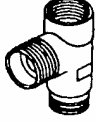



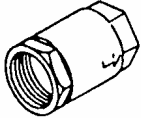


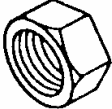


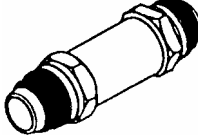
#### COLLECTORS (2)\*

	L Collector	J & KF Collectors
Overall Size (W x L)	82" x 76"	
Nominal Area	43 sq. ft.	
Case Material	23-gauge aluminium	
Cover Material	Low iron tempered glass	
Insulation material	Grey Polyester	Grey Polyester (KF uses FSB1 Fibre Glass)
Absorber Material	20-gauge aluminium sheet / Copper tube array	23 gauge low-carbon steel
Weight Empty	2 x 73 lbs.	2 x 93 lbs.
Weight Installed	2 x 79 lbs.	2 x 101 lbs.
Plate-to-Plate Bonding	N/A	Electric Welding
Test Pressure	22 psi	64 psi
Nominal Working Pressure	85 psi	12 psi

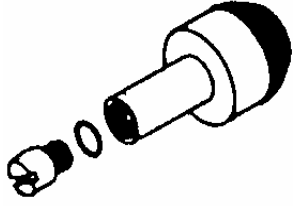
\*Optional additional third collector available

## 1.4 System Parts Identification List

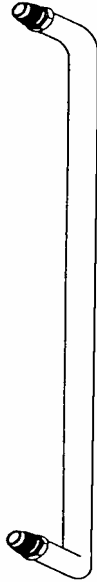
NOTE: FOR REFERENCE ONLY. PARTS MAY VARY DEPENDING ON PARTS KITS PURCHASED.

<p>Storage tank</p> 	<p>Lag Screw (5/16" x 1 3/4")</p> 
<p>Solar collector</p> 	<p>Tempering Valve</p> 
<p>Collector Nut</p> 	<p>3/4" Tee Adaptor</p> 
<p>Collector Plug</p> 	<p>3/4" T/P Valve</p> 
<p>3/4" Tail Plug</p> 	<p>3/4" Check Valve</p> 
<p>3/4" Union</p> 	<p>3/4" Cold Water Expansion Valve</p> 
<p>3/4" Union Nut</p> 	<p>PR6 jacket relief valve (including "O" ring)</p> 
<p>18 mm Union Cone</p> 	<p>Collector Union</p> 

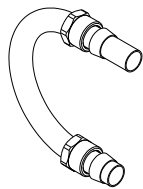
Fill Fitting



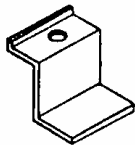
Collector Down Pipe



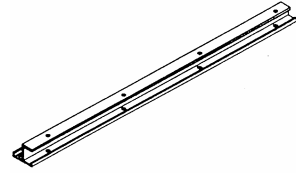
Collector Hot Pipe



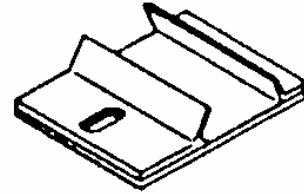
Collector Clamp



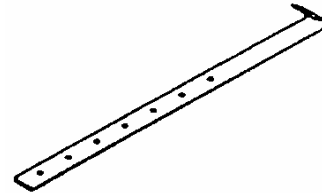
Collector Extrusion



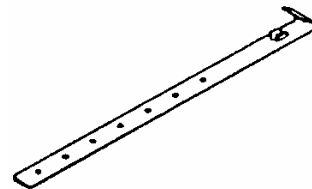
Tank Clamp



Tank Strap

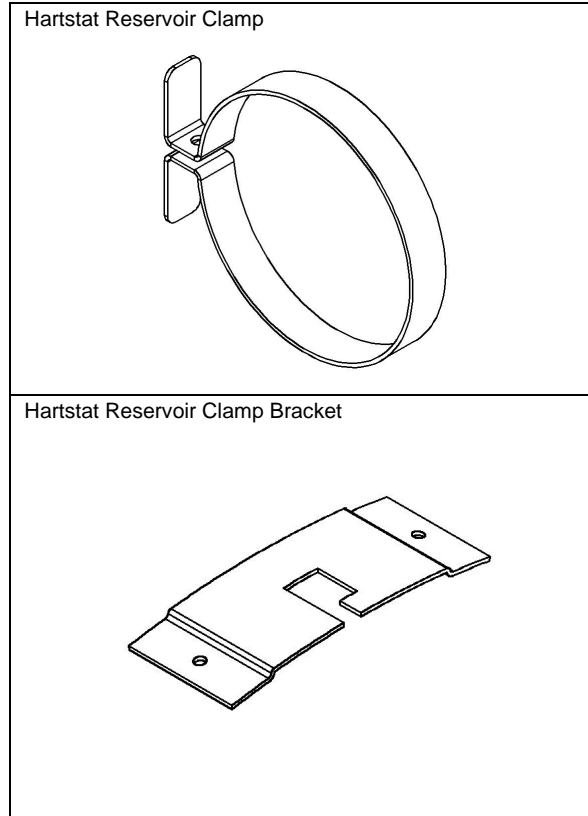
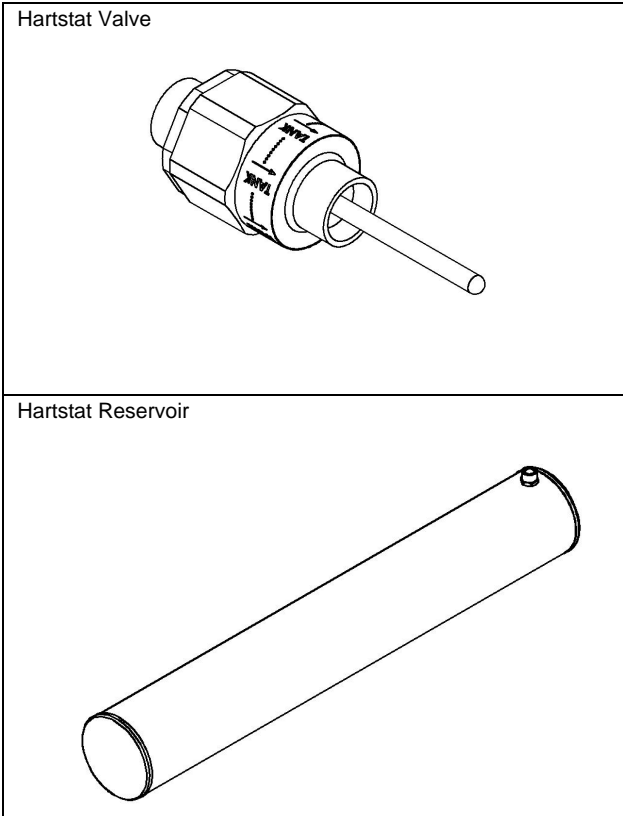


Collector Strap



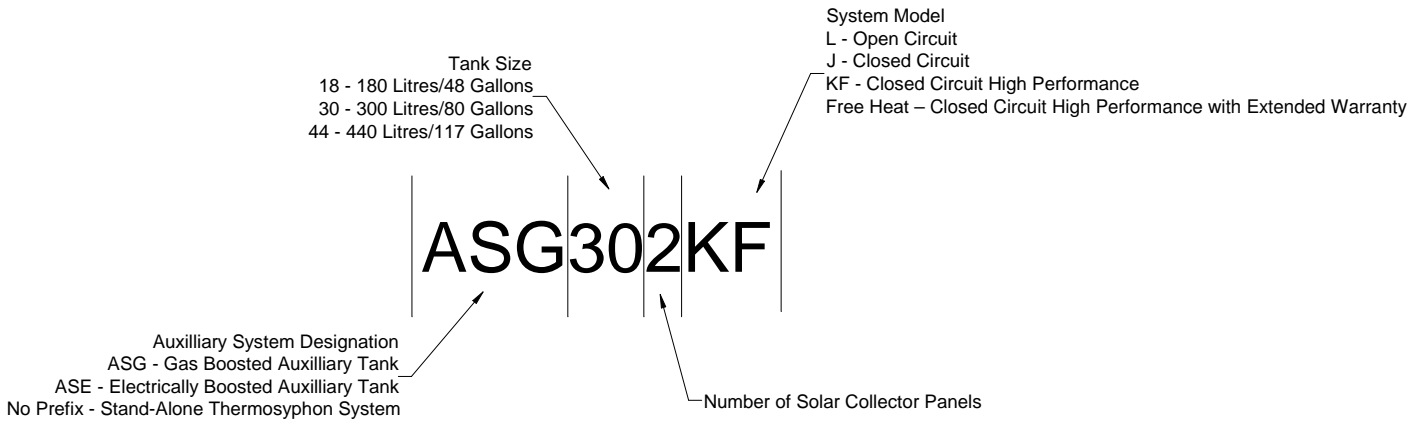
1.2 Gallon Hartgard





### 1.5 Solahart Model Details

Solahart water heating systems are designated according to the system outlined below:





## **2.0 PRE-INSTALLATION INSPECTION**

---

This section will guide you to gather the necessary information to install the system correctly. Use it together with the Pre-Installation Checklist (supplied by local Solahart dealer) to identify all installation requirements.

The pre-installation inspection procedures include;

- Review of local building codes for site requirements and specific guidelines for plumbing and electrical installation,
- Inspection of installation site,
- Completion of the Pre-installation Checklist, including customer's signature.

### **2.1 Site Inspection Equipment**

- Pre-Installation Inspection Checklist
- Pencil or pen
- Ladder
- Tape measure
- Flashlight
- Water pressure gauge
- Pitch gauge
- Compass

### **2.2 Review Local Codes**

2.2.1 Review local codes and record on checklist:

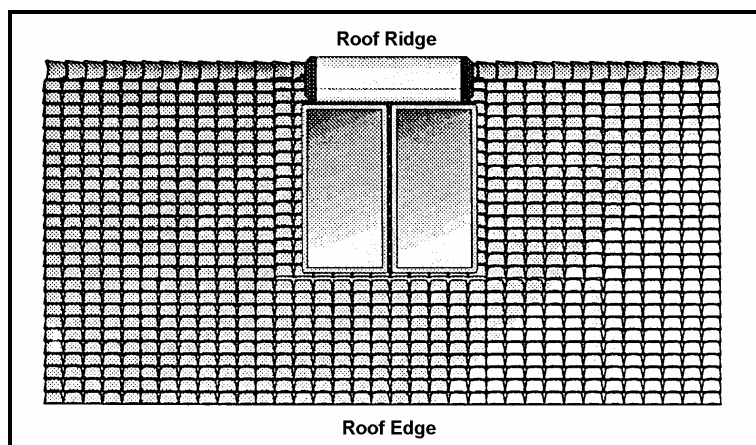
- Area requirements
- Plumbing requirements
- Electrical requirements
- Roof support stress load and modification requirements (including engineering review, if necessary).

2.2.2 Obtain building plans, if possible, to help locate bearing walls and determine truss strength.

2.2.3 Record extreme weather conditions on checklist;

- Heavy-snowfall areas require roof-ridge mount (refer to Figure 2.1),
- High-wind areas require an additional Bracing Kit,
- Installation sites subject to winds of more than 50 m.p.h. require a specially engineered frame.

**Figure 2.1** Roof-Ridge Mounts



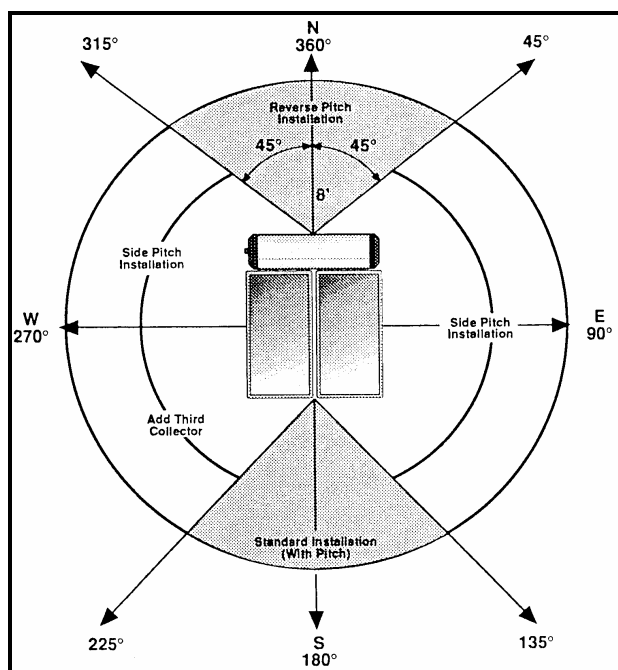
## 2.3 Choose Solahart Location

### 2.3.1 Placement Requirements

The system must face between 135 - 225° (Ideal direction is true South): (refer to Figure 2.2). Installations outside this range require either an additional collector or frame.

Site must be shade-free year-round and clear of obstructions.

**Figure 2.2** Solahart System Placement



**2.3.2 Area Requirements (refer to Figure 2.3):**

No. of Collectors	Installation Area Required
2	8'x 8'
3	8' x 12'

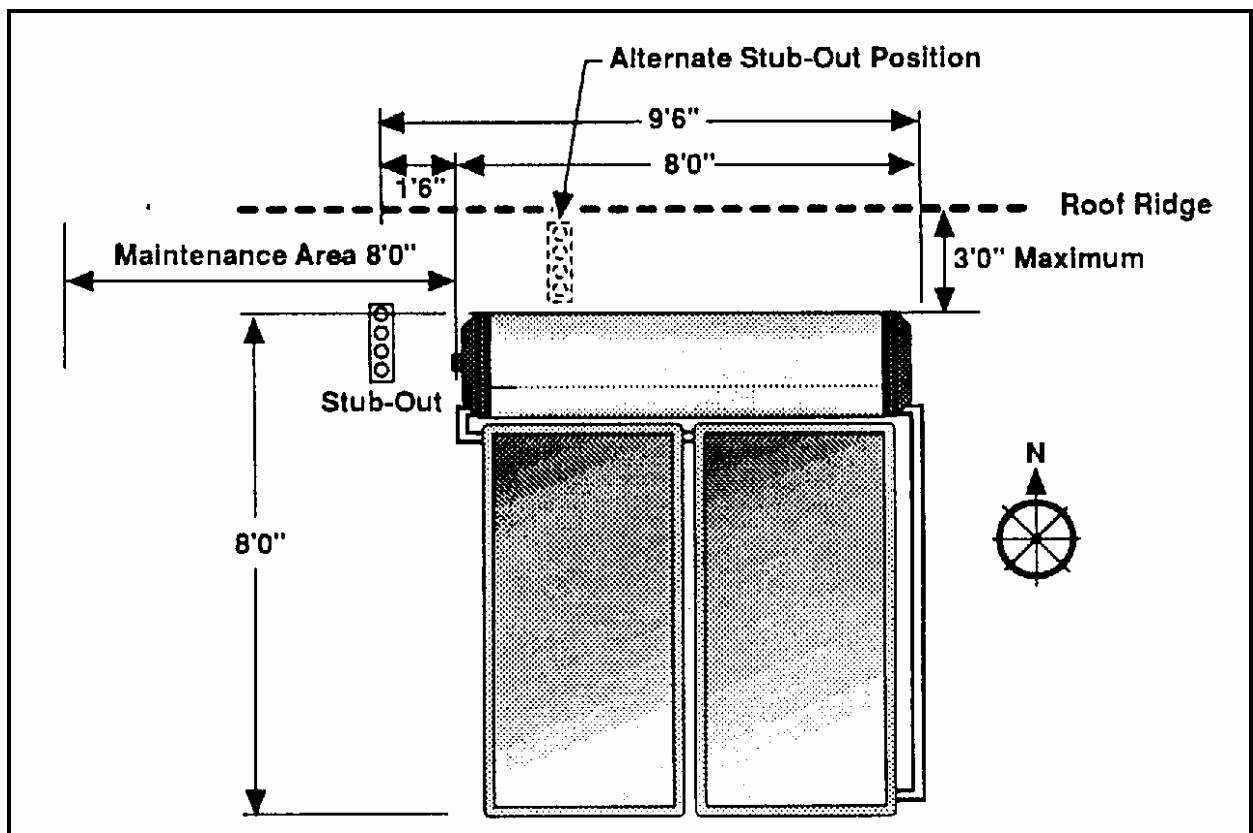
Plumbing/Electrical stub-out;

- 1' 6" left side for roof-ridge mount,
- 1' 6" top or left side all others.

Maintenance area: 8' on left side.

Code-required setbacks, heights, and distances from other structures, pipe vents and utilities.

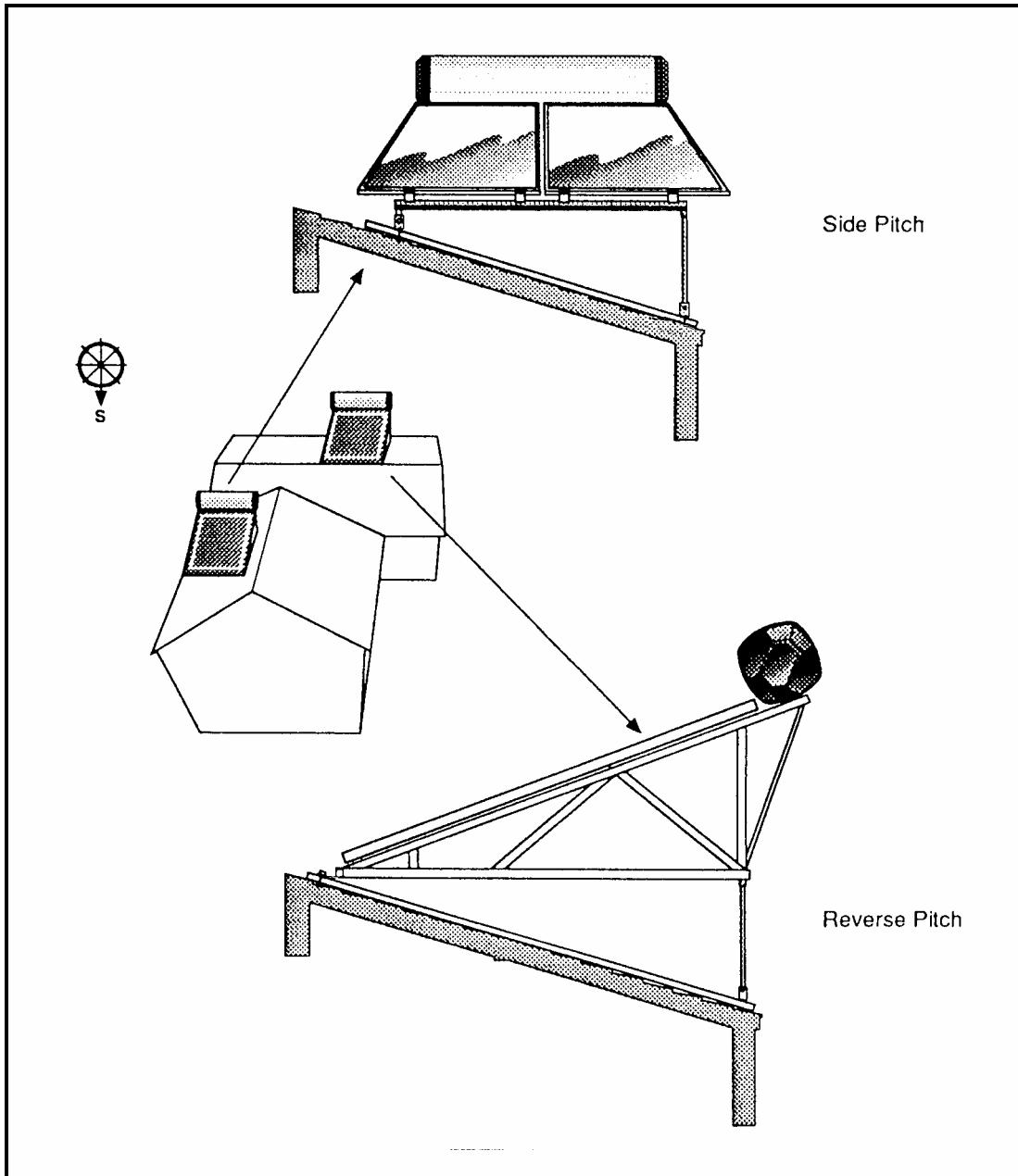
*Figure 2.3 Clearance Requirements*



### 2.3.3 Pitch Requirements

Correct operation requires a 15°- 45° pitch (slope). This can be done by using the roof slope itself or a frame (refer to Figure 2.4).

*Figure 2.4 Frame Installations*



**CAUTION**

**DO NOT INSTALL ON ROOF WITH PITCH BEYOND 45°.**

Use pitch gauge and compass and complete the following steps. Record the results on the checklist.

- Record pitch and compass bearing of proposed installation site.
- Using Table 2.1, select number of collectors and correct installation type.

**Table 2.1 Roof Installations**

Compass Bearing	Pitch	Mount	No. of Collectors
135° to 225°	15° - 45°	None	Base Model
135° to 225°	0° - 15°	Frame	Base Model
226° to 270°	15° - 45°	None	Base Model Plus 1
5° to 134° 270° to 315°	15° - 45°	Side Pitch	Base Model
0° to 44° 316° to 360°	15° - 35°	Reverse Pitch	Base Model

**NOTES**

1. PITCH BEYOND 30° REQUIRES ADDITIONAL BRACING.
2. A CRANE MAY BE NECESSARY IF INSTALLATION SITE IS ABOVE FIRST STORY OR NOT ACCESSIBLE FROM GROUND (TREES, FENCES, GROUND SLOPE, ETC.).

