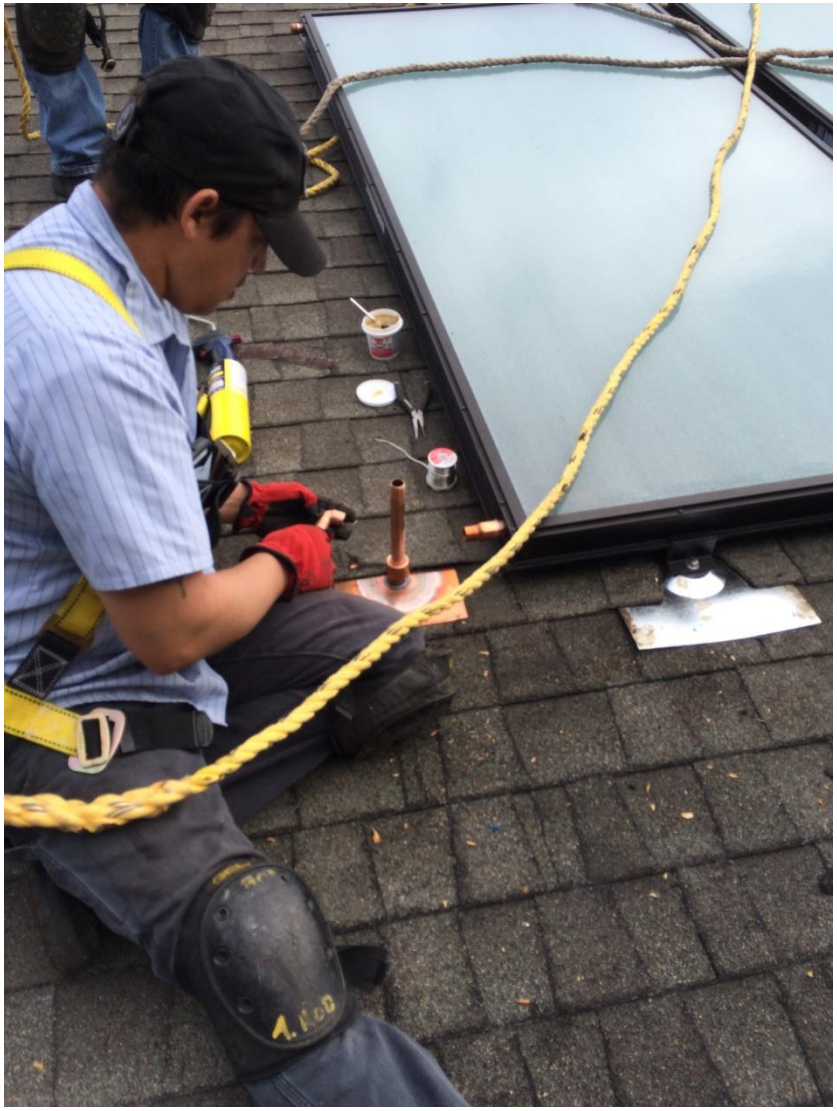
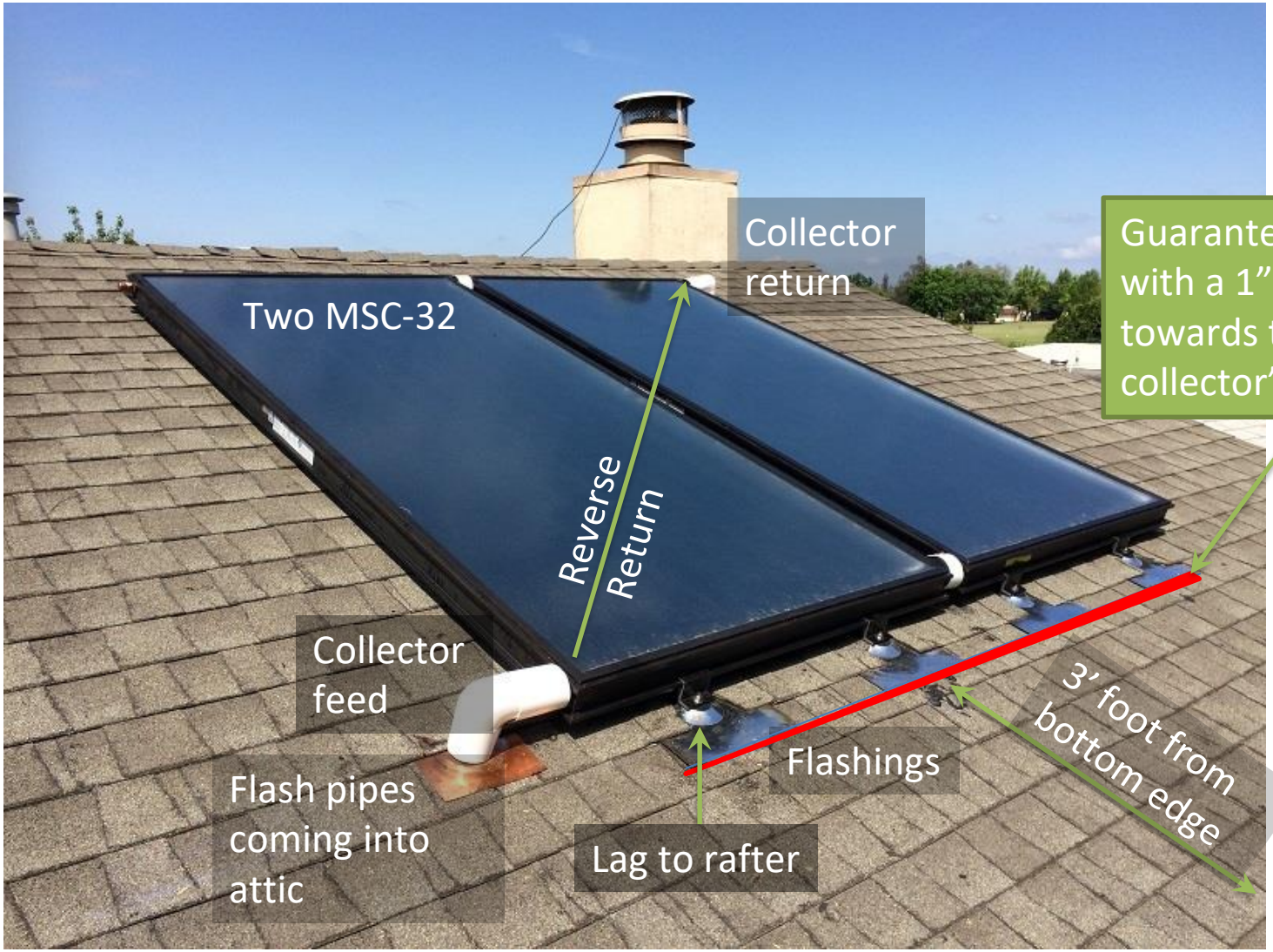
ALTERNATE ENERGY TECHNOLOGIES, LLC.