**2.4 Roof Survey**

Record the following on checklist:

- Type of roofing material (tile, shingle, tar & gravel, metal, etc.).
- Condition of roof. Note repair requirements.

**NOTE**

ROOF IN POOR CONDITION MAY NEED REPLACEMENT BEFORE INSTALLATION.

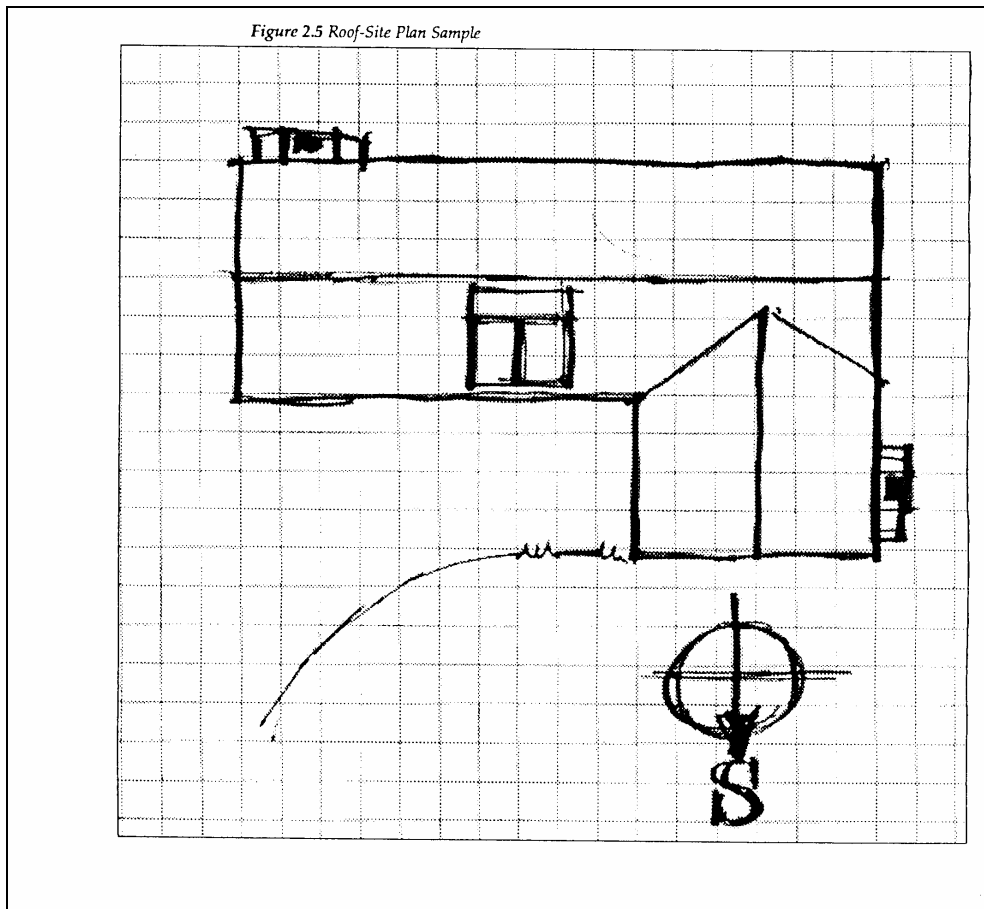
- Using Table 2.2, select the appropriate supporting structure.

**Table 2.2 Installation Matrix**

Roof Type	Installation Type	Supporting Structures
All types except sturdy tiles and metal	With pitch (standard)	4 runners and Collector Extrusion
Sturdy tiles or metal roof with No obstruction of water flow	With pitch (metal / sturdy tile)	Collector Extrusion only
All types	Side pitch	2 runners + Frame
All types	Reverse pitch	2 runners + Frame
All types	Flat / shallow pitch	2 runners + Frame

- Draw diagram (top view) of installation area. Mark location of system and stub-out (refer to Figure 2.5).

**Figure 2.5 Roof Site Plan Sample**



## **2.5 Roof Support Requirements**

The system weighs up to 1735 lbs (444 System) when installed and filled. It may not be necessary to provide additional support but you must inspect the roof support system to determine if additional bracing is needed.

Record the following on the checklist.

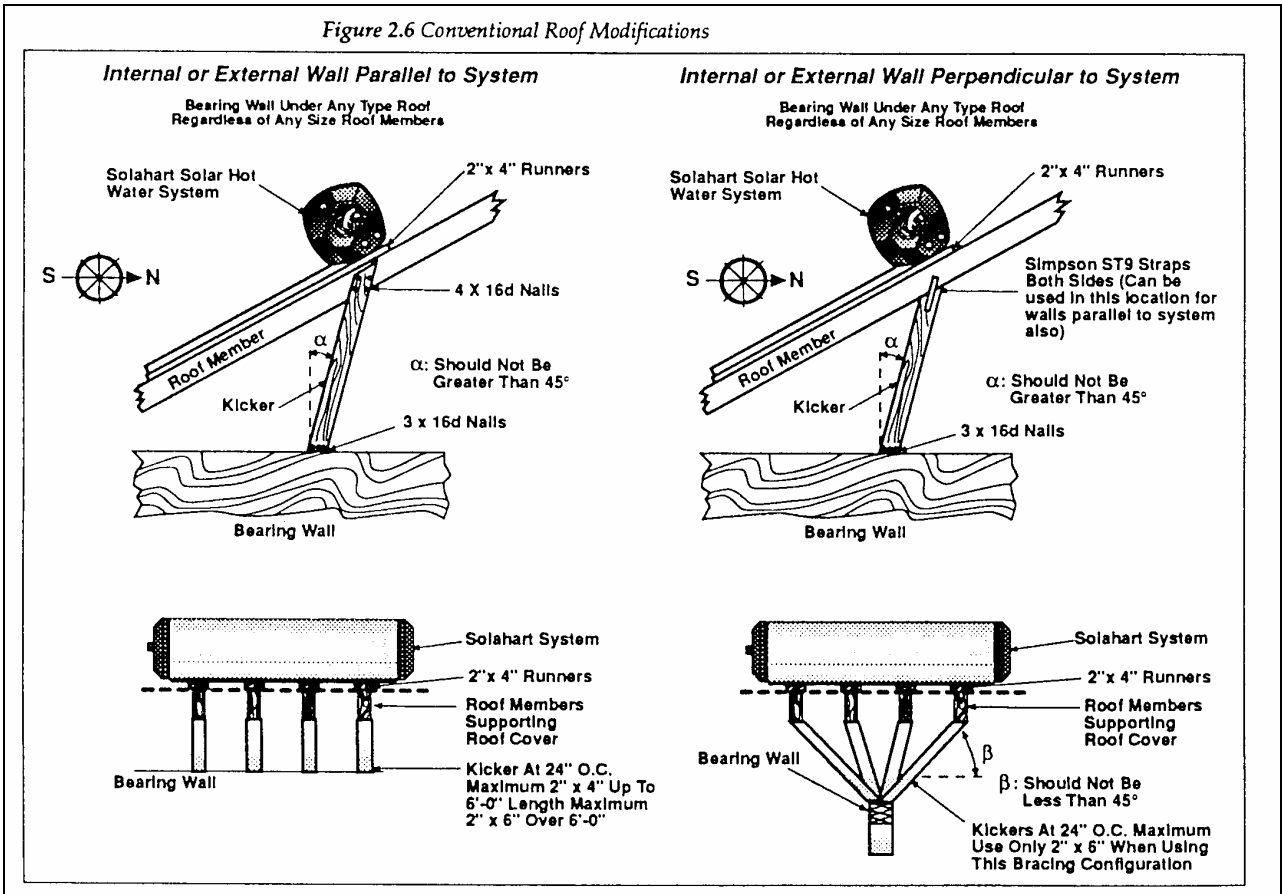
### **CAUTION**

**IF THE FOLLOWING MODIFICATIONS DO NOT APPLY TO THE INSTALLATION SITE, AN ENGINEER MUST SPECIFY SUPPORT MODIFICATIONS.**

#### **2.5.1 Conventional Roof Modifications**

1. Locate load bearing wall beneath installation site (refer to building plan if available) and indicate on roof-site plan. If load-bearing wall is not available, indicate on checklist.
2. Review Figure 2.6 and select correct supports.

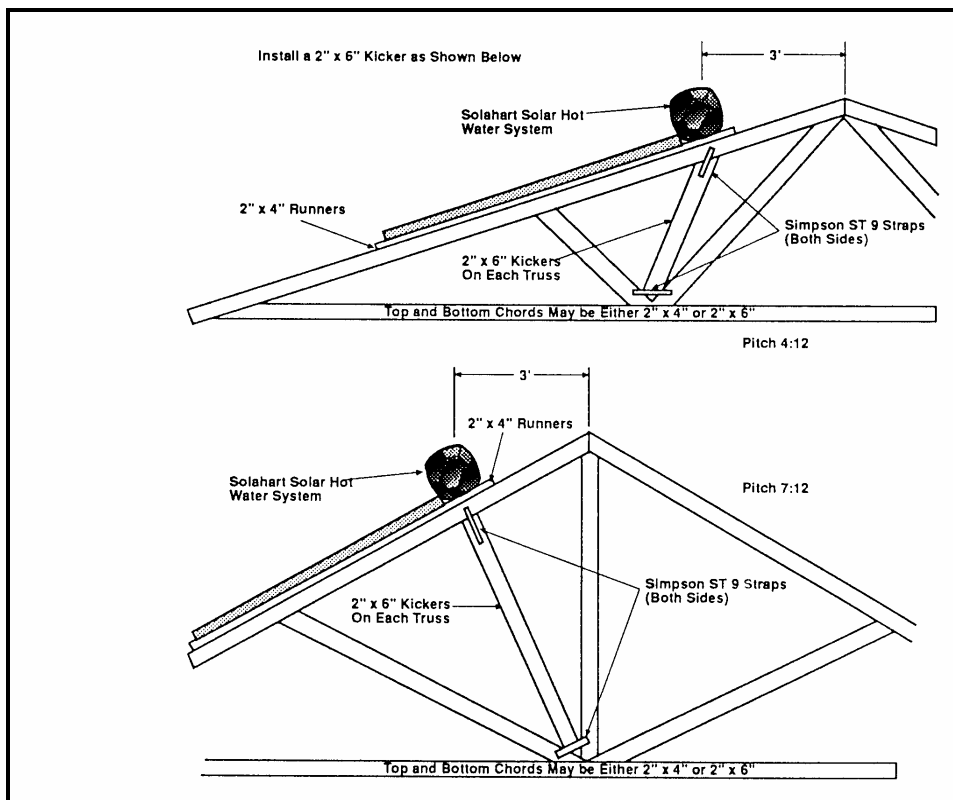
**Figure 2.6 Conventional Roof Modifications**



**2.5.2 Truss Frame Modifications**

- Determine correct truss frame modification using Figure 2.7 and Table 2.3.

**Figure 2.7 Truss Frame Modifications**



**Table 2.3 Allowable Spans for Fink and Queen Trusses**

Allowable					
2" x 4" Top Chord	2" x 6" Top Chord	24" O.C. Kickers	Bottom Chord	Pitch	Roof Material
21"	32"	X	2"x4" or 2"x6"	3:12 <sup>1</sup>	Tile
24"	36"	X	2"x4" or 2"x6"	3:12 <sup>1</sup>	Shake
25"	38"	X	2"x4" or 2"x6"	4:12 <sup>2</sup>	Tile
28"	42"	X	2"x4" or 2"x6"	4:12 <sup>2</sup>	Shake
28"	36"	X	2"x4" or 2"x6"	7:12 <sup>3</sup>	Tile
30"	38"	X	2"x4" or 2"x6"	7:12 <sup>3</sup>	Shake

<sup>1</sup> Pitch of 3:12 or less

<sup>2</sup> Pitch of 4:12 to 6:12

<sup>3</sup> Pitch of 7:12 or greater

Note For spans > 36", use double 2" x 6" kicker

## 2.6 General Plumbing Requirements

### 2.6.1 Water Quality

City water is a controlled water source and should not cause any difficulty with the system. Well water may have elevated mineral content and require more frequent system maintenance.

### 2.6.2 Water Pressure

Water pressure range of 15 to 145 psi is required for correct operation.

Measure mains water pressure and record on checklist.

- Pressures above 60 psi require installation of a Pressure Regulator on mains supply to site.
- Pressures below 15 psi are too low to raise water to the Solahart system. Pressure must be raised to 15 psi before installation.

### 2.6.3 Water Hammer

Water hammer (loud knocking and vibration caused by air in water lines) may reduce efficiency of the system.

Test for water hammer by turning a faucet on and off or flushing a toilet. Record results on checklist.

### 2.6.4 External Piping Insulation

Where potable water piping is in an external location or attic space where the temperature can be as low as 19°F, it must be insulated with a minimum ¾" Armaflex (or similar) flexible elastomeric closed cell thermal insulation. Where the temperature can fall to 12°F, the insulation thickness must be increased to 1 ½".

It is also recommended that heat trace be installed on potable water piping in areas where the outside temperature falls below 32°F for more than 4 hours with no hot water draw to protect against pipe freezing.

Insulation in external locations can deteriorate through UV radiation. To prevent this, a layer of outdoor UV stable paint or other similar protective coating must be applied to the insulation.

#### NOTE

THE CLOSED CIRCUIT PIPING BETWEEN THE STORAGE TANK AND SOLAR COLLECTORS DOES NOT REQUIRE INSULATION.

#### WARNING

HEAT TRACE WILL NOT PROTECT AGAINST PIPE FREEZING IN THE EVENT OF POWER LOSS.



## 2.7 Plumbing Survey

Choose installation type from the following;

1. As a replacement for an existing water heater, refer to Figure 2.8 (Preferred).
2. As the sole source of hot water for new construction or locations without a previous water heater, refer to Figure 2.9.
3. As a pre-heater to an existing water heater, refer to Figure 2.10.

### NOTES

1. USING THE SYSTEM AS PRE-HEATER TO AN *ELECTRIC* WATER HEATER IS LESS EFFICIENT THAN A STAND-ALONE SYSTEM. (NON-PREFERRED). DO NOT PERFORM THIS INSTALLATION UNLESS SPECIFICALLY REQUESTED BY THE CUSTOMER.
  2. ALL PLUMBING INSTALLATION MUST CONFORM TO LOCAL CODES.
  3. ALL PIPING MUST BE ADEQUATELY SUPPORTED; SUPPORTS MUST CONFORM TO LOCAL CODES.
  4. ALL PIPING MUST BE ADEQUATELY INSULATED; INSULATION MUST CONFORM TO LOCAL CODES.
4. ALL PIPING MUST BE SLOPED TO DRAIN.

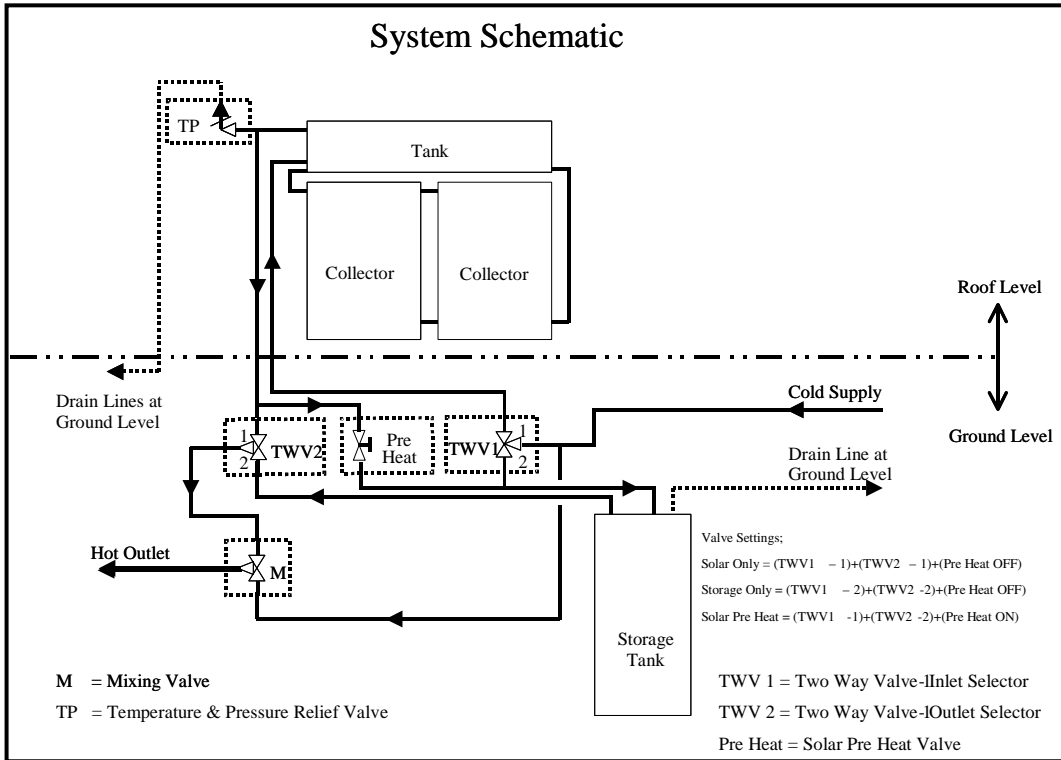
### CAUTION

**PLUMBING MUST BE INSTALLED SO THAT THE PERFORMANCE OF ANY FIRE-RATED ASSEMBLY IS NOT REDUCED.**

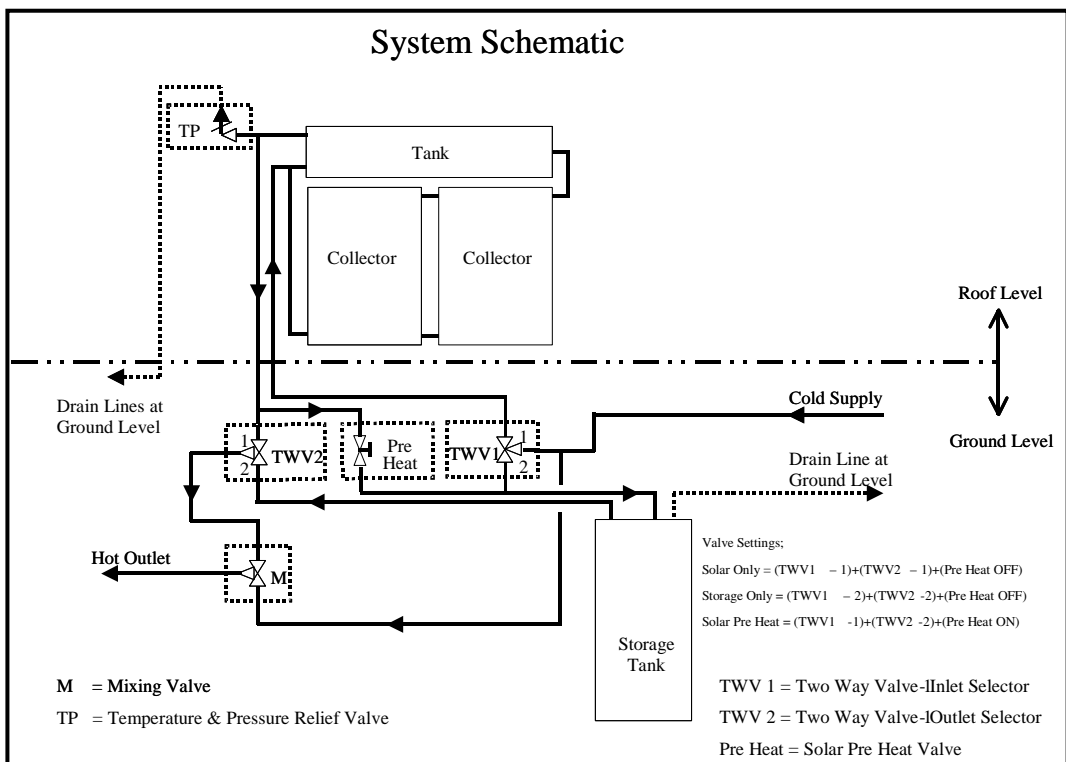
**Figure 2.8 Plumbing Schematic for Replacement of Existing Electric Water Heater (Preferred)**

This method is also used for Auxiliary system connections where the electric or gas water heater remains and the solar water heater serves as a pre-heater to it.

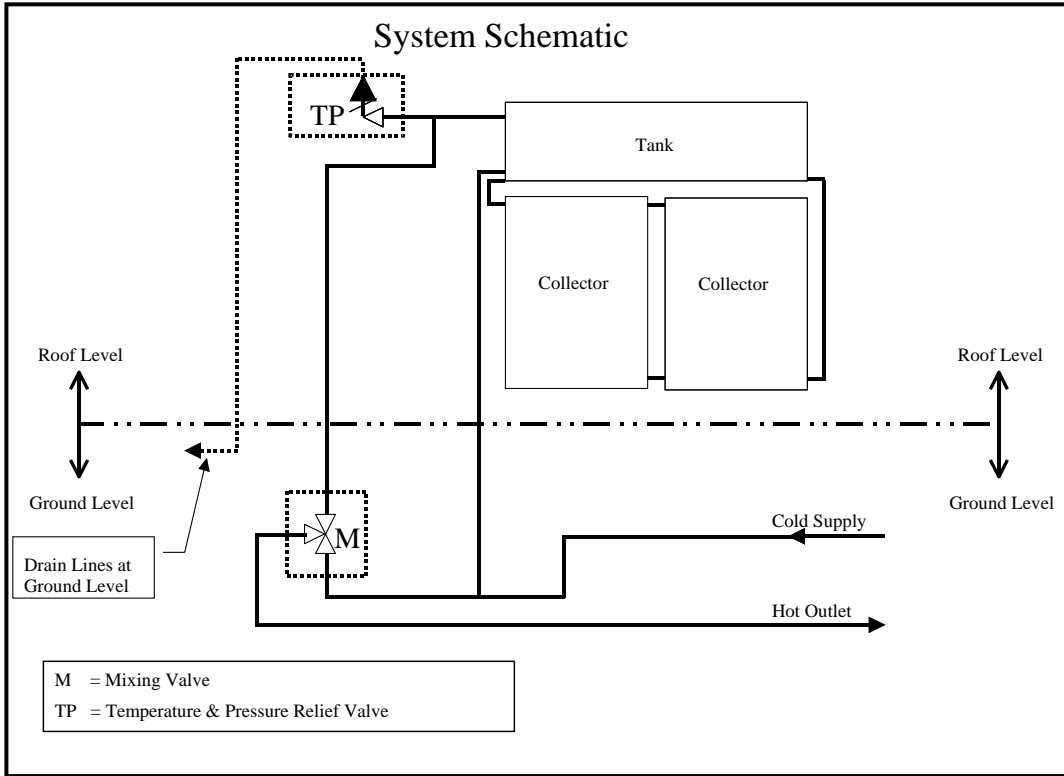
**Typical for models J, KF & Free Heat**



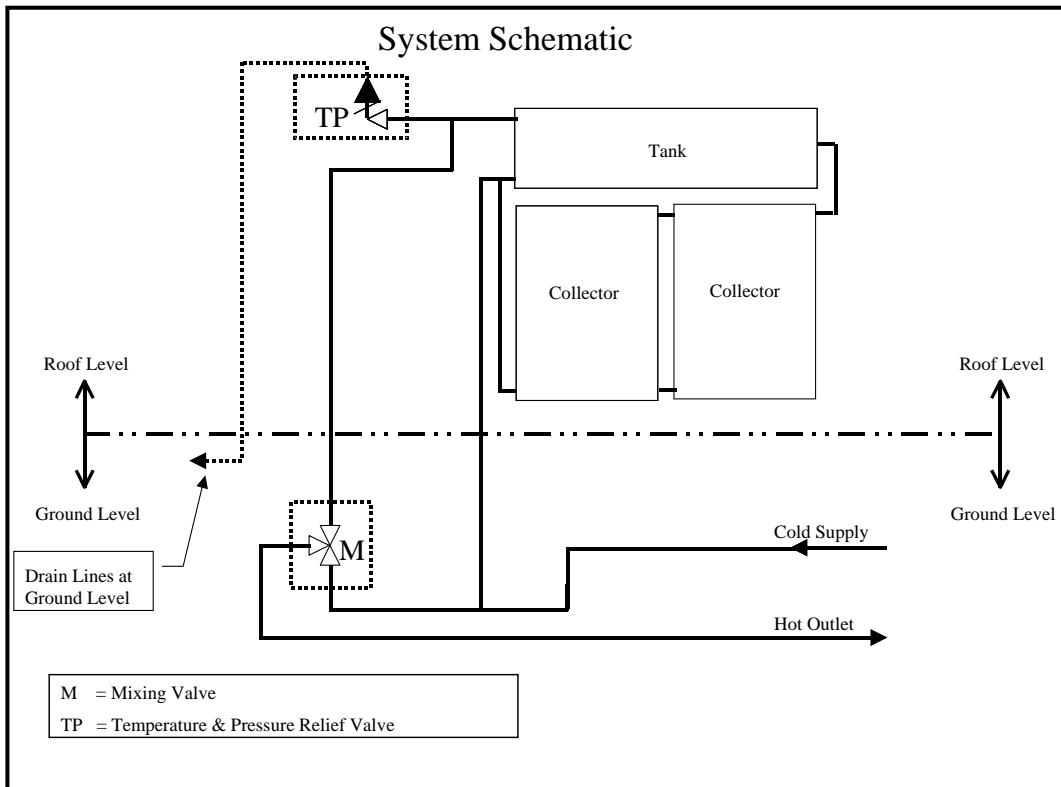
**Typical for Model L**



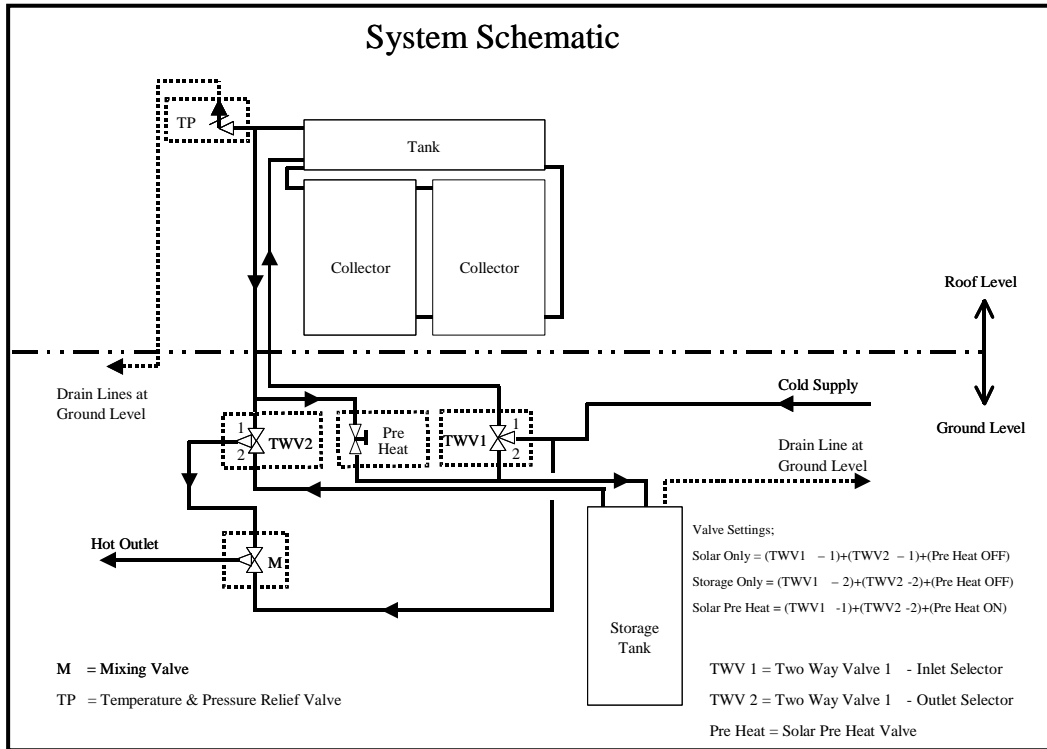
**Figure 2.9 Plumbing Schematic for Installation as Sole Source Heater**  
**Typical for Models J, KF & Free Heat**



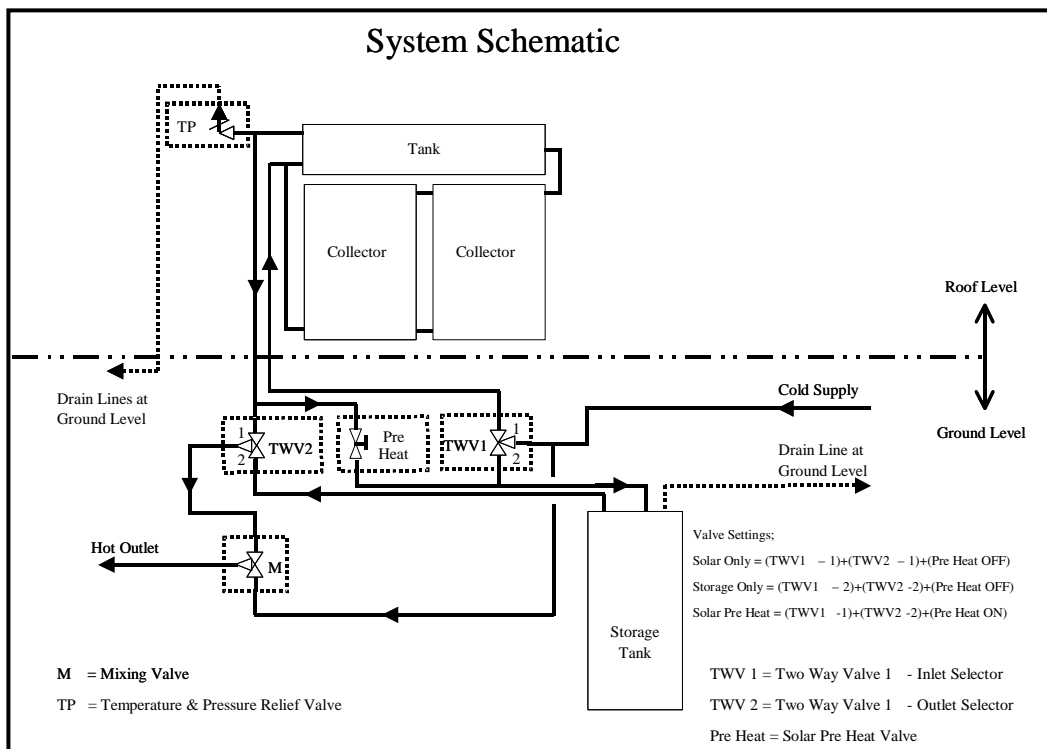
**Typical for Models L**



**Figure 2.10 Plumbing Schematic for installation as Pre Heater**  
**Typical for Models J, KF & Free Heat**



**Typical for Model L**



## 2.8 Electrical Survey

If the system is being used as a pre-heater to an existing water heater, electrical survey and installation may not be required.

### 2.8.1 General Electrical Requirements

A 220 Volt, 25 Amp electrical breaker is required to activate the Backup Heating Element located near or as part of the main circuit breaker/fuse panel.

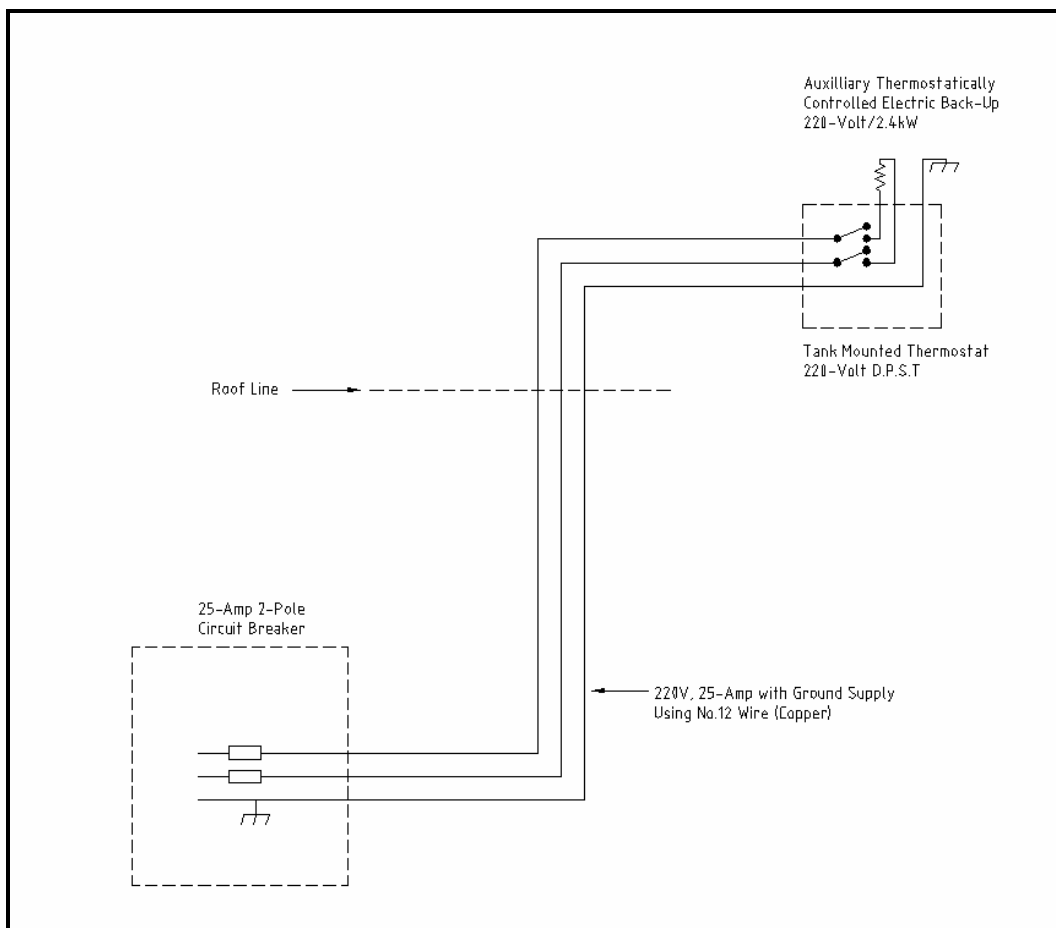
In order to complete the Electrical Survey follow the procedure outlined below;

1. Check availability of 220-volt, 25-amp breaker. Record on checklist.
2. If breaker is not available, mark location for a separate breaker.
3. Refer to Figure 2.12 for an electrical schematic for all new installations.

#### NOTE

ALL ELECTRICAL CONNECTIONS MUST CONFORM TO LOCAL CODES AND THE REQUIREMENTS AND CAUTIONS DETAILED IN SECTIONS 3.0 AND 5.12.

**Figure 2.11** Electrical Schematic for New Installation



## 2.9 Customer Approval

1. Review checklist with customer and discuss all installation requirements and procedures.
2. Have the customer sign the checklist.

## 3.0 HAZARDS AND SAFETY PRECAUTIONS

---

### IMPORTANT SAFETY INSTRUCTIONS

1. **WARNING** – When using electrical appliances, basic safety precautions to reduce the risk of fire, electric shock, or injury to persons should be followed, including:
2. **READ ALL INSTRUCTIONS BEFORE USING THIS WATER HEATER.**
3. The Water Heater must be grounded. Connect only to properly grounded outlet.
4. Install or locate this water heater only in accordance with the provided installation instructions.
5. Use this water heater only for its intended use as described in this manual.
6. Do not use an extension cord set with this water heater. If no receptacle is available adjacent to the water heater, contact a qualified electrician to have one properly installed.
7. As with any appliance, close supervision is necessary when used by children.
8. Do not operate this water heater if it has a damaged cord or plug, if it is not working properly, or if it has been damaged or dropped.
9. This water heater should be serviced only by qualified service personnel. Contact the nearest authorised service facility for examination, repair or adjustment.

### SAVE THESE INSTRUCTIONS

For safe installation and operation of the system, review the following hazards and follow all precautions.

**⚠ WARNING - HAZARD: Excessive Pressures and Temperatures**

#### **PRECAUTION:**

To reduce the risk of excessive pressures and temperatures in this water heater, install temperature and pressure protective equipment required by local codes but not less than a combination temperature and pressure relief valve. The valve must be certified by a nationally recognised testing laboratory that maintains periodic inspection of production of listed equipment or materials, as meeting the requirements for Relief Valves and Automatic Gas Shut Off Devices for Hot Water Supply Systems, ANSI Z21.22.

This valve must be marked with a maximum set pressure not to exceed the marked maximum working pressure of the water heater. Install the valve into an opening marked for this purpose in the water heater, and orient it or provide tubing so that any discharge from the valve will exit within 6 inches above, or at any distance below the structural floor, and cannot contact any live electrical part. The discharge opening must not be blocked or reduced in size under any circumstances.

**⚠ WARNING - HAZARD: Thermal Expansion**

When a water heater is installed in a closed water supply system, such as one having a back-flow preventer in the cold water supply, means shall be provided to control thermal expansion. Contact the water supplier or local plumbing inspector for information regarding the control of this situation.

**⚠ WARNING - HAZARD: Electrical Shock**

#### **PRECAUTIONS:**

1. Disconnect all power sources before starting installation, maintenance or troubleshooting.
2. Verify mains power is **OFF**.
3. If power is needed later for maintenance, place highly visible tape or tags on all appropriate locations to warn of LIVE electricity.

**⚠ WARNING - HAZARD: Burns from Hot Water and Steam**

**PRECAUTIONS:**

1. Use extreme care when opening relief valves, charging closed circuit, and filling storage tank.
2. The electrical booster thermostat has been factory set at 122°F (50 °C) to reduce the risk of scald injury. Adjusting the thermostat to a higher setting is not recommended. Hotter water increases the risk of scald injury.
3. Should the thermostat require adjustment to meet the customer demands this can be achieved by rotating the adjustor on the thermostat to the desired temperature.
4. Solar collectors can heat the water in the storage tank to temperatures that are higher than the thermostat setting.

**⚠ WARNING - HAZARD: Burns from Collector Fluid or Downpipe and Hot Pipe**

**PRECAUTION:**

Cover the solar collectors with an opaque (no light can penetrate) material and allow plumbing and fluid to cool before attempting any maintenance.

**⚠ WARNING - HAZARD: Heights**

**PRECAUTIONS:**

1. Use extreme care to avoid falling while on a ladder or the roof.
2. If a roof section does not appear to be solid under foot, do not subject it to any added weight until it is adequately reinforced.

## 4.0 PRE-INSTALLATION

---

Review the checklist for installation requirements. Complete the following before beginning installation.

### 4.1 Permits

Obtain required permits before installation.

### 4.2 Work Force

An 80 gall storage tank weighs up to 216lbs empty, requiring a crew of two or more to install.

### 4.3 Inventory

Review Section 4.4, Frames (Appendix A), Third Panel Parts Kits (Appendix B) and all optional supplies before installation.

### 4.4 Required Tools, Equipment and Supplies

#### **Basic Plumbing, Electrical and Carpentry Supplies**

- Metric wrench (36 mm open end wrench)
- 12" pipe wrench
- Two 12" adjustable (crescent)
- Wrenches
- Water pressure gauge
- Crowbar
- Copper tubing cutter
- Soldering kit
- Caulking gun
- 24" Spirit (bubble) level
- Cable cutter / stripper
- 6" diagonal cutting and long nose pliers
- 100' Grounded extension cord
- Screwdriver Set (# 2 Philip's, 1/4" Slotted)
- Tape measure (100 Foot)
- 16-Ounce claw hammer
- Marking pen
- Utility knife
- 3/8"-drive socket set
- 2 Extension ladders
- Flashlight / electric lantern
- Pipe vice / cutter / threader
- Multimeter
- Hacksaw
- 1/2" Electric drill with bit set
- Skill Saw with standard and masonry blades
- Crane, if required
- 1" Wood-boring bit

#### **Consumable Supplies:**

- Masking/duct tape
- Wood/sheet metal screws
- Dielectric pipe unions
- Waterproof sealing compound
- 5/16" Lag Screws, 1 3/4", 2", 3", 6", as required
- Washers
- Nails, 16g, or assorted, as required
- Silicone sealant
- 2' x 4' x 8'4" redwood, treated-wood or Unistrut runners, as required



## 5.0 INSTALLATION PROCEDURES

---

This section contains instructions for correct installation of the system. Complete the procedures in the order listed.

**NOTE**

INSTALLATION OF ROOF SUPPORTS, PLUMBING, AND ELECTRICAL MUST CONFORM TO LOCAL CODES.

Installation types are divided into the following:

**Standard Installation:**

System is mounted to wood or Unistrut runners directly to roof with no need for pitch or directional changes.

**Metal / Sturdy Tile Installation:**

System is mounted directly to roof with no need for pitch or directional changes.

**Frame Installation** (Side, Reverse, Shallow-Pitch and Flat-Roof Installation)

System is mounted on a variable pitch frame to provide pitch or a fixed pitch frame to provide directional changes.

### 5.1 *Prepare the Roof*

#### 5.1.1 Roof Reinforcement (if necessary)

1. Refer to checklist for necessary roof modification.

**NOTE**

STORAGE TANK WILL BE PARALLEL TO RAFTERS OR TRUSSES FOR SIDE-PITCH MOUNT AND AT A RIGHT ANGLE FOR ALL OTHER MOUNTS.

2. Install supports.

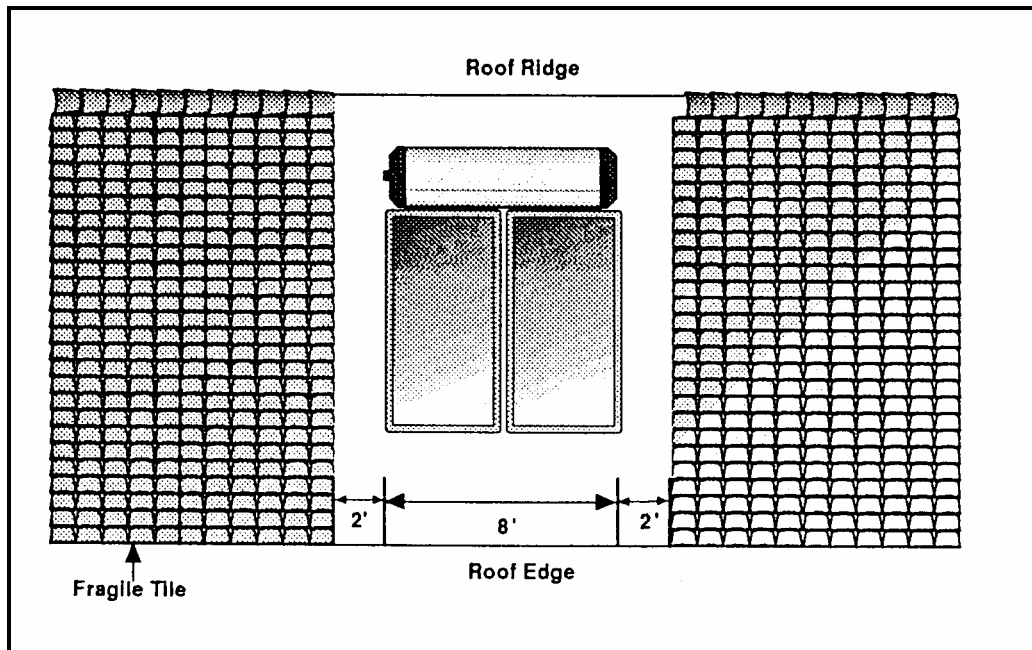
#### 5.1.2 Fragile/Ornamental Roof Material

The system may be installed directly on most roof types if the roof is in good condition with adequate drainage.