Installation Overview

- Mounting the collectors on the roof
- Running the pipes in the attic
- Installing the system manifold
- Installing the tank
- Setting the controller

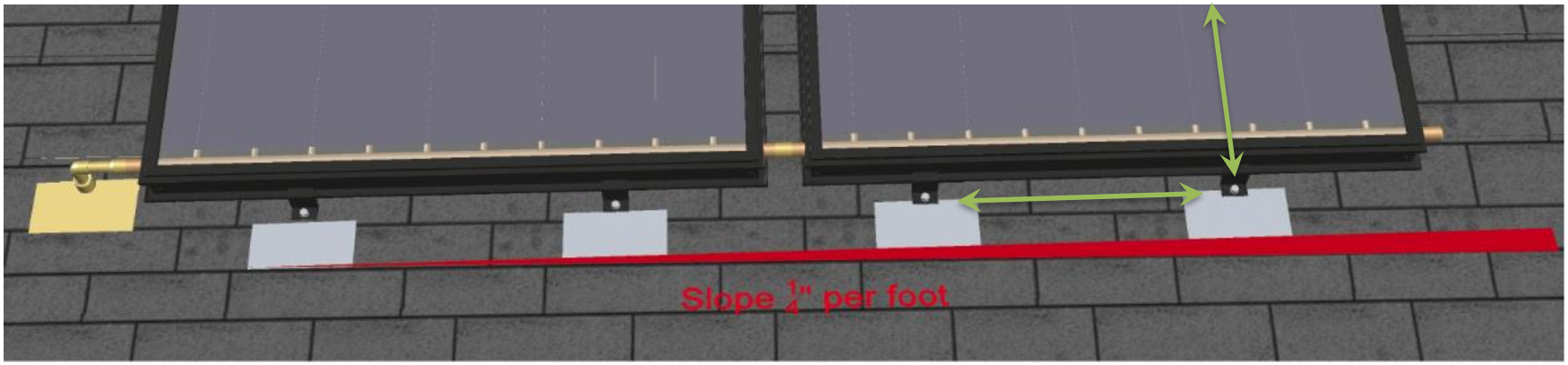


Mounting the collectors on the roof



Mounting the collectors on the roof

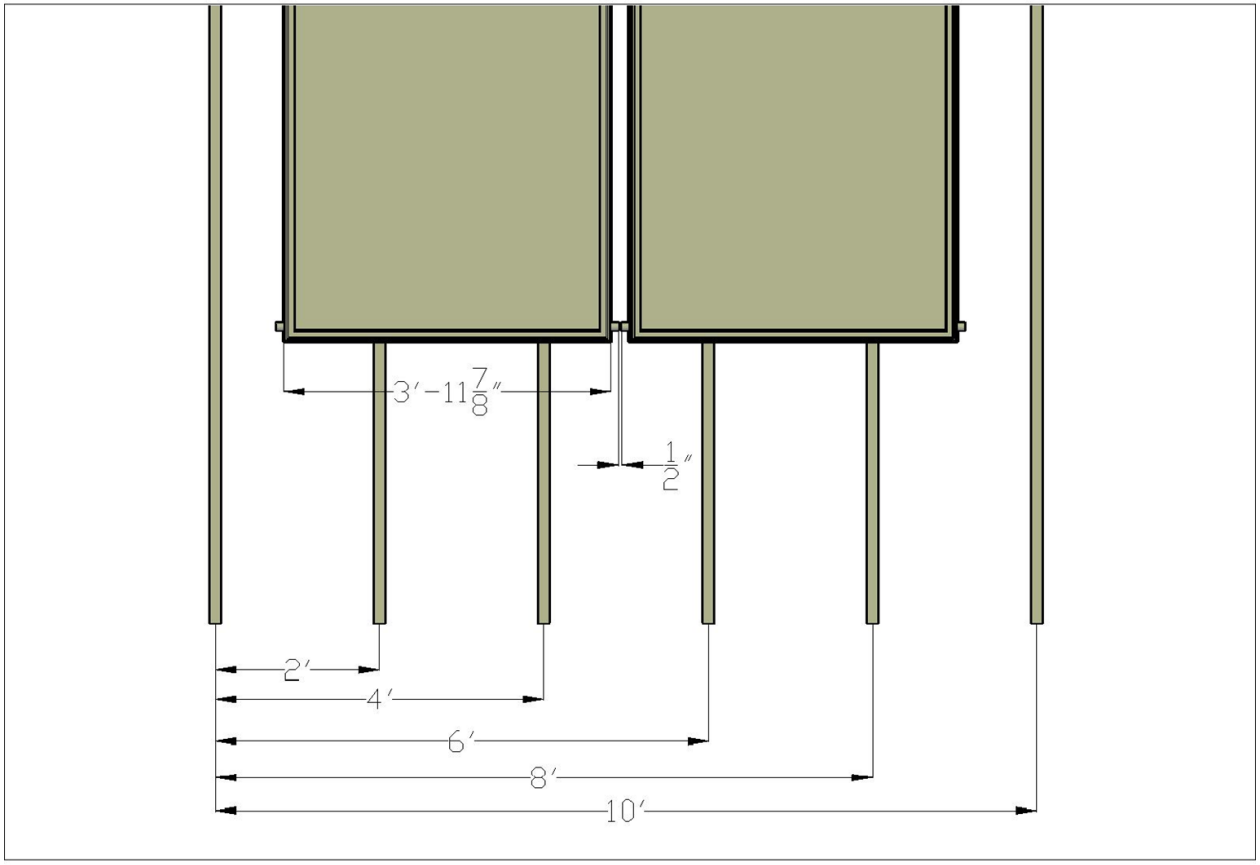
Measure the position of the mounts with the 1/4 slope
Run a chalk line



- **Mounts should be separated by 24”**
- **Center line distance between mount lag screws across the collector:**
  - MSC-20: 63 ¾”
  - MSC-32: 99 ⅝”