For other types of roofs, do the following:

1. Clear area of roofing material from top of roof to lower edge of roof with 2' clearance on each side (refer to Figure 5.1). Set aside for reinstallation.
2. Install waterproof material over cleared area.
3. Fully seal and waterproof new material.
4. Continue with Section 5.2, Supporting Structure Installation.

Figure 5.1 Fragile Tile Site Preparation



## 5.2 Supporting Structure installation

Refer to the appropriate section listed below for installation procedures:

- Standard Installation: Section 5.2.1.
- Metal / Sturdy Tile Installation: Section 5.2.2.
- Frame Installation: Section 5.2.3.

### 5.2.1 Standard Installation

1. Mark supporting rafter/truss and bearing-wall locations on roof.

#### NOTE

SUPPORTING RAFTERS MAY BE EITHER 16" OR 24" ON CENTER. RUNNERS WILL NOT BE EQUALLY SPACED ON 16" ON-CENTER RAFTERS (REFER TO FIGURE 5.2).

2. Place four 2" x 4" x 8' 4" redwood, treated-wood or Unistrut runners parallel down roof slope over marked rafters or trusses. For three-collector installations, two additional runners are necessary.
  - For standard installation, runners must be placed within 3' of roof ridge (refer to Figure 2.3).
  - For roof-ridge mounts, place top of runners at roof ridge (refer to Figure 2.1).

#### NOTE

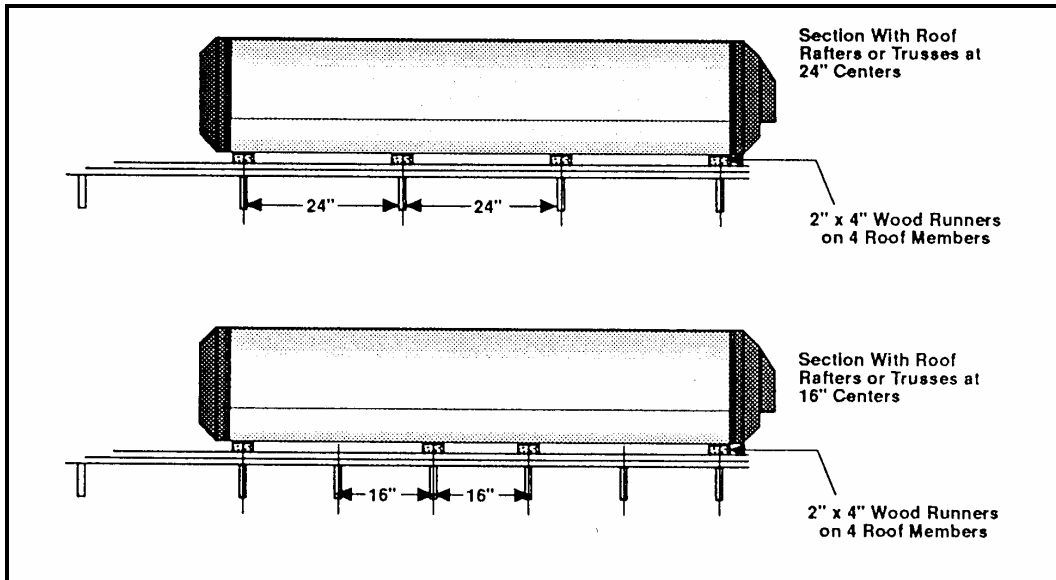
DOUBLE CHECK THE PLACEMENT OF RUNNERS OVER RAFTERS OR TRUSSES BEFORE DRILLING HOLES.

#### HINT

YOU MAY WANT TO PRE-DRILL RUNNERS WITH PILOT HOLES TO AVOID SPLITTING RUNNERS WITH LAG SCREWS.

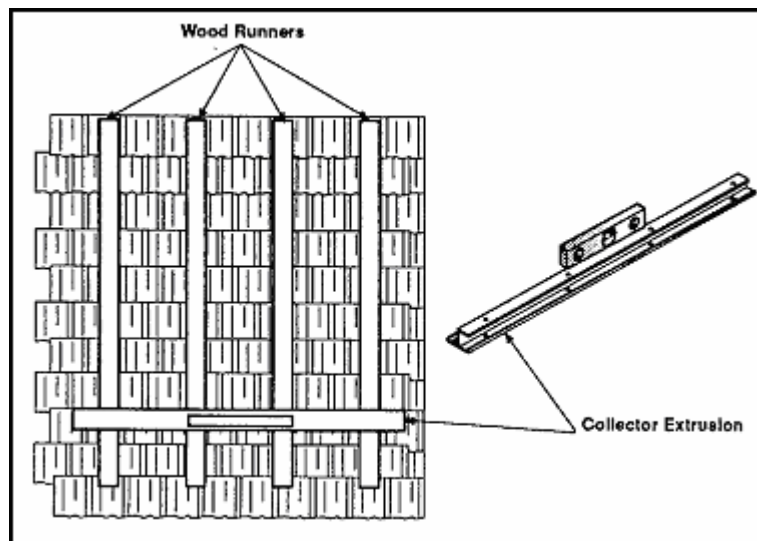
3. Drill each runner in center and 6" from runner ends and attach to rafters or trusses with 5/6" x 6" lag screws and washers.
4. Flash and seal all roof penetrations.

**Figure 5.2** Wood Runner Installation Detail on 16 " and 24 " On-Center Rafters



5. Position Collector Extrusion so that flat vertical edge is toward roof ridge (refer to Figure 5.3).

**Figure 5.3** Collector Extrusion Detail for Standard Installation



**CAUTION**

**EXTRUSION MUST SLOPE  $\frac{1}{2}$ " PER COLLECTOR FROM HORIZONTAL (HOT PIPE SIDE TO BE HIGHER) FOR SYSTEM TO WORK CORRECTLY.**

6. Level the Extrusion using a spirit level and shims (refer to Figure 5.3). After levelling, raise the hot pipe side of the extrusion by  $\frac{1}{2}$ " per collector to ensure correct operation of the system (eg. For a 2 collector system, raise the hot pipe side of the extrusion by 1").
7. Mount the Extrusion to each runner using 5/16" x 2" lag screws or Unistrut bolts.
8. Continue with Section 5.3, Collector Installation.

**5.2.2 Metal / Sturdy Tile Installation**

1. Mark tank location on roof with front foot of tank located directly over reinforced roof area.
2. Measure 82 inches down roof from front foot of tank to determine location for Collector Extrusion.

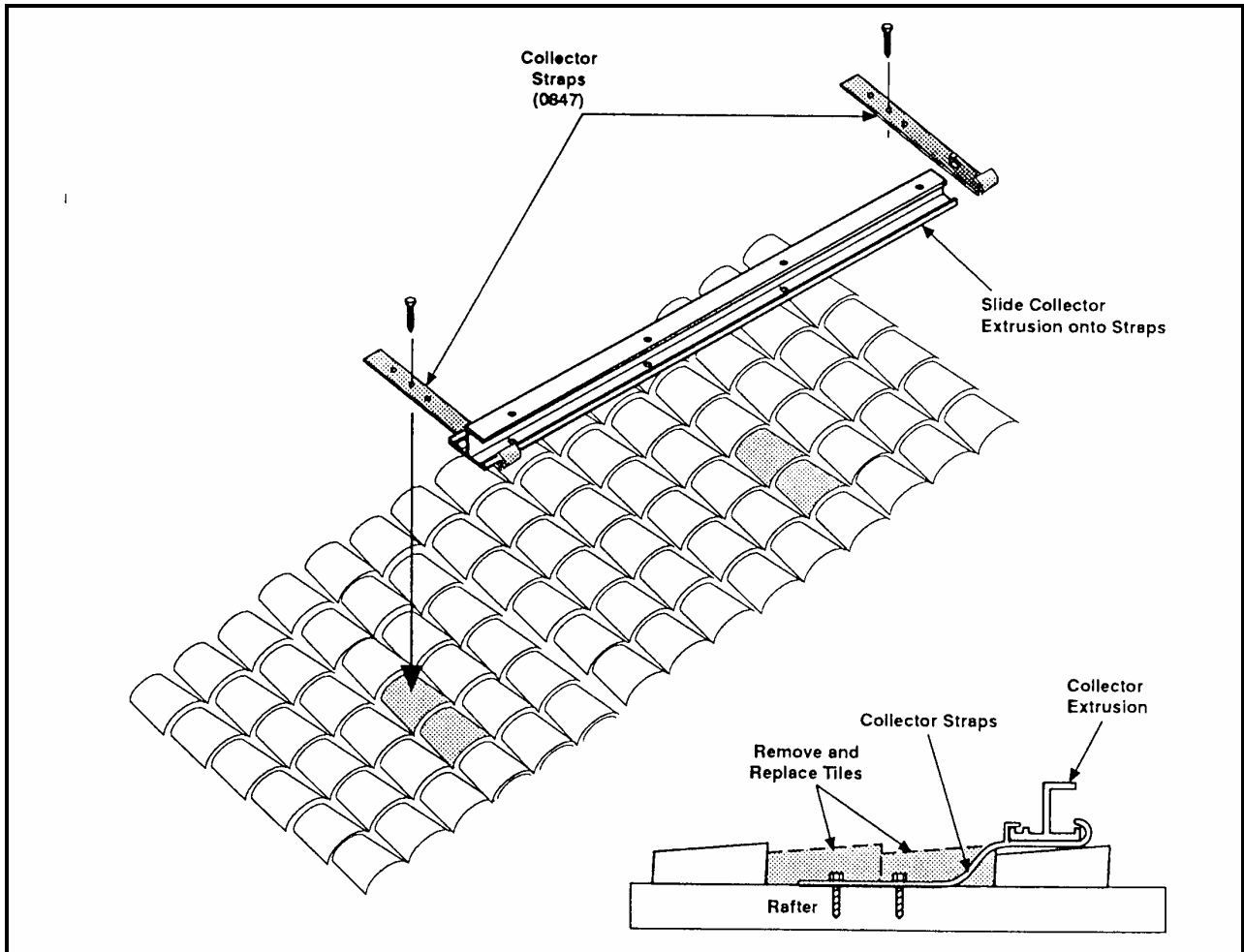
- For Tiled roofs, remove tiles to allow for room to screw collector straps to rafters or trusses (refer to Figure 5.4). If installing three collectors, remove tiles for third collector strap.

**NOTE**

BE SURE FLAT SIDE OF VERTICAL SUPPORT OF EXTRUSION FACES TOWARD COLLECTOR LOCATION, AND 'U' SHAPE OPENS TOWARD LOWER ROOF EDGE.

- If a third collector is being installed, use a Drive Cleat to attach the Collector Extrusion to the Extrusion Extension (refer to Appendix B).
- Slide the Collector Extrusion on to the Collector Straps (refer to Figure 5.4). After levelling, adjust the collector straps to raise the hot pipe side of the extrusion by  $\frac{1}{2}$ " per collector to ensure correct operation of the system (eg. For a 2 collector system, raise the hot pipe side of the extrusion by 1").

**Figure 5.4** Collector Extrusion and Strap Installation Detail - Tile Roof

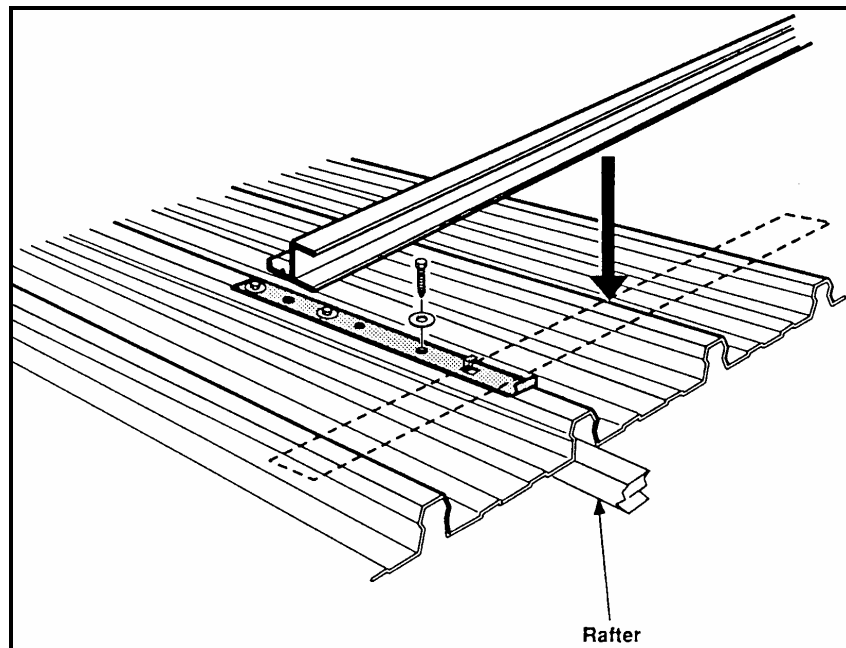


**CAUTION**

- STRAPS MUST BE ATTACHED DIRECTLY ONTO THE RAFTERS OR TRUSSES, NOT LESS THAN 39" APART AND NOT MORE THAN 63" APART.**
- EXTRUSION MUST SLOPE  $\frac{1}{2}$ " PER COLLECTOR FROM HORIZONTAL (HOT PIPE SIDE TO BE HIGHER) FOR SYSTEM TO WORK CORRECTLY.**

- Attach straps onto rafters or trusses with  $\frac{5}{16}$ " x 6" lag screws (refer to Figure 5.5).

**Figure 5.5** Collector Extrusion and Strap Installation Detail-Metal Roof



7. Replace tiles that have previously been removed.

**NOTE**

ENSURE THE WEATHERPROOF SEAL IS RESTORED.

8. Flash and seal all roof penetrations.
9. Continue with Section 5.3, Collector Installation.

### 5.2.3 Frame Installation

The frame is attached to two wood or Unistrut runners and installed over rafters or trusses, bearing wall or reinforced roof area. Fixed pitch frame assemblies are used in reverse and side pitch installations, whereas variable pitch frame assemblies are used for shallow pitch or flat roof installations.

**CAUTION**

**FOR ALL FRAME INSTALLATIONS, TANK-END SUPPORT POINTS MUST BE LOCATED OVER LOAD-BEARING WALL OR A REINFORCED ROOF AREA.**

1. Remove roofing if necessary where runners will be installed to provide solid base for the frame.
2. Install two off 2" x 4" x 8'4" redwood, treated-wood or Unistrut runners;
  - Mark supporting rafter or truss locations,
  - Place tank-end of runners over load-bearing wall,

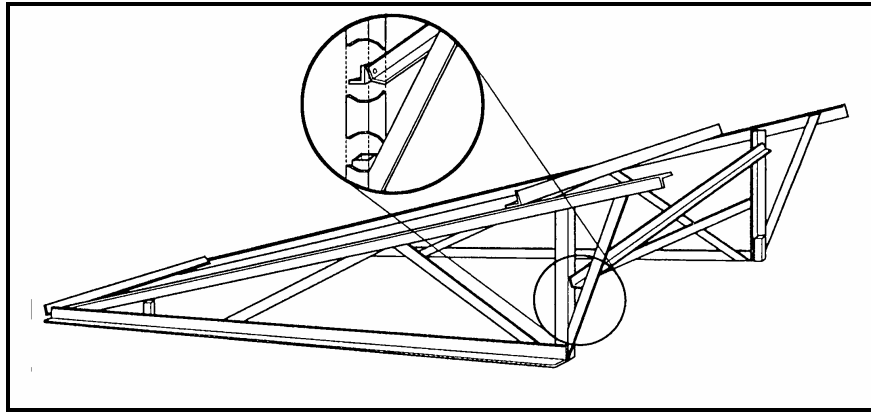
**NOTE**

IF RUNNERS BLOCK WATER FLOW, STRADDLE TWO CLOSEST RAFTERS.

- Cut runners to straddle the two closest rafters diagonally,
- Angle runners under support points to permit rainwater drainage,
- Drill each runner in center and 6" from runner ends and screw to rafters or trusses with 5/16" x 6" lag screws and washers,
- Flash and seal all roof penetrations.

3. Move all pieces of Frame to roof and assemble (refer to Figure 5.6).

**Figure 5.6 Frame Assembly**



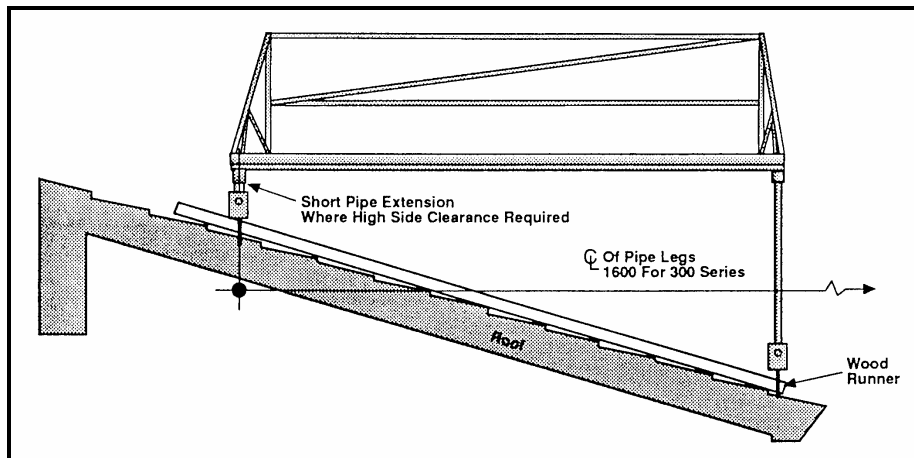
4. Attach Frame to runners:

For shallow-pitch or flat roofs, screw frame directly to runners.

For side pitch or reverse pitch roofs;

- Loosely screw collector end of frame to runners with 5/16" x 1 3/4" lag screws and washers,
- Level frame and measure the required length for the tank-end pipe legs ( 5) (refer to Figure 5.7),

**Figure 5.7 Pipe Leg Connection Detail**



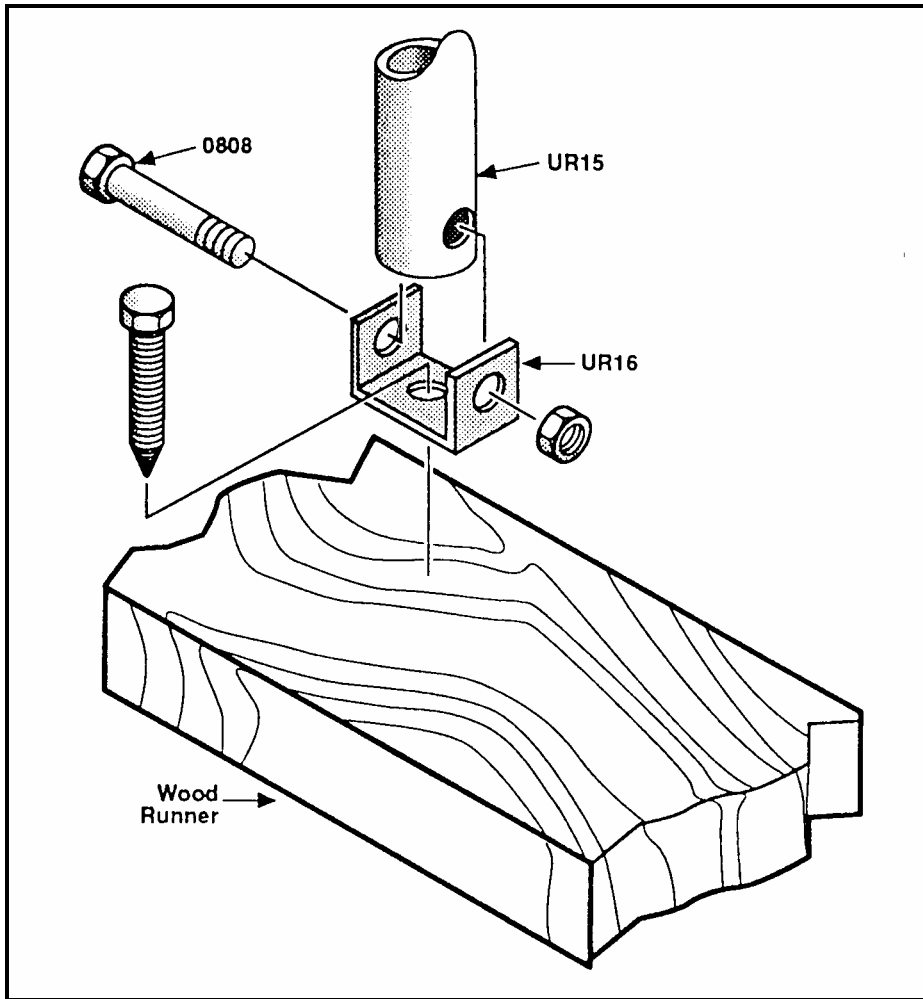
**NOTE**

ALLOW ROOM FOR 'U' BRACKET PIPE-LEG CRADLE ON FRAME.

ROOFS WITH STEEP PITCH (ABOVE 20°) MAY REQUIRE SHORT PIPE LEGS AT COLLECTOR END OF FRAME FOR CLEARANCE (REFER TO FIGURE 5.7).

- Measure and cut un-drilled end of pipe legs to correct length,
- Attach 'U' brackets to runners with 5/16" X 1 3/4" lag screws and washers or Unistrut bolts (refer to Figure 5.8),

Figure 5.8 Lower Pipe Leg Installation

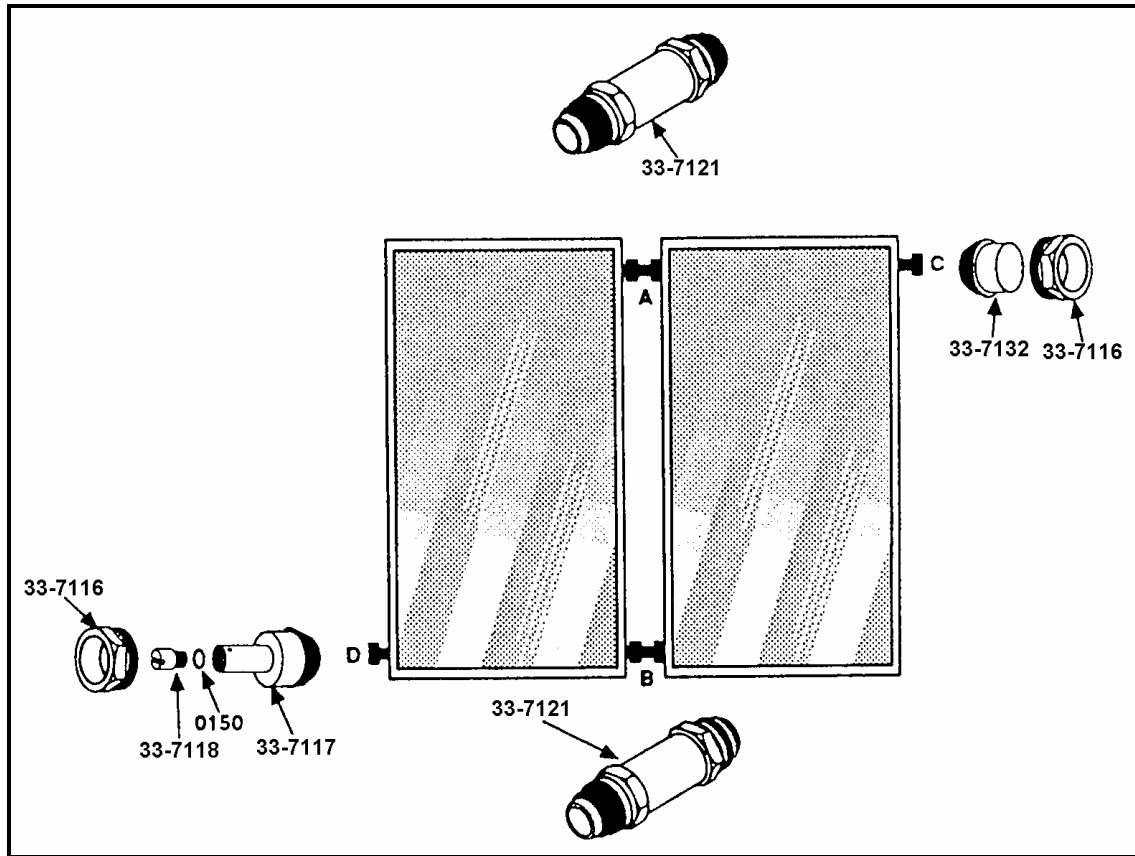


- Insert un-drilled ends of pipe legs into frame,
- Attach drilled end of pipe legs to 'U' brackets using 2" screws (refer to Figure 5.8),
- Screw pipe legs to frame with 2" screws through pipe legs and frame sleeves,
- Continue with Section 5.3, Collector Installation.

### 5.3 Collector Installation

1. Set Collectors in place, resting lower ends on Collector Extrusion or frame,
2. Remove plugs from corners of Collectors,
3. Connect Collectors with Collector Unions. Do not tighten fully (refer to Figure 5.9, Points A & B),
4. Where applicable, connect the third collector using with Collector Unions,

Figure 5.9 Collector Fitting Installation Detail



**CAUTION**

**COLLECTORS MUST SLOPE 1/2" PER COLLECTOR FROM HORIZONTAL (HOT PIPE SIDE TO BE HIGHER) TO ENSURE CORRECT OPERATION OF THE SYSTEM.**

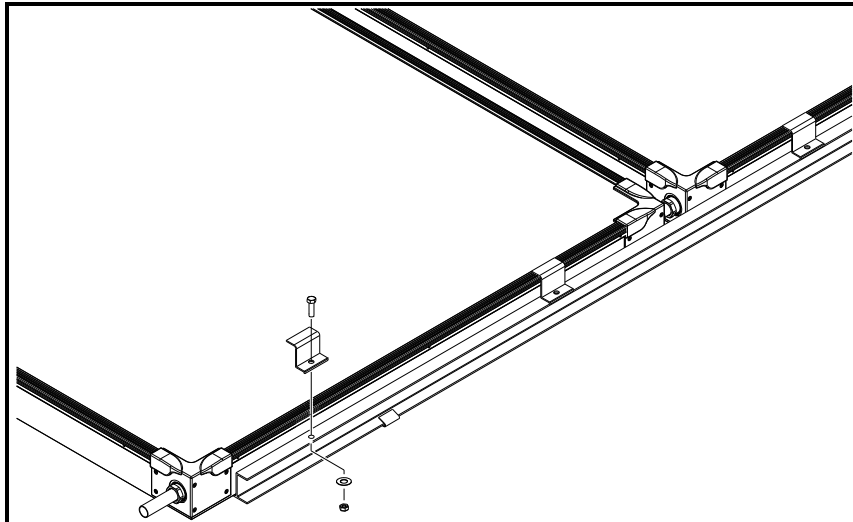
5. Check that Collectors slope 1/2" per collector from horizontal (hot pipe side to be higher).
6. Install the Collector Plug and the Collector Nut at Point C,
7. Install collector Fill Assembly and Collector Nut at Point D,
8. Attach collectors to support structure as shown in sections 5.3.1 and 5.3.2 below.

**5.3.1 Standard Installation**

Attach Collectors to Extrusion using 2 sets of Collector Clamps, Screws and Nuts, per collector (refer to Figure 5.10a).



**Figure 5.10a** Collector Attachment Details: Standard and Metal or Sturdy Tile



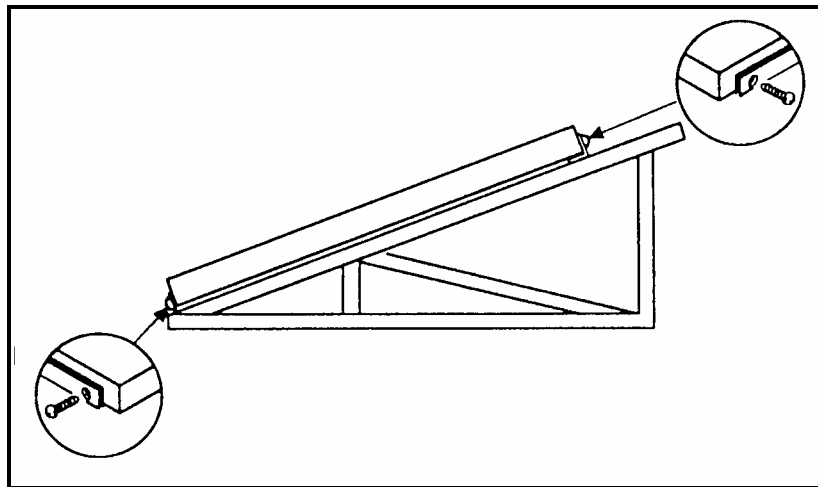
### 5.3.2 Frame Installation

**CAUTION**

**DO NOT DAMAGE INTERNAL COLLECTOR ABSORBER WITH SCREWS.**

1. Attach Collectors with 2 sheet metal screws per collector, through the angle iron upright into the collector frame at the top and bottom of each collector (refer to Figure 5. 10b).

**Figure 5.10b** Collector Attachment Details: Frame Installation



2. Tighten Collector Unions, parts and hardware securely.
3. Continue with Section 5.4, Storage Tank Installation.

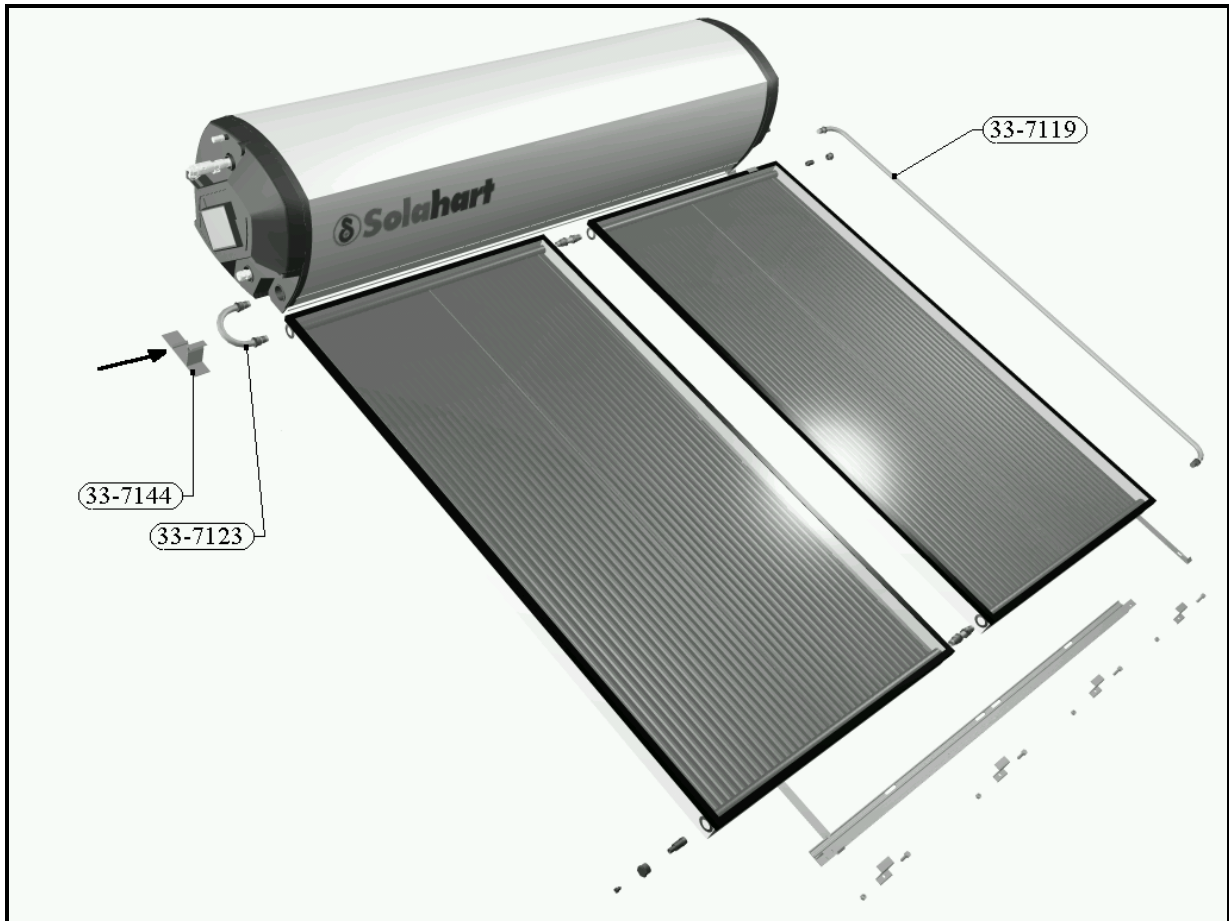
### 5.4 Storage Tank Installation

**CAUTION**

**IF LIFTING TANK TO ROOF MANUALLY USE CORRECT LIFTING TECHNIQUES.**

1. Spread open Tank Clamps to allow room to clear tank foot, and attach to rear foot of tank.
2. Place the Tank-to-Collector Spacers at the top of the collectors, to ensure correct spacing for alignment of Downpipe and Hot Pipe (refer to Figure 5.11).
3. Position tank centrally above the collectors, with the front foot of the tank resting up against the Tank-to-Collector Spacers. Refer to Appendix B for a 3 collector installation.

**Figure 5.11** Collector Downpipe Alignment



**NOTE**

DO NOT TIGHTEN TANK IN PLACE AT THIS STAGE. REFER SECTION 5.5.

**CAUTION**

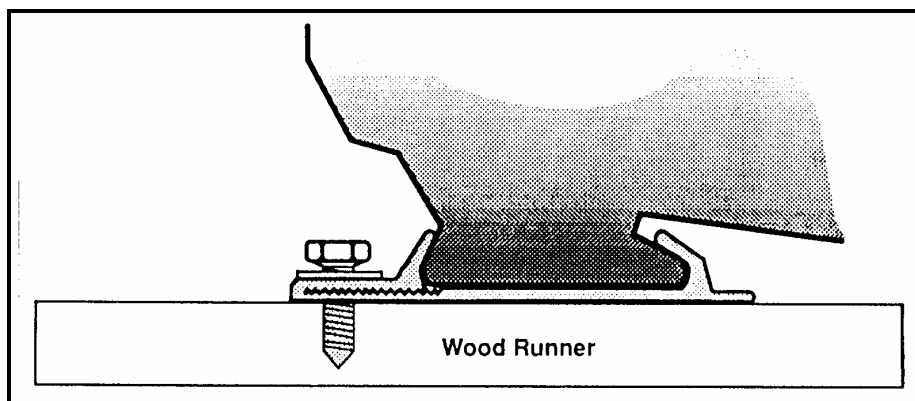
IF PITCH IS 30° - 45°, ADDITIONAL TANK BRACING IS REQUIRED.

4. Attach tank to supporting structure as detailed in sections 5.4.1 and 5.4.2 below;

**5.4.1 Standard Installation**

Drill holes in each runner, and screw the Tank Clamps directly to runner with 5/16" X 1 1/4" lag screws (refer to Figure 5.12a).

**Figure 5.12a** Storage Tank Attachment Detail to Wood Runner



## Metal / Sturdy-Tile

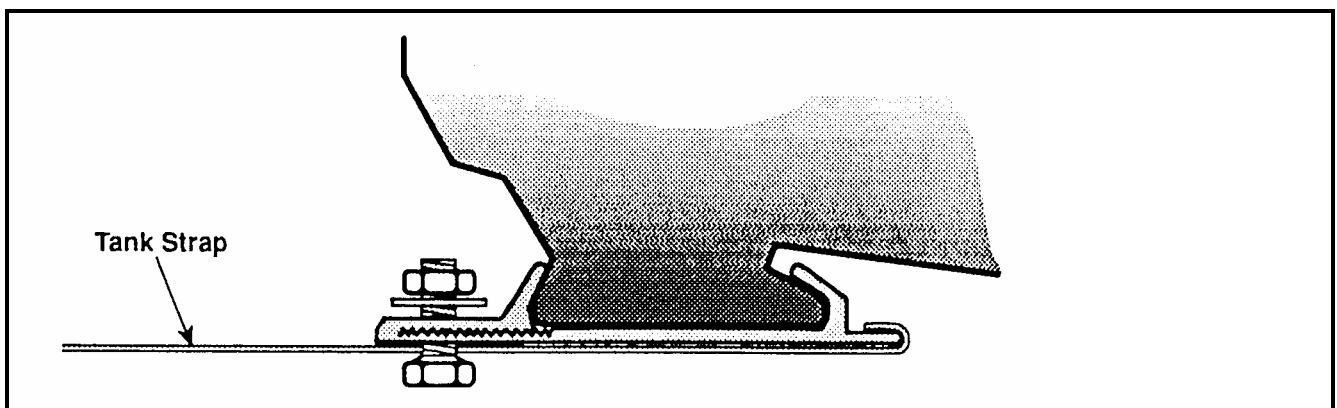
1. Attach the Tank Clamps to the stainless steel Tank Straps. The Tank Straps should run straight up the roof perpendicular to the tank so that when they are fixed to the roof structure, they can support tank without movement (i.e. the Tank Straps should not run up the roof at an angle).
2. Remove the tiles to allow room to screw Tank Straps directly into the rafters or trusses.
3. Position the Tank Clamps along the rear tank foot so that the Tank Straps align with the roof rafters or trusses.

### CAUTION

**TANK STRAPS MUST BE SCREWED DIRECTLY INTO RAFTERS OR TRUSSES NOT LESS THAN 39" APART AND NOT MORE THAN 63" APART.**

4. Attach the two Tank Straps directly to rafters or trusses with 5/16" x 1 1/4" lag screws (refer to Figure 5.12b).

*Figure 5.12b Storage Tank Attachment Detail to Metal / Sturdy Tile*



### 5.4.2 Frame Installation

Screw Tank Clamps directly to frame with 5/16" X 1 1/2" machine screws and washers.

### 5.5 Installing Tank and Collector Connecting Pipework

1. Where there is a third collector, attach the 3-Panel Pipe Extensions to each end of the tank.
2. Carefully align Collector Hot Pipe and Downpipe connections with tank.
3. Connect Hot Pipe to lower-left side of tank (or Pipe Extension) and upper-left side of left-hand collector. Do not fully tighten (refer to Figure 5.11).

### NOTES

STORAGE TANK CONNECTION SHOULD ALWAYS BE HIGHER THAN COLLECTOR CONNECTION.  
IF INSTALLING A HARTSTAT SYSTEM ON THE WATER HEATER, THEN THE HOT PIPE WILL BE A HARTSTAT HOT PIPE ASSEMBLY, AS SUPPLIED WITH THE HARTSTAT KIT

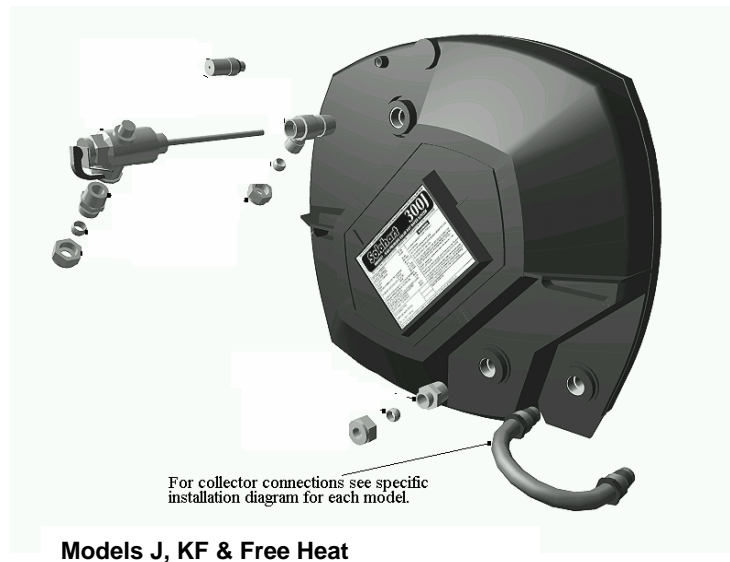
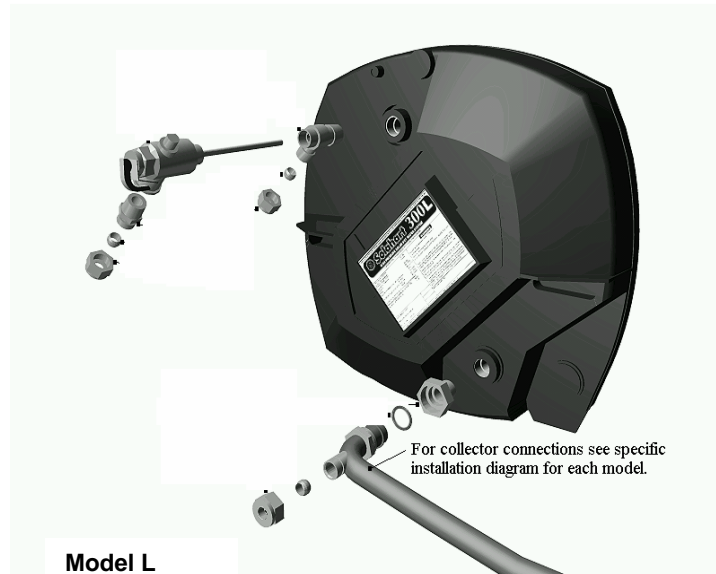
4. Connect Downpipe to lower-right side of tank (or Pipe Extension) and lower-right side of right-hand Collector. Do not fully tighten (refer to Figure 5.11).

### NOTES

IF INSTALLING A HARTSTAT SYSTEM ON THE WATER HEATER, THEN THE DOWNPIPE WILL BE A HARTSTAT DOWNPIPE, AS SUPPLIED WITH THE HARTSTAT KIT

5. Tighten the fasteners on the Tank Clamps and/or Tank Straps holding the tank in place.
6. Tighten Hot Pipe and Downpipe connections.
7. Install Tee Adaptor (refer to Figure 5.13).

**Figure 5.13 Storage Tank Plumbing Attachment Detail, Left Side**



**NOTE**

IF USING TEFLON TAPE TO SEAL T/P VALVE, MAKE SURE TAPE DOES NOT BLOCK WATER PASSAGE.