Mounting the collectors on the roof

Find the rafters

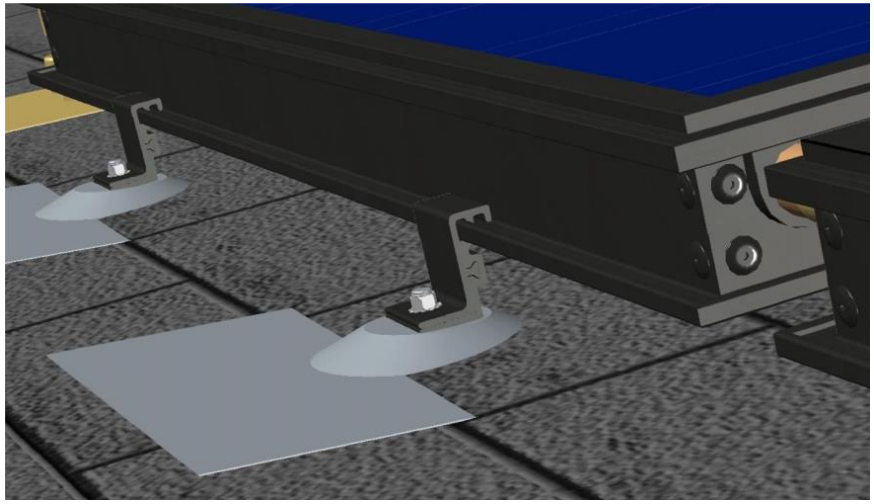


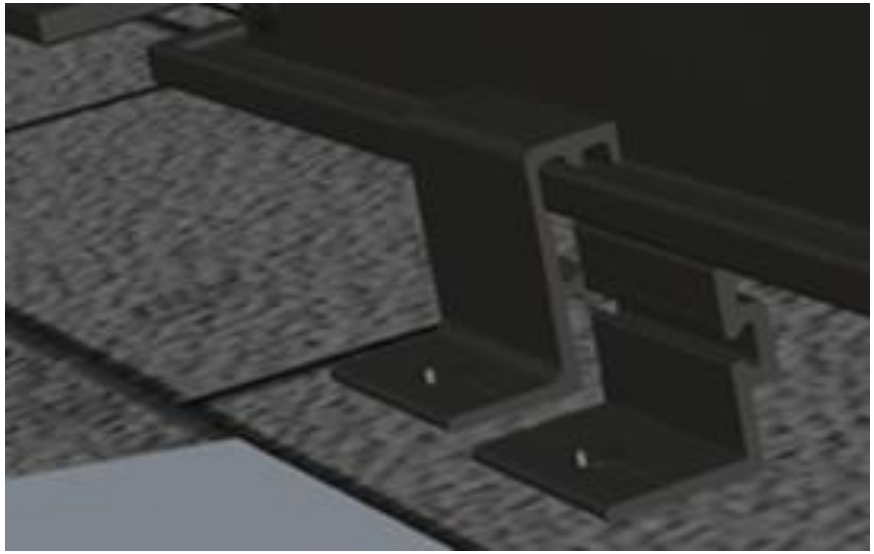
Mounting the collectors on the roof

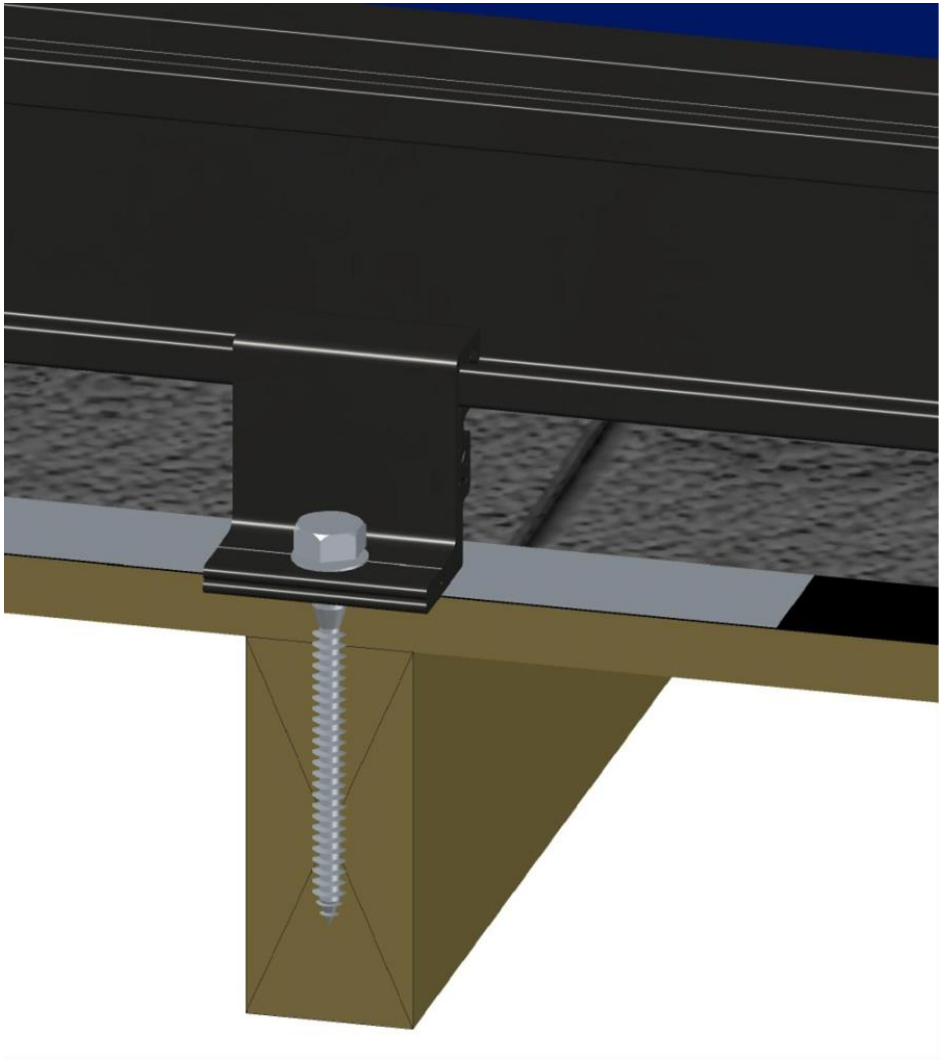
Hoisting Options

MS Collector Flush Mount

Drill, Place flashing and Attach Mounting Clip to Rafter with Lag Screw







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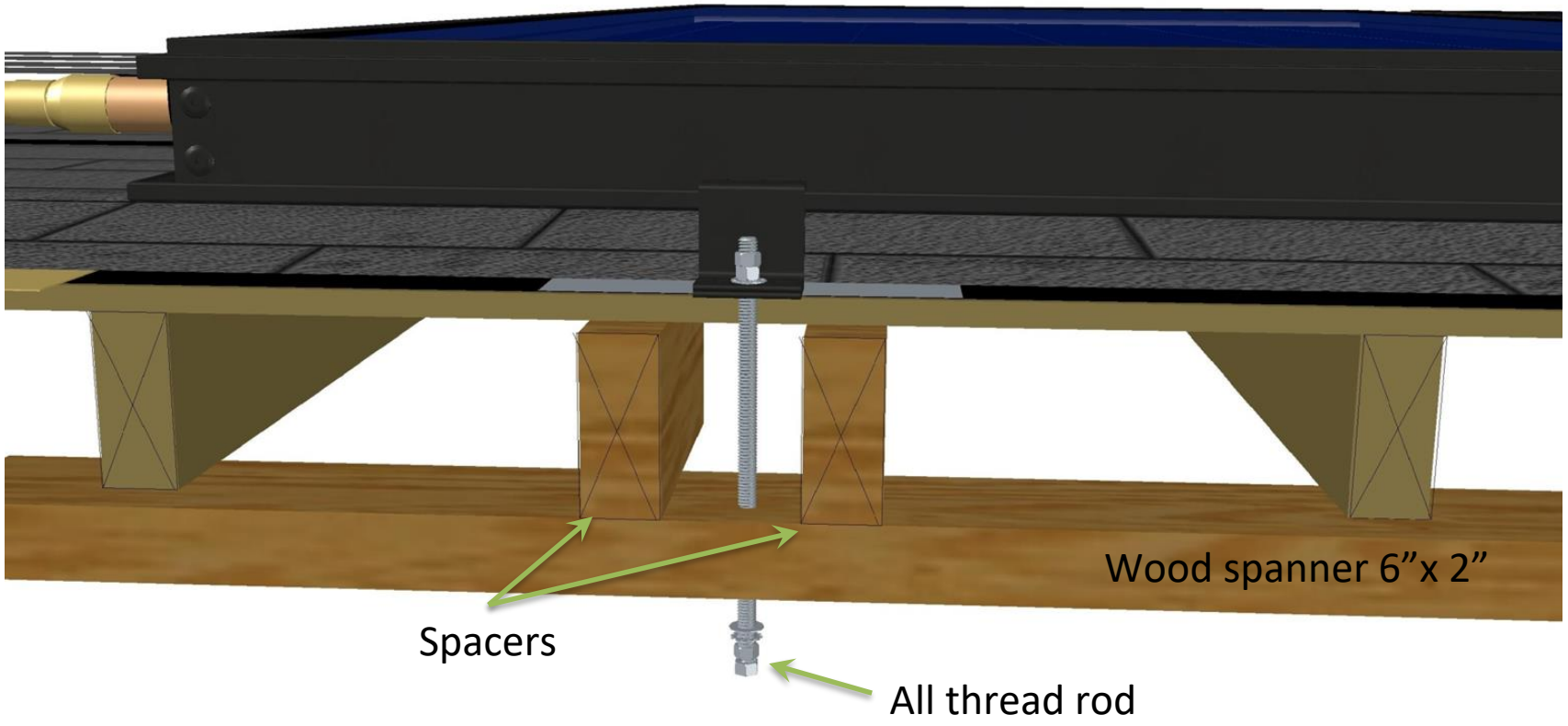
Alternative mounting strategy