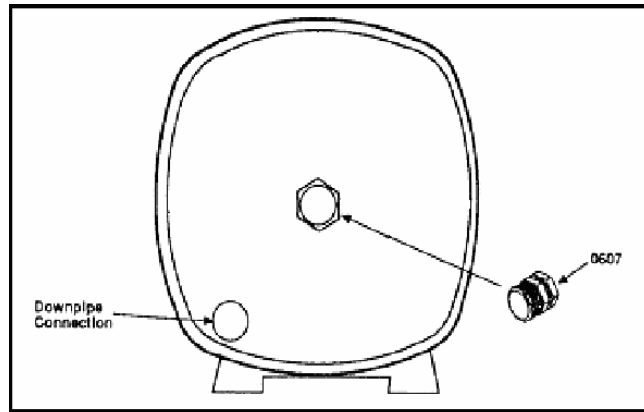
8. Install T/P Valve into Tee Adaptor (refer to Figure 5.13).
9. Install Tail Plug in right end of Tank (refer to Figure 5.14). Not used on L model systems.

**5.5.1 Hartstat Installation (Optional)**

The Hartstat hot pipe assembly and cold pipe should already be fitted to the system as instructed above.

Install the Hartstat reservoir system to the water heater in accordance with the installation instructions provided with the Hartstat kit.

**Figure 5.14** Storage Tank Plumbing Attachment Detail, Right Side



## 5.6 Plumbing Installation

1. Review checklist sketches for roof-jack location.
2. Mark on the roof the exact location of roof-jack installation.

### CAUTION

**PLUMBING MUST BE INSTALLED SO THAT THE PERFORMANCE OF ANY FIRE-RATED ASSEMBLY IS NOT REDUCED.**

### NOTE

LOCATION OF ROOF JACK MAY VARY DEPENDING ON INSTALLATION TYPE.

3. Install plumbing according to Figure 2.8, 2.9, or 2.10 and plumb lines to roof according to Key to Stub-Outs (refer to Figure 5.15).
4. External Piping Insulation
  - Where potable water piping is in an external location or attic space where the temperature can be as low as 19°F it must be insulated with a minimum ¾" Armaflex (or similar) flexible elastomeric closed cell thermal insulation. Where the temperature can fall to 12°F the insulation thickness must be increased to 1 ½".
  - It is recommended that heat trace be installed on potable water piping in areas where the temperature falls below 32°F for more than 4 hours with no hot water draw to protect against pipe freezing.
  - Insulation in external locations can deteriorate through UV radiation. To prevent this, a layer of outdoor UV stable paint or other similar protective coating must be applied to the insulation.

### NOTE

THE CLOSED CIRCUIT PIPING BETWEEN THE STORAGE TANK AND SOLAR COLLECTORS DOES NOT REQUIRE INSULATION.

### WARNING

**HEAT TRACE WILL NOT PROTECT AGAINST PIPE FREEZING IN THE EVENT OF POWER LOSS.**

The following may be performed in any order necessary:

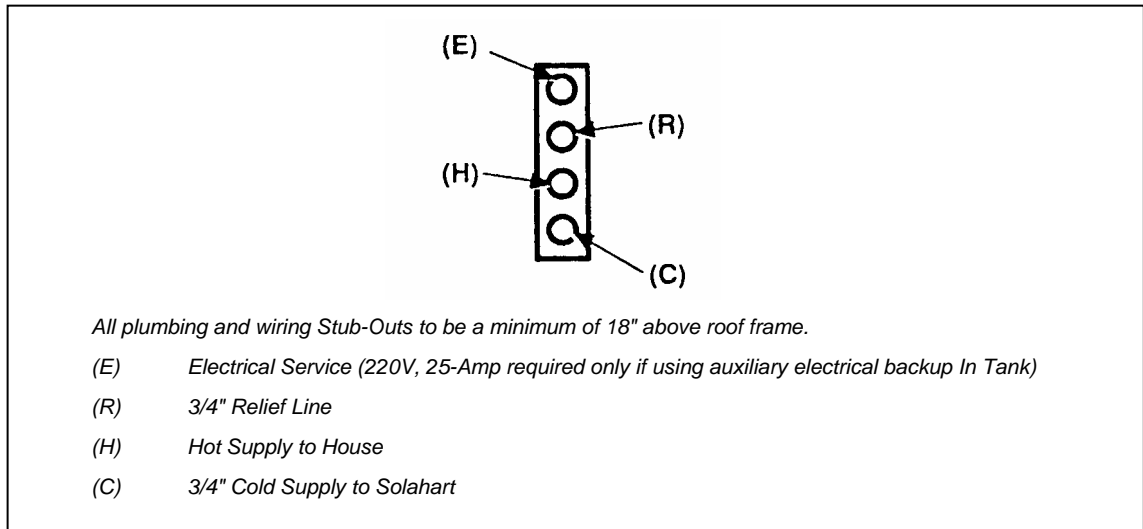
- If water pressure exceeds 60 psi, install optional Pressure Regulator on main supply to building.
- Install Safety Relief Line Connection to drain-line termination site within 6 inches of ground-level drainage point capable of hot water disposal.

### NOTE

1. ALL PLUMBING INSTALLATION MUST CONFORM TO LOCAL CODE.
2. ALL PIPING MUST BE ADEQUATELY SUPPORTED; SUPPORTS MUST CONFORM TO LOCAL CODE.
3. ALL PIPING MUST BE ADEQUATELY INSULATED; INSULATION MUST CONFORM TO LOCAL CODE.
4. ALL PIPING MUST SLOPE TO DRAIN.

5. Key to Stub - Outs

**Figure 5.15 Stub-Out Attachment Detail**



- Install tempering valve between Solahart system and existing water heater tapping into cold water supply line. If connecting to an existing conventional water heater, water from the Solahart system **must** be tempered with cold water before entry into the existing water heater to avoid damaging it and voiding its warranty.
- Install hot and cold water shut-off valves next to the existing water heater in a convenient location.

**5.7 Electrical Installation**

**NOTE**

THIS SECTION DOES NOT APPLY IF INSTALLING SYSTEM AS PRE - HEATER TO EXISTING WATER HEATER.

1. Refer to section 5.12 for electrical requirements.

**CAUTION**

**DO NOT CONNECT ELECTRICITY TO MAINS CIRCUIT BREAKER AT THIS TIME.**

2. Install according to Figure 2.11 or 2.12, electrical schematics, and optional electrical connections on the checklist.

**5.8 Install Roof - Jack Panel**

1. Remove necessary roofing material,
2. Place panel over plumbing and electrical stub-outs and install with nails or screws,
3. Flash and seal all roof penetrations,
4. Replace roofing material.

**5.9 Connect Plumbing to Storage Tank (refer to Figure 5.13)**

**NOTES**

1. ENSURE PLUMBING IS INSTALLED TO ALLOW REMOVAL OF STORAGE TANK END COVER FOR MAINTENANCE WORK.
2. PLUMBING CONNECTIONS ARE 3/4" BSP (NOT NPT). ADAPTORS CONSISTING OF 3/4" UNIONS, OLIVES AND COMPRESSION NUTS ARE INCLUDED IN YOUR PARTS KIT.

1. Connect cold water supply line to storage tank.
2. Connect solar hot water line to Tee Adaptor.
3. Connect drain line to T/P Valve.

## 5.10 Fill and Test Potable Water Storage Tank (All Models)

### CAUTION

1. ON NEW CONSTRUCTION, DO NOT FILL STORAGE TANK AND/OR CHARGE THE CLOSED CIRCUIT SYSTEM UNTIL WATER HEATER IS READY FOR USE. COVER COLLECTORS UNTIL SYSTEM IS FILLED AND CHARGED. PLACE TAG ON SYSTEM IF NOT FILLED AND CHARGED.
2. ON SOLAHART SYSTEMS MODEL J, KF & FREE HEAT, DO NOT FILL THE CLOSED CIRCUIT UNTIL THE STORAGE TANK HAS BEEN FILLED AND PRESSURISED.

1. Close all hot water outlet faucets except one in a safe location (a laundry tub is usually best).
2. Open mains site water supply valve to water heater.
3. As the water heater fills, air will be pushed from the open outlet faucet. When a continuous flow of water is achieved the faucet should be closed which will pressurise the storage tank.
4. Check tank and cold water lines for leaks and repair any found. For model L systems also check the connections to and between the solar collectors.
5. Ensure that the storage tank is completely free of air by opening the T/P Valve until it discharges a steady stream of water. Then close the valve.
6. For system model L the water heater is now operational. For closed circuit system models J, KF & Free Heat, the system is now ready to Test and Fill the closed circuit as described in Section 5.11.

## 5.11 Test and Fill the Closed Circuit

Fill the closed circuit and test the closed circuit system connections for leaks as detailed below.

### NOTE

FOR INSTRUCTIONS ON FILLING AND TESTING INSTALLATIONS FITTED WITH HARTSTAT SYSTEMS, REFER TO THE INSTALLATION AND COMMISSIONING PROCEDURE CONTAINED IN THE HARTSTAT KIT.

### 5.11.1 Closed Circuit Fluid

The closed circuit of Solahart models J, KF & Free Heat must be filled ONLY with Solahart Hartgard solution and potable water. Each system closed circuit is to be filled with one bottle of Hartgard and the balance potable water. When mixed the approximate Hartgard concentration is 20%.

### CAUTION

UNDER NO CIRCUMSTANCES CAN ANY FLUID OTHER THAN HARTGARD BE USED.  
ALTERNATE FLUIDS COULD BE HAZARDOUS TO YOUR HEALTH.

#### 5.11.1.1 Material Safety Data

Service Temperature Range	-40°F to 300°F
Viscosity	approx 0.00145 Ns/m <sup>2</sup>
Freezing Point	-50°F
Boiling Point	212°F
Flash Point	218°F
Auto Ignition Temperature	> 750°F
Specific Heat	4190 J/kg/°C
Vapour Pressure	0.22 mm Hg @20°C
Fluid Colour	Light Blue
PH Mixed	7 – 9

### 5.11.1.2 First Aid

- Eye Contact: Irrigate with water for 5 minutes
- Skin Contact: Wash with flowing water or shower
- Inhalation: No adverse effects
- Ingestion: No adverse effects
- Advice to Doctor: Treatment based on judgement of doctor in response to patient reaction

### 5.11.1.3 Disposal of Fluid

Reprocess or burn in an approved incinerator in accordance with State/Local Government requirements.

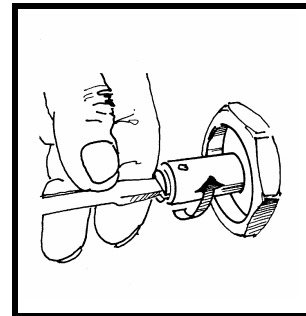
### 5.11.2 Test and Fill Procedure - Closed Circuit Installations without Hartstat Systems

Remove the Fill Plug from the collector fill assembly.

Remove PR6 Jacket Relief Valve from the tank.

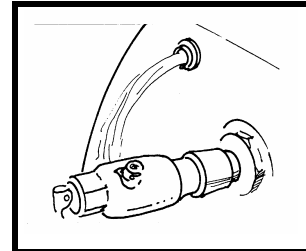
Connect a 1/2" hose and fill the closed circuit with water.

1



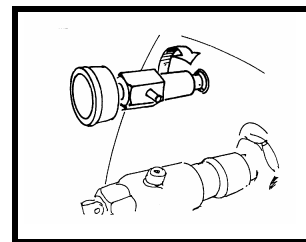
Continue filling until the water overflows from the PR6 Jacket Relief Valve port and air bubbles stop.

2



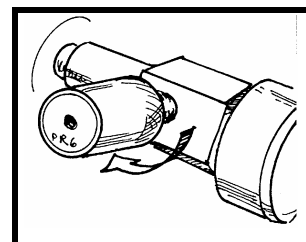
Fit the Test Block into the PR6 Port.

3



Fit the PR6 Jacket Relief Valve onto the Test Block.

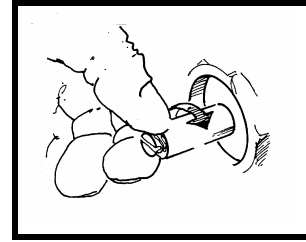
4





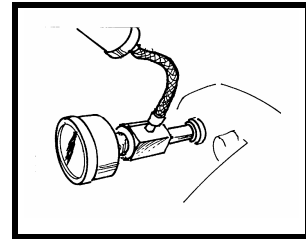
Now remove the hose from the Fill Assembly and replace the Fill Plug.

5



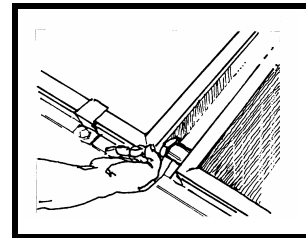
Connect a bicycle pump to the Test Block and pressurise the Closed Circuit to 80 kPa.

6



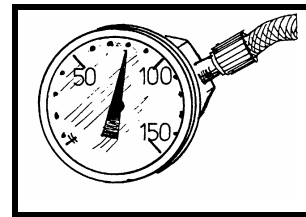
Check all connections for any evidence of leakage.

7



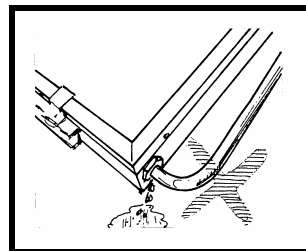
Ensure that the pressure remains constant at 80 kPa for at least 10 minutes.

8



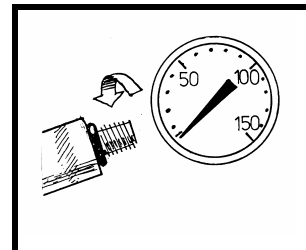
Rectify leakage if observed at any of the connections and repeat steps 1 to 8.

9



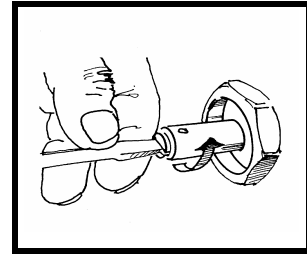
Release the pressure from the closed circuit by loosening the PR6 valve from the Test Block. When the pressure is zero tighten the PR6 Jacket Relief Valve.

10



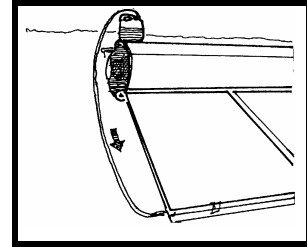
Once again remove the Fill Plug from the Fill Assembly and connect the hose.

11



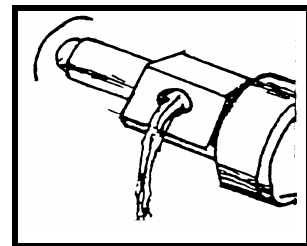
Remove the PR6 Jacket Relief Valve and siphon the entire contents of the blue Hartgard container with help of the hose.

12



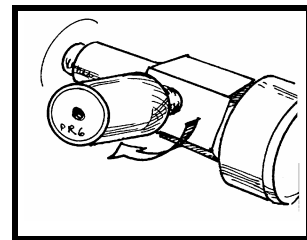
Water will flow through the PR6 port on the Test Block during this operation.

13



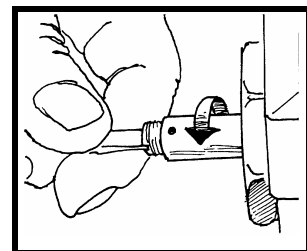
When the Hartgard container is completely empty refit the PR6 valve onto the Test Block.

14



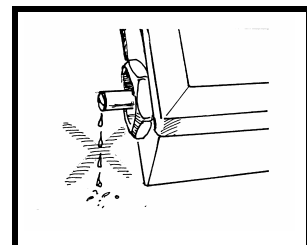
Remove the hose from the Fill Assembly.  
Allow the fluid to flow until it stops.  
(This checks the vacuum seal on the PR6 valve).  
Once the flow stops, screw in the Fill Plug.

15



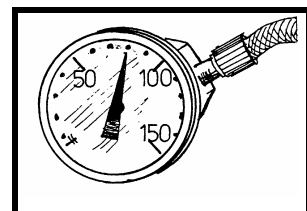
Pressurise the Closed Circuit to 80 kPa as before with the help of the bicycle pump and ensure there is no leak at the Fill Assembly.

16



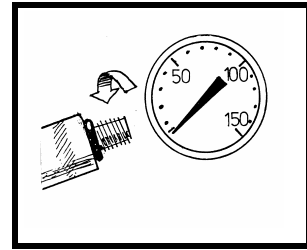
Ensure that the pressure remains at 80 kPa for at least 10 minutes, as before.

17



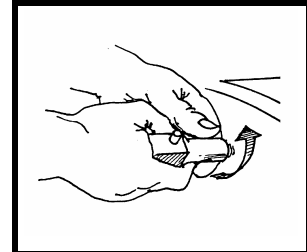
Release the pressure from the closed circuit by removing the PR6 Valve from the Test Block.

18



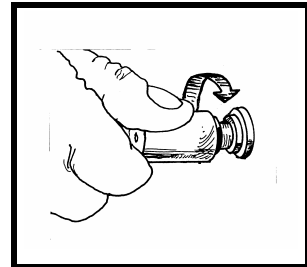
Remove the Test Block from the Tank.

19



Fit the PR6 Valve in its place on the tank after ensuring that the "O" ring is in its seat.

20



## 5.12 Connect Storage Tank to Electrical Supply

### WARNING

TURN OFF ALL POWER TO AVOID INJURY.

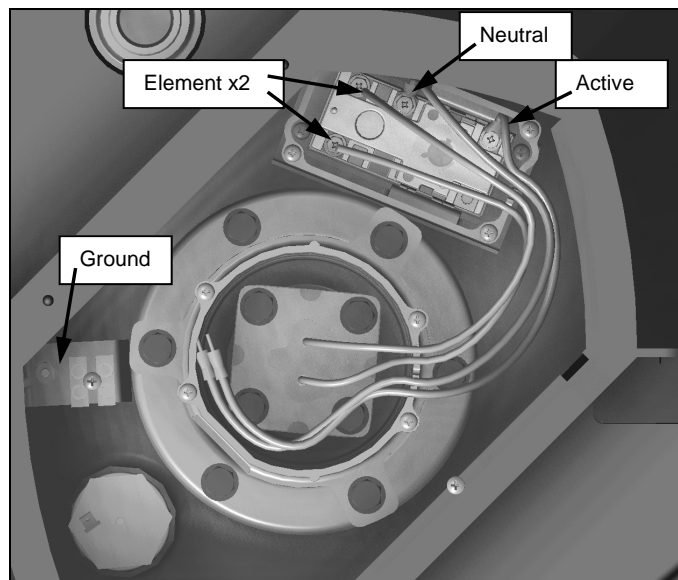
### CAUTION

TO REDUCE THE RISK OF ELECTRIC SHOCK OR FIRE:

- USE ONLY ON A UTILITY SUPPLY HAVING A MAXIMUM 125 / 250 VOLT, THREE WIRE SYSTEM.
- THE WATER HEATER MUST ALWAYS BE CONNECTED TO GROUND IN ACCORDANCE WITH THE LOCAL CODES.
- CONNECT BRANCH CIRCUIT EQUIPMENT GROUNDING MEANS AND SYSTEM GROUNDING CONDUCTORS TO WATER HEATER AT THE TERMINAL MARKED "G".
  - USE ONLY COPPER CONDUCTORS.

1. Turn **OFF** all electrical supply to the residence.
2. Remove left tank End Cover, thermostat and element covers, to expose electrical connections (refer to Figure 5.16).

**Figure 5.16** Detail of Electrical Connections



3. Connect tank electrical connections into the electrical stub-out location.
4. Connect Solahart electrical circuit breaker/fuse box to mains supply line.
5. Turn **ON** all electrical supply to the residence.

## 5.13 Complete Solahart Installation

1. Insulate all plumbing lines. See Section 2.6.4 for details
2. Replace tiles or other roofing to cover straps, etc, as necessary.
3. Remove and dispose of packing materials and leave area clean and neat.
4. Complete Service Technician contact details and Model details in the Owner's Manual, then hand the manual to the homeowner.
5. Instruct homeowner regarding system operation and features.
6. Complete Post-Installation Checklist.

## 6.0 TROUBLESHOOTING

This section covers problems you may experience while installing or maintaining the Solahart system.