Spanner mounting an alternative to Lag Bolting



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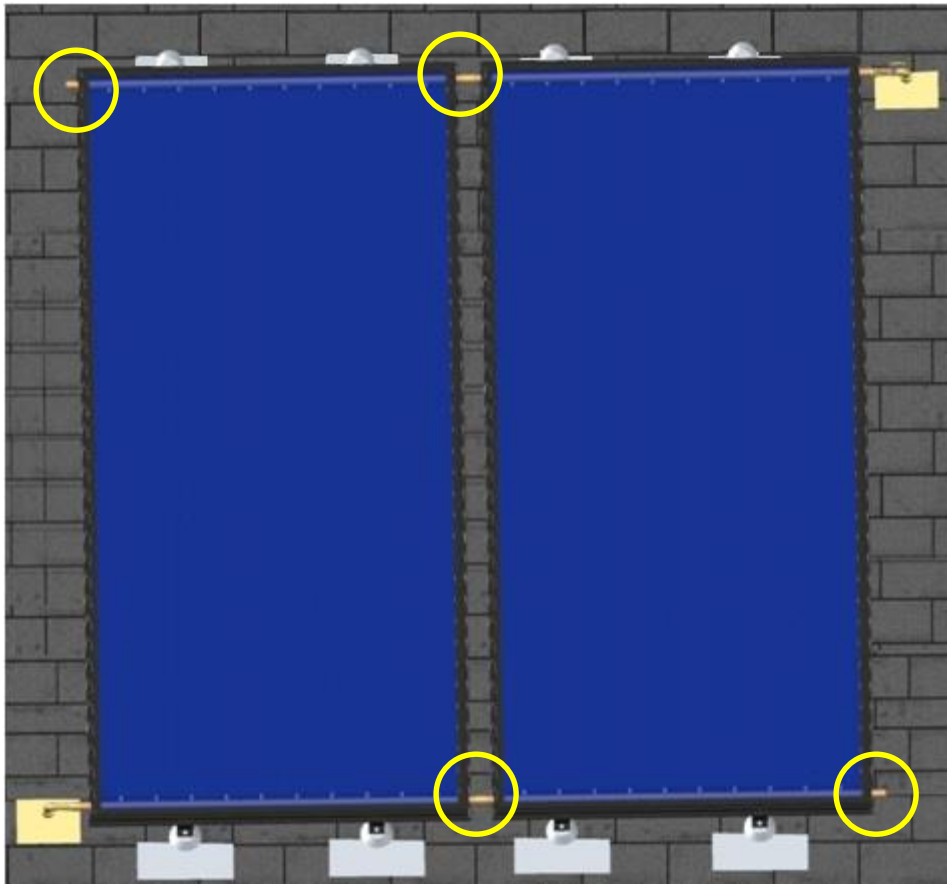
Plumbing the collectors on the roof

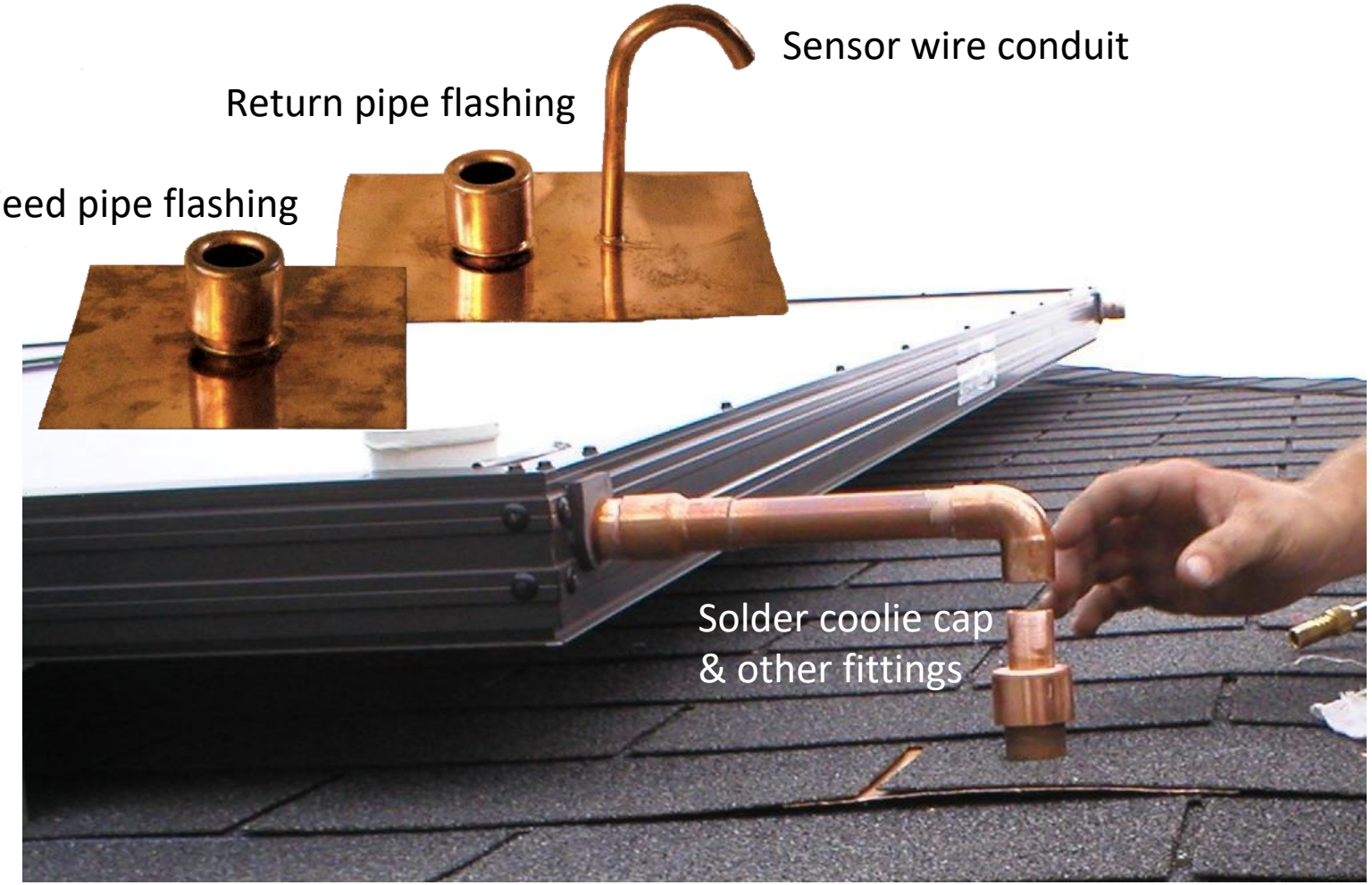
Solder the unions and caps, couple collectors top and bottom



WARNING: USE TWO WRENCHES DO NOT TORQUE THE HEADERS!!!