### CAUTION

**REVIEW SECTION 3.0, HAZARDS AND PRECAUTIONS, BEFORE PROCEEDING WITH ANY TROUBLESHOOTING.**

<b>SYMPTOM: Insufficient Hot Water</b>	
<b>Possible Cause</b>	<b>Corrective Action</b>
Solar circuit breaker tripped / fuse blown	Reset/replace as necessary
Safety Thermostat tripped/malfunction	Replace as necessary according to Procedure 7.2.4
Faulty Backup Heating Element	Replace Backup Heating Element
Hot water leak in household system	Locate and repair leak
Blockage in water line	Locate and correct blockages
Pipes not properly connected during installation	Correct pipe connections according to installation instructions
Tank blocked with sediment	Flush tank to remove sediment
Closed circuit charge low	Recharge closed circuit
Leak in closed circuit	Locate and repair as necessary, recharge closed circuit
Air bubbles in closed circuit	Recharge closed circuit
Ruptured tank jacket	Replace tank
Tank not level	Level tank
Collectors not level	Level collectors
Collectors shaded during daylight hours	Clear obstruction to sunlight on collectors
Tempering Valve malfunction	Repair/replace as necessary

<b>SYMPTOM: Insufficient Hot Water in Morning or Following a Cloudy Day</b>	
<b>Possible Cause</b>	<b>Corrective Action</b>
System circuit breaker tripped	Repair/replace as necessary
Safety Thermostat switch tripped/malfunction	Replace as necessary according to Procedure 7.2.4
Faulty Backup Heating Element	Replace according to Procedure 7.2.5

<b>SYMPTOM: Excessive Cold Water Discharging from Drain Line</b>	
<b>Possible Cause</b>	<b>Corrective Action</b>
No T/P Valve installed	Install T/P according to Procedure 7.2.7
Excessive pressure through T/P Valve	Repair/ replace as necessary
Faulty Cold Water Expansion Valve	Repair/ replace as necessary
Pressure build up from non-Solahart source	Repair plumbing as necessary

<b>SYMPTOM: Hot Water discharging from Drain Line</b>	
<b>Possible Cause</b>	<b>Corrective Action</b>
Faulty Safety Thermostat	Repair/ replace as necessary
Malfunctioning T/P valve	Press and release T/P valve handle to reseal valve Repair/ replace as necessary
System oversized for customer requirements	Fit a Solahart Heat Dissipater Unit / Fit a Hartstat system for closed circuit installations/ cover a solar collector / contact Solahart Dealer

<b>SYMPTOM: No Hot Water</b>	
<b>Possible Cause</b>	<b>Corrective Action</b>
Hot Water Tempering Valve fouled	Repair/ replace as necessary
Pressure imbalance (over 5 psi) Between hot and cold water lines	Locate and repair cause of imbalance
Fouled Pressure Regulator Valve	Repair/ replace as necessary
Cold water line blocked	Repair as necessary

<b>SYMPTOM: Low Hot Water Pressure</b>	
<b>Possible Cause</b>	<b>Corrective Action</b>
Fouled Pressure Limiting Valve / Strainer	Repair/ replace as necessary
<b>SYMPTOM: Water Too Hot</b>	
<b>Possible Cause</b>	<b>Corrective Action</b>
Tempering Valve malfunction	Repair/ replace as necessary

<b>SYMPTOM: Severe Noise or Knocking When Water is Turned ON or OFF</b>	
<b>Possible Cause</b>	<b>Corrective Action</b>
Pipes not solidly clamped down	Repair as necessary
Faulty washer(s) in outlet faucets	Repair as necessary
Other plumbing problem	Repair as necessary

<b>SYMPTOM: Gas Discharge from Hot Water Tap</b>	
<b>Possible Cause</b>	<b>Corrective Action</b>
Result of system operating but water not being used	Run tap to allow gas to escape
Corroded Anode	Replace according to Procedure 7.2.6

## 7.0 MAINTENANCE

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This section covers scheduled inspections, maintenance and detailed procedures for disassembly and repair of the Solahart system.

### CAUTION

- **ONLY QUALIFIED PERSONNEL SHOULD PERFORM PERIODIC MAINTENANCE.**
- **FOLLOW THE INSTRUCTIONS IN THIS SECTION AS CLOSELY AS POSSIBLE. IF YOU ARE UNSURE OF ANY INSTRUCTIONS OR PROCEDURES, PLEASE CONTACT A SOLAHART DEALER.**
- **USE OF ANY OTHER THAN SOLAHART REPLACEMENT PARTS MAY VOID THE MANUFACTURERS WARRANTY AND MAY CAUSE SYSTEM MALFUNCTIONS.**
- **REFER TO SECTION 3.0, HAZARDS AND PRECAUTIONS, BEFORE PROCEEDING WITH ANY MAINTENANCE.**

### 7.1 Periodic Maintenance

To keep the Solahart system working efficiently, perform the following maintenance schedules:

#### 7.1.1 Quarterly

### CAUTION

**COLLECTORS MUST BE COOL BEFORE WASHING.**

1. Clean collector glass periodically to remove accumulated dust and dirt.
2. Trim trees near collectors.

#### 7.1.2 Annually

Perform the regular quarterly and annual maintenance at the same time as this maintenance.

1. Flush hot and cold water relief valves, lift valve handle - hold for 30 seconds - release to reset valve. If water flow does not stop, lift and release handle repeatedly until valve resets.
2. If valve does not reset properly after a few tries, it must be removed and cleaned or replaced.

#### 7.1.3 Every 3 to 5 Years (10 years for Free Heat systems)

Perform the regular quarterly and annual maintenance at the same time as this maintenance.

1. Check all valves and electrical equipment.
2. Replace Anode.
3. Replace T/P Valve.
4. Check fluid level in closed circuit. Replace fluid if necessary according to Section 5.10.

### NOTE

**NEVER REPLACE CLOSED CIRCUIT FLUID WITH USED FLUID. ALWAYS REPLACE WITH A NEW SOLUTION OF HARTGARD AND POTABLE WATER.**

5. Install new Solahart logo if necessary.

## 7.2 Maintenance Procedures

NUMBER	TITLE
7.2.1	Draining Storage Tank
7.2.2	Filling Storage Tank
7.2.3	Drain Closed Circuit
7.2.4	Thermostat Reset/Replacement
7.2.5	Backup Heating Element Replacement
7.2.6	Anode Replacement
7.2.7	Temperature Pressure Relief (T/P) Valve Replacement
7.2.8	Collector Replacement
7.2.9	Storage Tank Replacement

### 7.2.1 Draining Storage Tank

**WARNING**  
**TURN OFF ALL POWER.**

1. Cover collectors with opaque (light cannot penetrate) material.

**CAUTION**  
**BEFORE DRAINING STORAGE TANK ON CLOSED CIRCUIT MODELS, PRESSURE IN CLOSED CIRCUIT MUST BE RELIEVED OR CIRCUIT MAY COLLAPSE. THIS ACTION IS NOT REQUIRED FOR L MODELS.**

2. Turn **OFF** Cold Water Shut-off Valve.
3. Remove Jacket Relief Valve to relieve closed-circuit pressure in J, KF and Free Heat models only, (refer to Figure 5.13).
4. Relieve pressure in system by lifting T/P Valve handle for at least 30 seconds.
5. To Empty the storage tank (all models):

***Installations with Cold Water Expansion Valve:***

Lift Cold Water Expansion Valve handle allowing the tank water to flow out of the tank until it is empty.

***Installations without Cold Water Expansion Valve:***

- a) Remove cold supply pipe from tank on roof.
  - b) Attach a hose to tank inlet connection to direct flow from the tank to a safe location.
  - c) Open a **HOT** faucet inside house to allow tank to drain.
- 6 To Empty the collectors (L models only)
    1. Empty storage tank as above.
    2. Remove plug from bottom right hand corner of the collector and allow the water to flow out. The water volume is ½ US Gallon per collector.



### 7.2.2 Filling Storage Tank

**WARNING**  
**TURN OFF ALL POWER.**

1. Place opaque (light cannot penetrate) coverings over collectors.
2. Open at least one hot water faucet, preferably over a bathtub or large sink.
3. Turn **ON** Cold Water Shut-off Valve.
4. When water begins to flow through hot-water faucet without airbursts, turn faucet **OFF**. Bleed air from all other hot water faucets.
5. Lift T/P Valve handle for at least 30 seconds.
6. Check for and repair any plumbing leaks.
7. Replace Jacket Relief Valve using new "O" ring.
8. Remove coverings from collectors.
9. Turn **ON** power.

### 7.2.3 Drain Closed Circuit

**WARNING**  
**TURN OFF ALL POWER.**

**WARNING**  
**TO AVOID THE RISK OF SCALDING, ENSURE THAT THE CLOSED CIRCUIT FLUID IS COLD BEFORE REMOVING THE JACKET RELIEF VALVE.**

**NOTE**  
INSTALLATIONS FITTED WITH HARTSTAT SYSTEMS USE A 200kPa PR200 JACKET RELIEF VALVE IN PLACE OF THE 80kPa PR6 VALVE.

1. Place opaque (light cannot penetrate) coverings over collectors.
2. Open at least one hot water faucet, preferably over a bathtub or large sink, and flush all hot water from the system, replacing it with fresh cold water.
3. Carefully unscrew and remove the Jacket Relief Valve from the tank, allowing the pressure in the jacket system to normalize. Replace the Jacket Relief Valve.
4. Remove the thumb screw from the fill fitting and connect one end of the 1/2" clear plastic tube (part of the commissioning kit) to the fill assembly on the bottom left hand corner of the installation. Place the other end of the tube into a clean plastic container, capable of holding all of the closed circuit fluid in the system. There are 6.5 US Gal of fluid in the closed circuit of a 302 system.
5. Place the container on the roof, such that the top of the container is below the bottom of the system. Remove the Jacket Relief Valve, and allow all of the closed circuit fluid to flow into the container. Store the container until after the repair, so that the fluid can be replaced back into the jacket.

**NOTE**  
TO FILL AND TEST THE CLOSED CIRCUIT REFER TO SECTION 5.11.

### 7.2.4 Thermostat Replacement

**WARNING**  
**TURN OFF ALL POWER.**

1. Remove End Cover from left end of Storage Tank.

2. Remove yellow Thermostat Enclosure Cover.
3. Disconnect electrical wires to Thermostat one at a time, noting proper connecting points for new Thermostat.
4. Install new Thermostat, connecting wires as noted.
5. Replace yellow Thermostat Enclosure Cover.
6. Replace End Cover.
7. Turn **ON** power.

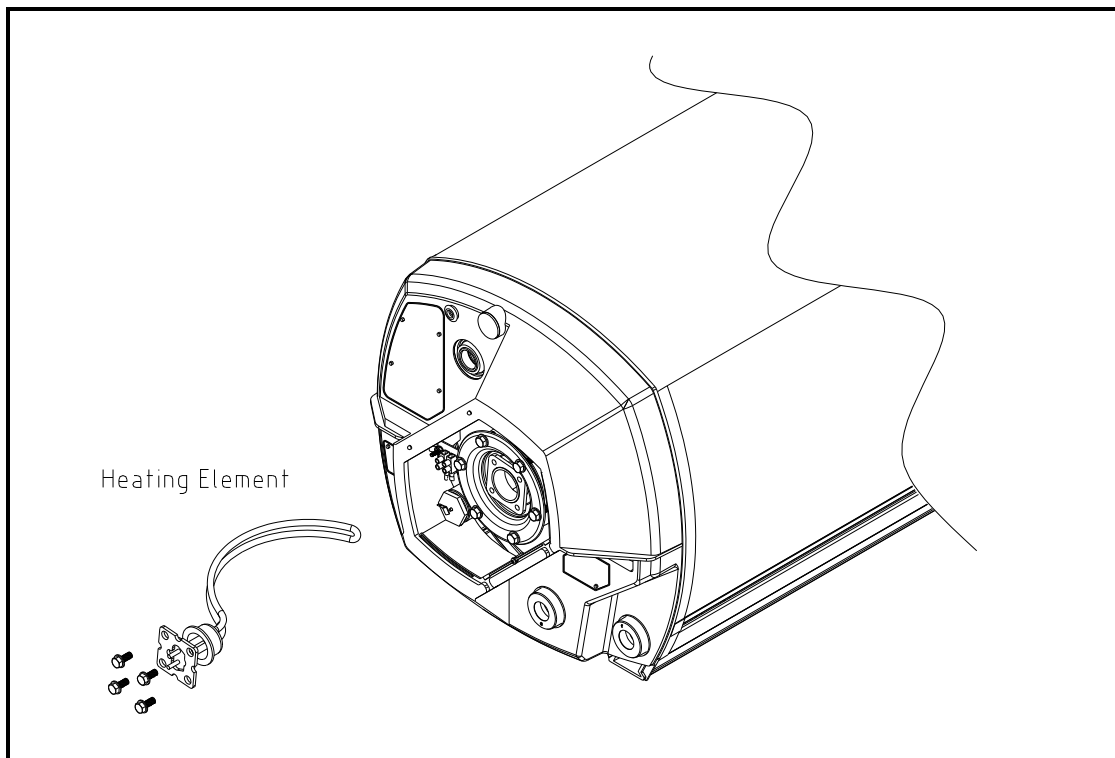
### 7.2.5 Backup Heating Element Replacement

**WARNING**  
**TURN OFF ALL POWER.**

1. Cover collectors with opaque (light cannot penetrate) material.
2. Remove Jacket Relief Valve to relieve closed circuit pressure.
3. Drain storage tank according to Procedure 7.2.1.
4. Remove End Cover on left side of tank.
5. Remove yellow Element Enclosure Cover.
6. Disconnect wires from Heating Element.

Remove the four screws from the Element and remove the Element and seal (refer to Figure 7.1)

**Figure 7.1 Heating Element Detail**



8. Install new Element and new seal.

**NOTE**

IF THE NEW ELECTRICAL ELEMENT IS A SICKLE TYPE, THE SICKLE MUST BE INSTALLED IN THE HORIZONTAL POSITION. THIS POSITION ENSURES THAT THE UPPER SECTION OF THE TANK CAN BE ELECTRICALLY BOOSTED AND THE LOWER SECTION IS MAINTAINED FOR SOLAR INPUT.

9. Refit the four element screws.

**CAUTION**

**DO NOT OVER TIGHTEN THE FOUR ELEMENT SCREWS OR DAMAGE WILL OCCUR TO THE TANK AND SEAL. USE ONLY LIGHT/MEDIUM SPANNER PRESSURE. THESE SCREWS MUST BE REFITTED CORRECTLY OR THE ELEMENT FLANGE THREADS MAY BE DAMAGED.**

10. Re-connect Element wires.
11. Replace yellow Element Enclosure Cover
12. Replace tank End Cover.
13. Refit Jacket Relief Valve.
14. Fill Tank according to Procedure 7.2.2.
15. Turn **ON** power.
16. Uncover collectors.
17. Check for leaks around element seal.

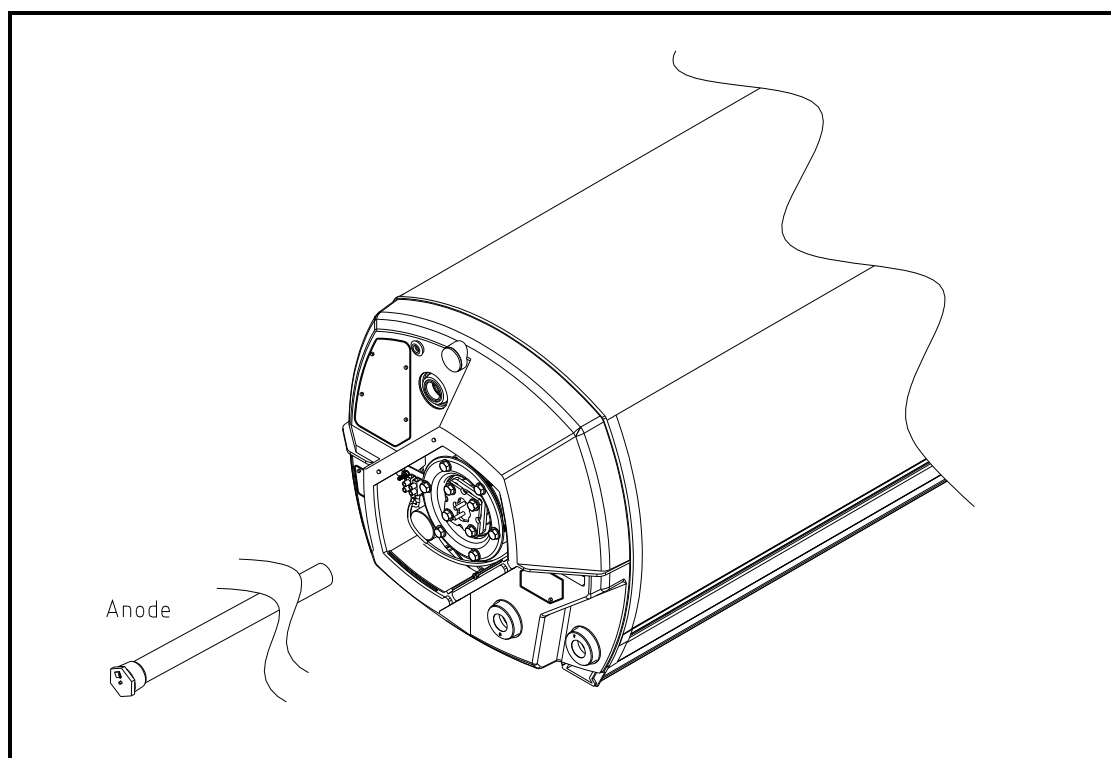
#### **7.2.6 Anode Replacement**

**WARNING**

**TURN OFF ALL POWER.**

1. Drain Tank according to Procedure 7.2.1.
2. Replacing Anode requires 8 feet of work area on left side of tank. If required area is not available:
  - Disconnect plumbing connections from Tank (refer to Figure 5.13 and 5.14).
  - Drain closed circuit according to Section 7.2.3.
  - Loosen Tank Clamps on rear feet of tank and move tank (refer to Figure 5.12a or b).
3. Remove tank End Cover.
4. Remove Anode by unscrewing counter-clockwise (refer to Figure 7.2).

**Figure 7.2 Anode Replacement Detail**



5. Insert replacement Anode.
6. Tighten Anode, taking care not to strip threads.

**NOTE**

IF YOU MOVED TANK, REPLACE IN ORIGINAL POSITION, REATTACH TANK CLAMPS, DOWNPIPE AND HOT PIPE.  
CHARGE CLOSED CIRCUIT ACCORDING TO SECTION 5.11.

7. Refill tank according to Section 7.2.2.
8. Check for leaks.
9. Replace tank End Cover.
10. Turn **ON** power.

**7.2.7 Temperature Pressure Relief (T/P) Valve Replacement**

1. Turn **OFF** water to system at Cold Water Shut-off Valve.
2. Remove Jacket Relief Valve to relieve closed-circuit pressure (refer to Figure 5.13).
3. Relieve pressure in system by lifting T/P Valve handle for at least 30 seconds.
4. Disconnect drain line and unscrew T/P Valve (refer to Figure 5.13).

**WARNING**

**A SMALL AMOUNT OF HOT WATER MAY FLOW FROM THE TANK OUTLET SOCKET WHEN THE VALVE IS REMOVED. CARE SHOULD BE TAKEN TO AVOID SCALDING.**

5. Install replacement T/P Valve and tighten into place.
6. Reconnect drain line.
7. Turn **ON** water and check for leaks.

### 7.2.8 Collector Replacement

**WARNING**  
**TURN OFF ALL POWER.**

1. Cover ALL collectors with opaque (light cannot penetrate) material.
2. Drain closed circuit according to Section 7.2.3 (not applicable for L Model Systems).
3. For L Model Systems, turn OFF mains water supply and drain tank and collectors according to Section 7.2.1.
4. Disconnect pipe work and remove mounting brackets on the damaged collector(s).
5. Remove damaged collector (refer to Figures 5.9 and 5.10).
6. Place new collector on supporting structure using bottom support extrusion as a guide.
7. Position overhang to match existing collector.

**CAUTION**  
**USE ONLY MANUFACTURER-SUPPLIED HARTGARD.**

8. Remove plugs from ends of replacement collector.
9. Connect Collector Unions between upper and lower inside collector ends.
10. If the replacement collector is on the LHS of the collector bank reinstall Fill Assembly, Collector Nut, and Hot Pipe (refer to Figure 5.9).
11. If the replacement collector is on the RHS of the collector bank, reinstall Downpipe and Plug Assembly (refer to Figure 5.14).
12. If the replacement collector is the center collector (3-panel system), reinstall Collector Unions.
13. Tighten Collector Unions and related parts.
14. Level collectors.
15. Attach collector to supporting structure.
16. For L Model Systems, turn ON mains water supply and fill tank and collectors in accordance with Section 7.2.2.
17. Test and charge closed circuit according to Section 5.11.
18. Turn **ON** power.
19. Remove coverings from collectors.
20. Check for leaks.

### 7.2.9 Storage Tank Replacement

**WARNING**  
**TURN OFF ALL POWER.**

1. Cover ALL collectors with opaque (light cannot penetrate) material.
2. Drain closed circuit according to Section 7.2.3 (not applicable to L Model Systems).
3. Drain tank according to procedure 7.2.1.
4. Remove End Cover and yellow Thermostat and Element Enclosure Covers from left side of tank to expose electrical connections.

5. Mark and disconnect tank electrical connections (refer to Figure 5.16).
6. Mark and disconnect tank plumbing connections (refer to Figure 5.13 and 5.14).
7. Loosen tank from supporting structure (refer to Figure 5.12a or b).