ALTERNATE ENERGY TECHNOLOGIES, LLC.

Roof pipe flashing



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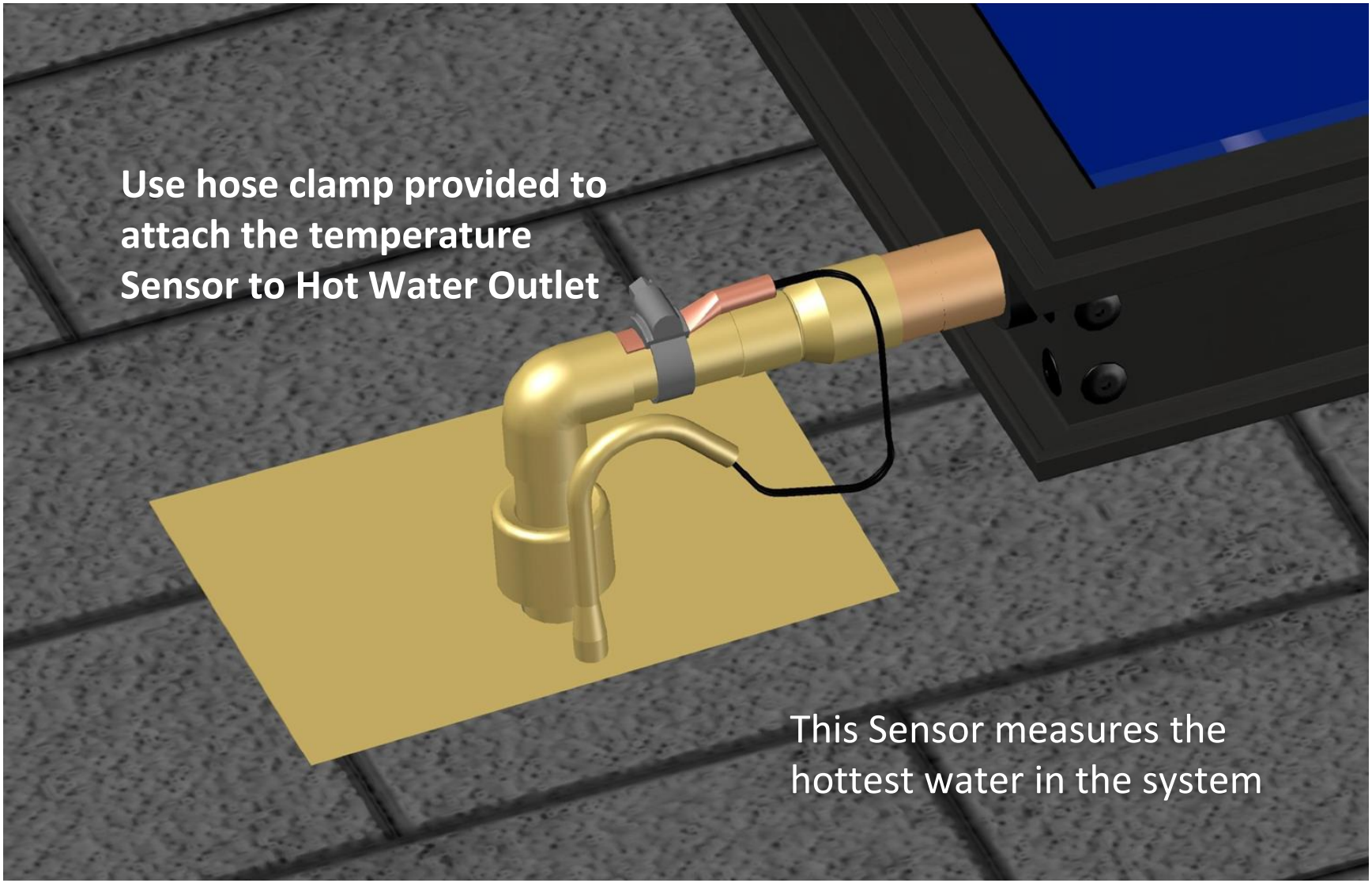
Collector Sensor Mounting