**CAUTION**

**IF LIFTING TANK TO OR FROM THE ROOF MANUALLY, USE CORRECT LIFTING TECHNIQUES.**

8. Remove and discard old tank.
9. Place new tank on roof, using care to avoid site damage.
10. Move tank into location.
11. Be sure Hot Pipe and Downpipe connections are properly aligned with the replacement tank.
12. For three collector systems, attach 3-Panel Pipe Extensions to cold side of tank.
13. Connect Hot Pipe to lower-left side of tank, or Pipe Extension for three panel systems (not applicable to L Model Systems). **DO NOT** fully tighten connection.
14. Connect Downpipe to the lower-right side of tank or Pipe Extension (not applicable to L Model Systems). **DO NOT** fully tighten connection.
15. For L Model Systems, connect Hot Pipe to tail socket on RHS of tank or Pipe Extension for three panel systems. **DO NOT** fully tighten connection.
16. For L Model Systems, connect Downpipe to cold inlet socket on LHS of tank or Pipe Extension. **DO NOT** fully tighten connection.
17. Level the tank.
18. Secure tank to supporting structure.
19. Tighten Hot Pipe and Downpipe connections to tank.
20. Install Tee Adaptor (refer to Figure 5.13).
21. Install T/P Valve (refer to Figure 5.13). Use Teflon tape to seal threads; avoid blocking water flow.
22. Install PR6 Jacket Relief Valve and 'O' ring (refer to Figure 5.13).
23. Install Tail Plug (refer to Figure 5.14) or Heat Dissipater Unit (not applicable to L Model Systems).
24. Connect cold water supply line (refer to Figure 5.15).
25. Connect solar hot water line (refer to Figure 5.15).
26. Connect drain line to T/P Valve (refer to Figure 5.15).
27. Fill storage tank according to procedure 7.2.2.
28. Charge and test closed circuit according to Section 5.11.
29. Remove left End Cover and yellow Thermostat and Element Enclosure Covers from tank to expose electrical connections.
30. Connect tank electrical connections to electrical stub-out connections.
31. Turn **ON** power and check for proper operation.
32. Replace left End Cover and yellow Thermostat and Element Enclosure Covers on tank.

**Installations using 17.5° 'A' Frames**

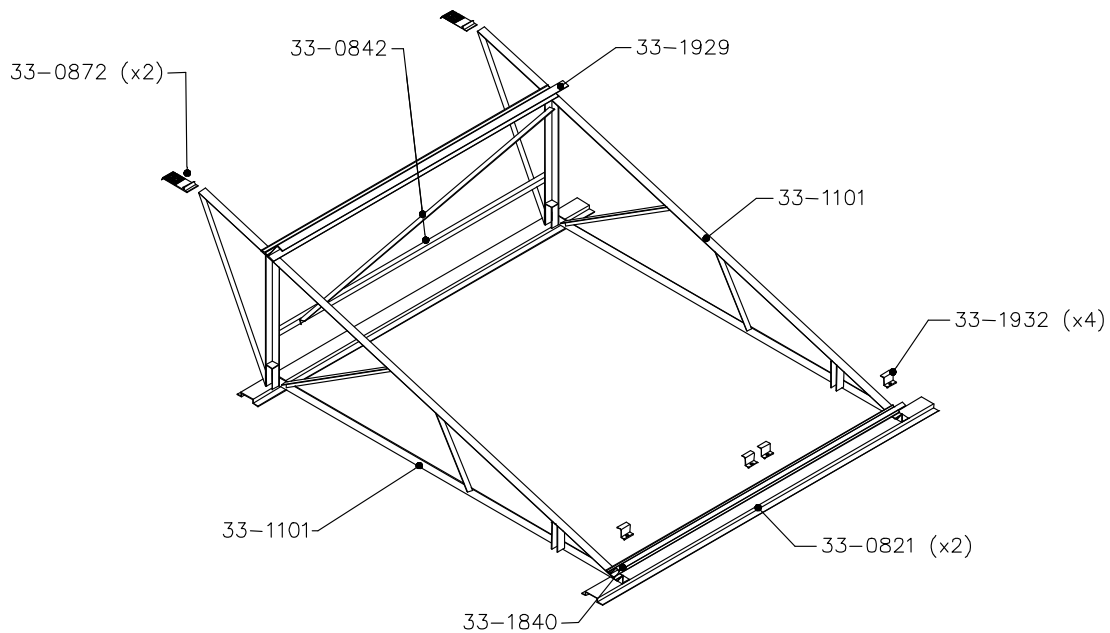
This 'A'-Frame is for use in **non-cyclone areas only**. In areas susceptible to cyclones, hurricanes or very high winds, a separate set of instructions and a cyclone frame mounting kit is required and available from your Solahart dealer. The cyclone frame mounting kit is suitable for with pitch and low pitch installations only.

The Solahart 'A' Frame kit is for use where side pitch, against pitch and low or flat roof installations are required. The 'A' Frame kit is provided with 17.5° angled side frames. Fixing nails, bolts, screws and flashing material are not normally supplied by Solahart except by special arrangement. The weight of the assembled frame is approx. 50kg. The installations described below are for Solahart 302 models, however, the same procedure is applicable for all models.

**'A' Frame Kit**

The 'A' Frame kit consists of:

Part No.	Description	Qty: 150/180	Qty: 220/300
33-0350	5/16" hex set screw	16	18
33-0354	5/16" washer	6	6
33-0806	5/16" nut	20	22
33-0808	5/16" bolt (2" long)	4	4
33-0810	Coach screws	2	2
33-0825	Pipe leg	2	2
33-0826	'U' Bracket	2	2
33-0842	Brace angle	2	2
33-0846	Stainless steel straps	2	2
33-0874	Tank clamp	2	2
33-1101	17.5 Frame	2	2
33-1824	Tank Collector Rail	1	1
33-1832	Collector clamps	2	4
33-1839	Collector Fixing Rail, Single Collector	1	0
33-1840	Collector Fixing Rail, Two Collectors	0	1
33-6807	Baseplate	2	2



**Figure 1**

The arrangement and location of the baseplate (Part No. 33-6807), pipe leg (Part No. 33-0825), 'U' Bracket (Part No. 33-0826), and the length of the pipe leg will vary for different installation types.

### Side Pitch Installations (Tiled Roof)

Assemble the 'A' Frame kit and loosely bolt the baseplate to one side of the angle frame as per Figure 2. For installations on a roof with a pitch of greater than 20°, a 'U' bracket and small pipe legs should be used on top of the baseplate as shown in figure 3. Note that the baseplate is positioned towards the rear of the frame to distribute the weight of the tank more evenly. Remove several roofing tiles to expose the outer wall. Fix the 'U' brackets to the top of the wall plate and secure with the coach screws supplied (refer to figure 4 for method).

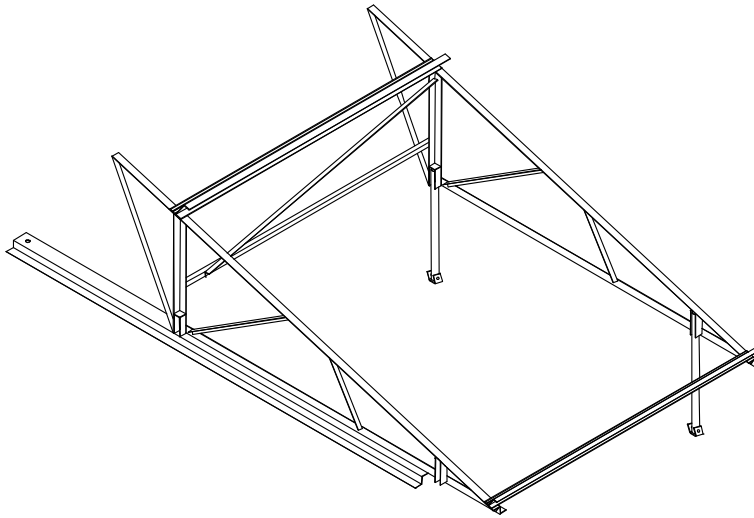


Figure 2

Using the assembled stand in a level position, measure the required length for the pipe legs, allowing for the inside length of the pipe leg cradle. Cut the two pipe legs the same length. Fit the pipe legs to the 'U' bracket using the 5/16" x 2" bolts. Insert the pipe legs to the assembled stand and fit the 5/16 x 2" bolts. Remove tiles from above the baseplate to expose the rafters. Fix the two stainless steel straps (Part No. 33-0846) onto the baseplate and fix the straps to the rafters as shown in figure 3. Replace the tiles. Replace the tiles to the lower portion of the roof, then weather seal and overflash the penetrations through the roof (refer to figure 7). Position the collector centrally on the frame. Check that the collector is level across the frame using a spirit level. Secure the collector in place using the collector clamps (Part No. 33-1842). Fit the tank and the fittings to the frame as per the standard installation instructions. However, fit the aluminium tank clamps onto both rear and front feet of the tank base.

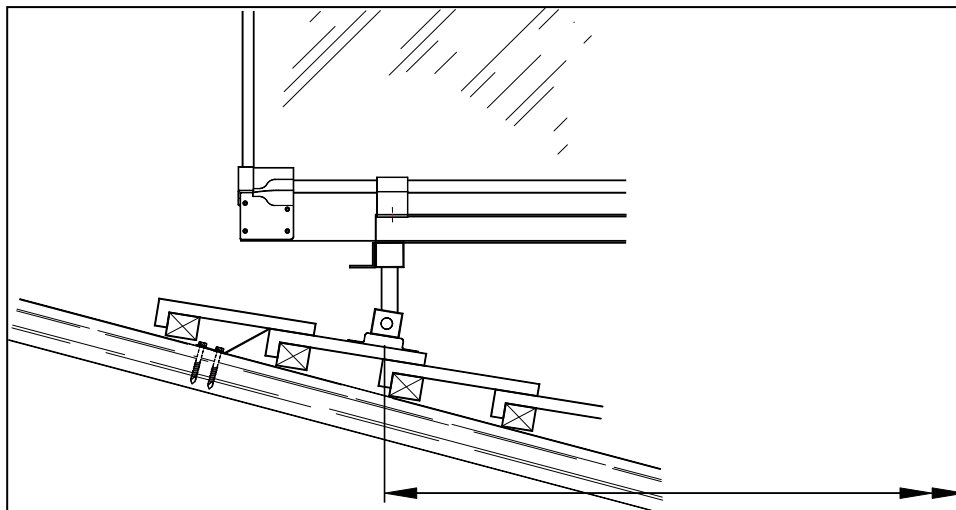


Figure 3



### Against Pitch Installations (Tiled Roof)

Assemble the stand and then loosely bolt the baseplate to the frame in the position shown in figure 1. For installations on a roof with a pitch of greater than 20°, a 'U' bracket and small pipe legs should be used on top of the baseplate as shown in figure 3. The frame installation proceeds following the instructions for side pitch installations, with the pipe legs located directly over a load-bearing wall. (See figure 4.)

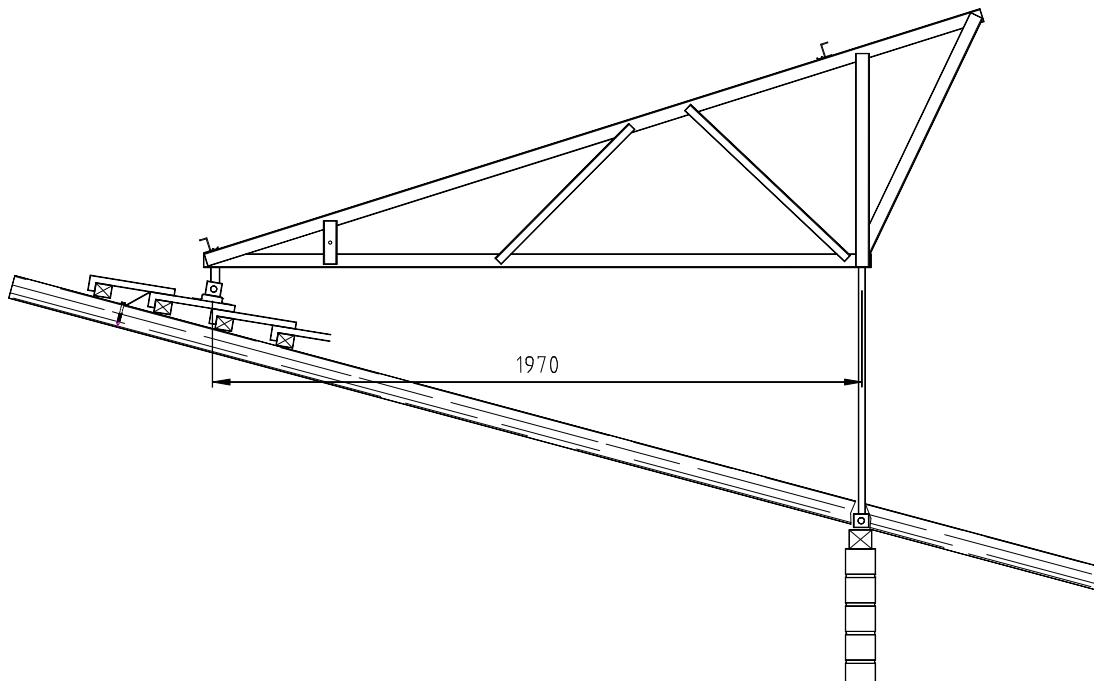


Figure 4

### Variations for Metal and Fibreboard Roofs

Fixing method is similar to that for a tiled roof, with the exception that two baseplates are used. The second positioned over the building outer wall. These baseplates are fixed to the metal or fibreboard roof using coach bolts through to the rafters (see figure 5). The holes for the bolts are sealed with mastic.

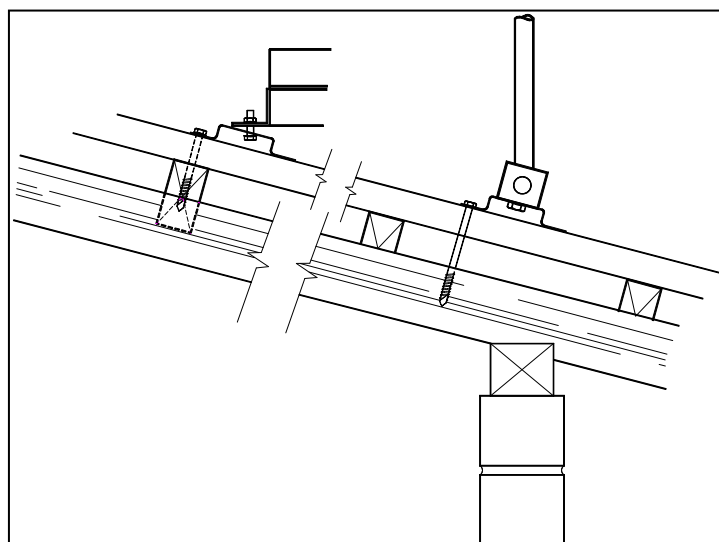


Figure 5

### Variations for Shallow Pitch or Flat Deck Roofs

On shallow pitch roofs (less than 8°) of metal or fibreboard materials, the frame may be installed without using the pipe legs, provided that the inclination of the solar collector remains greater than 8° (see figure 6). On flat roofs, the assembled frame may be installed without the baseplates. Provided the roof material is structurally suited, the frame may be bolted directly to it.

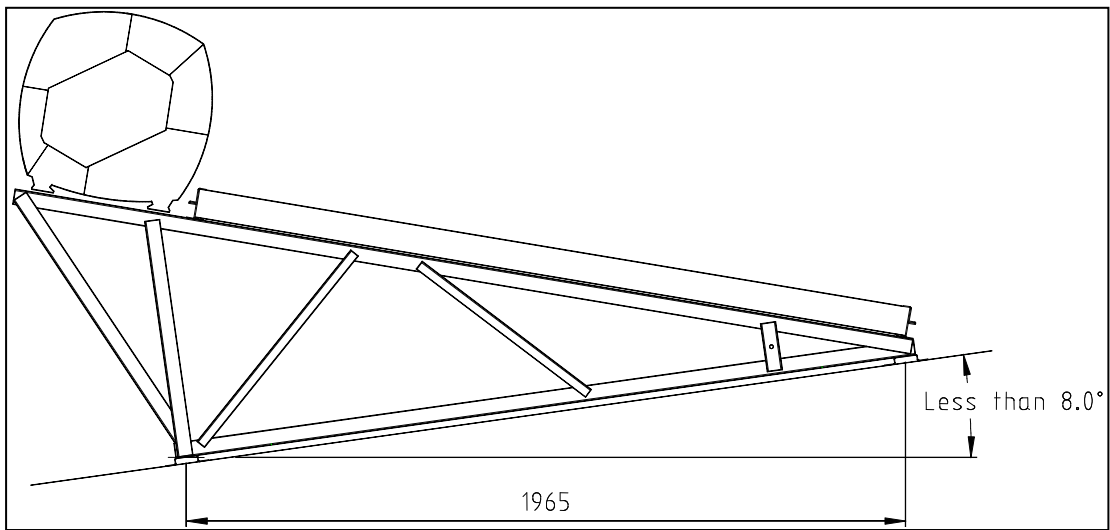


Figure 6

### Flashing and Roof Penetrations

Flashing of roof penetrations must meet the requirements of the local authorities. Suggested methods are shown in figure 7.

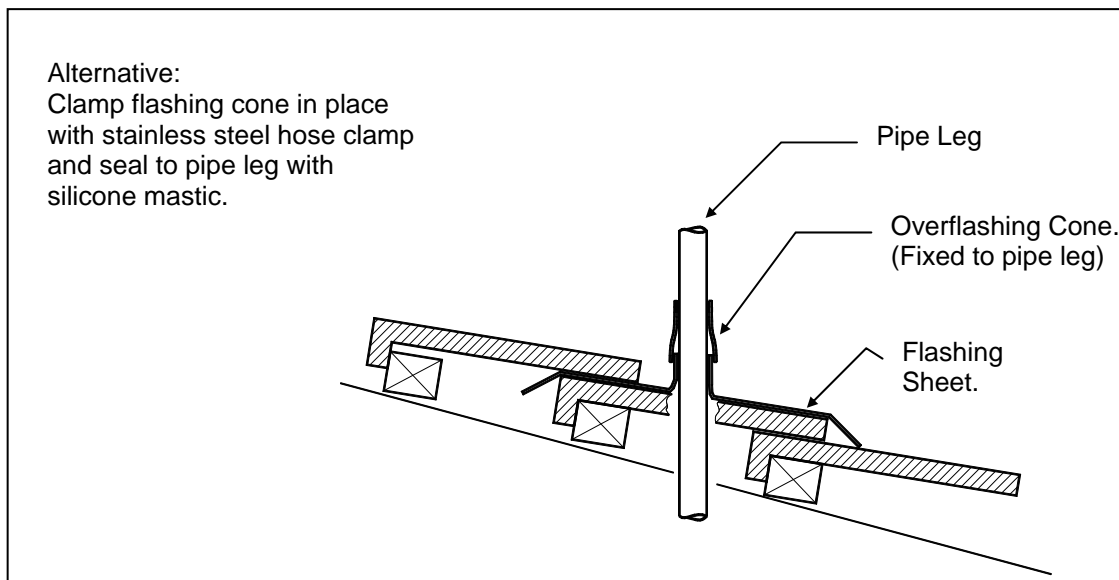
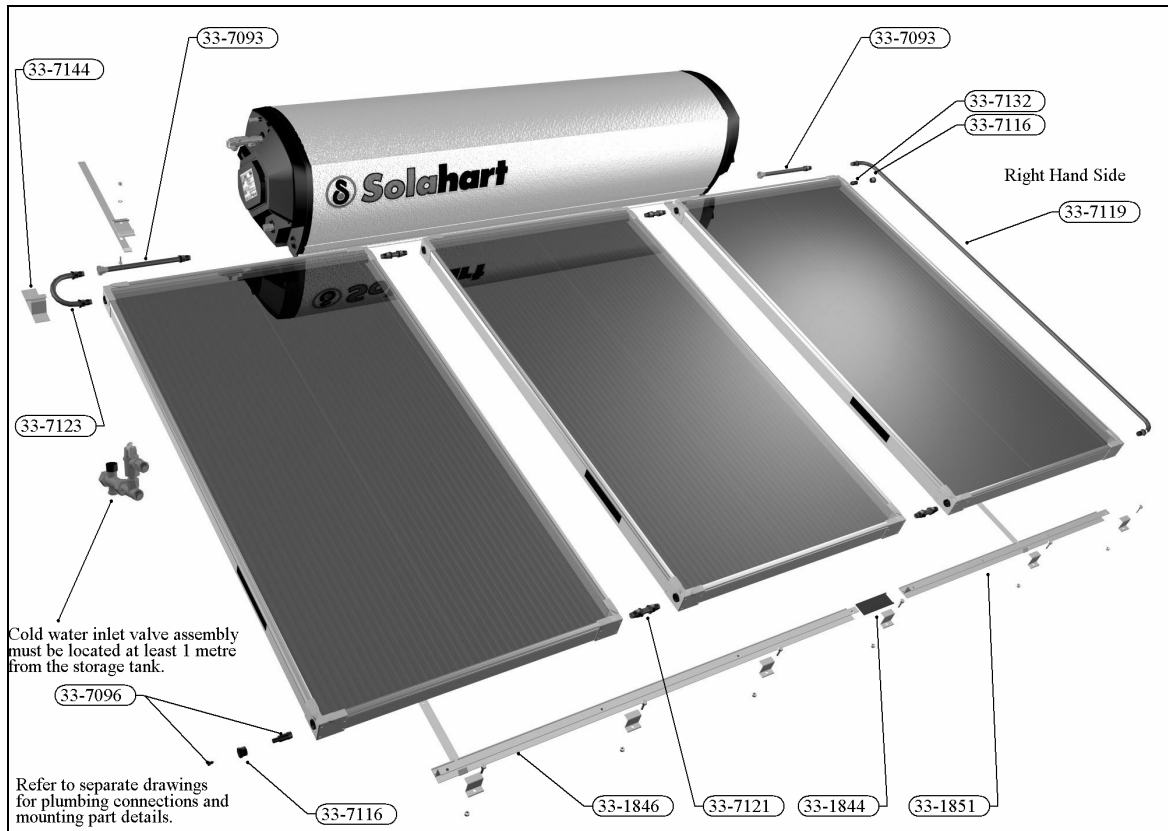


Figure 7

INSTALLATION DIAGRAM - MODELS 303J, 303KF,  
303KF FREE HEAT, 303J FREE HEAT



INSTALLATION DIAGRAM - MODEL 303L