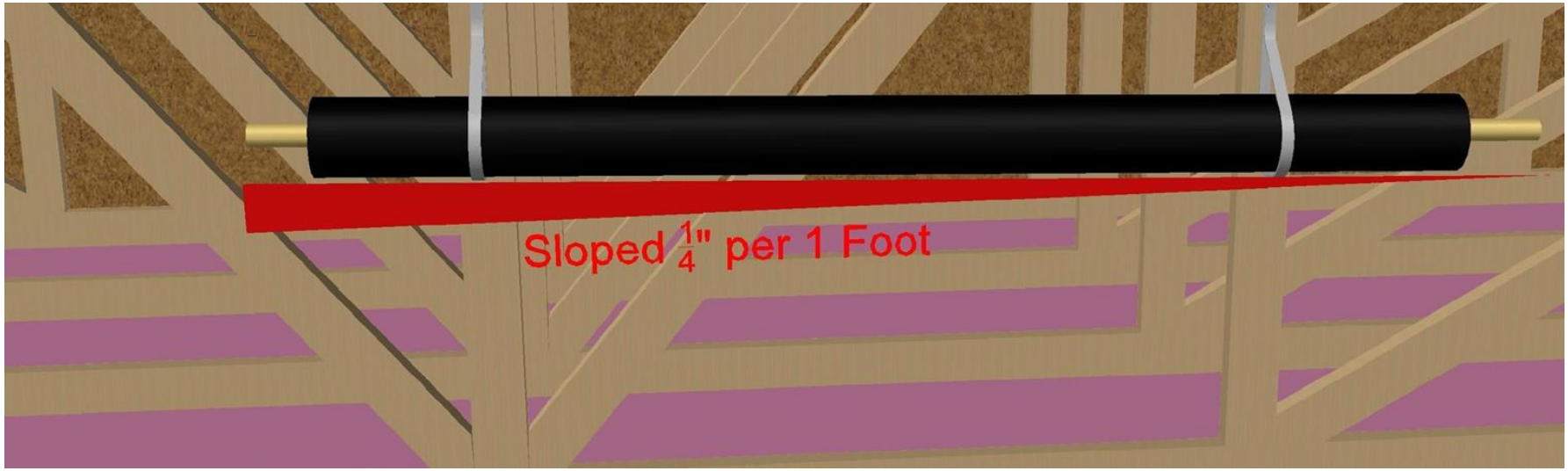
ALTERNATE ENERGY TECHNOLOGIES, LLC.

Mounting the collectors on the roof

ALTERNATE ENERGY TECHNOLOGIES, LLC.

Running the pipes in the attic

Slope Attic Pipe 1”: 4’ downwards, away from the collector toward the drainback tank



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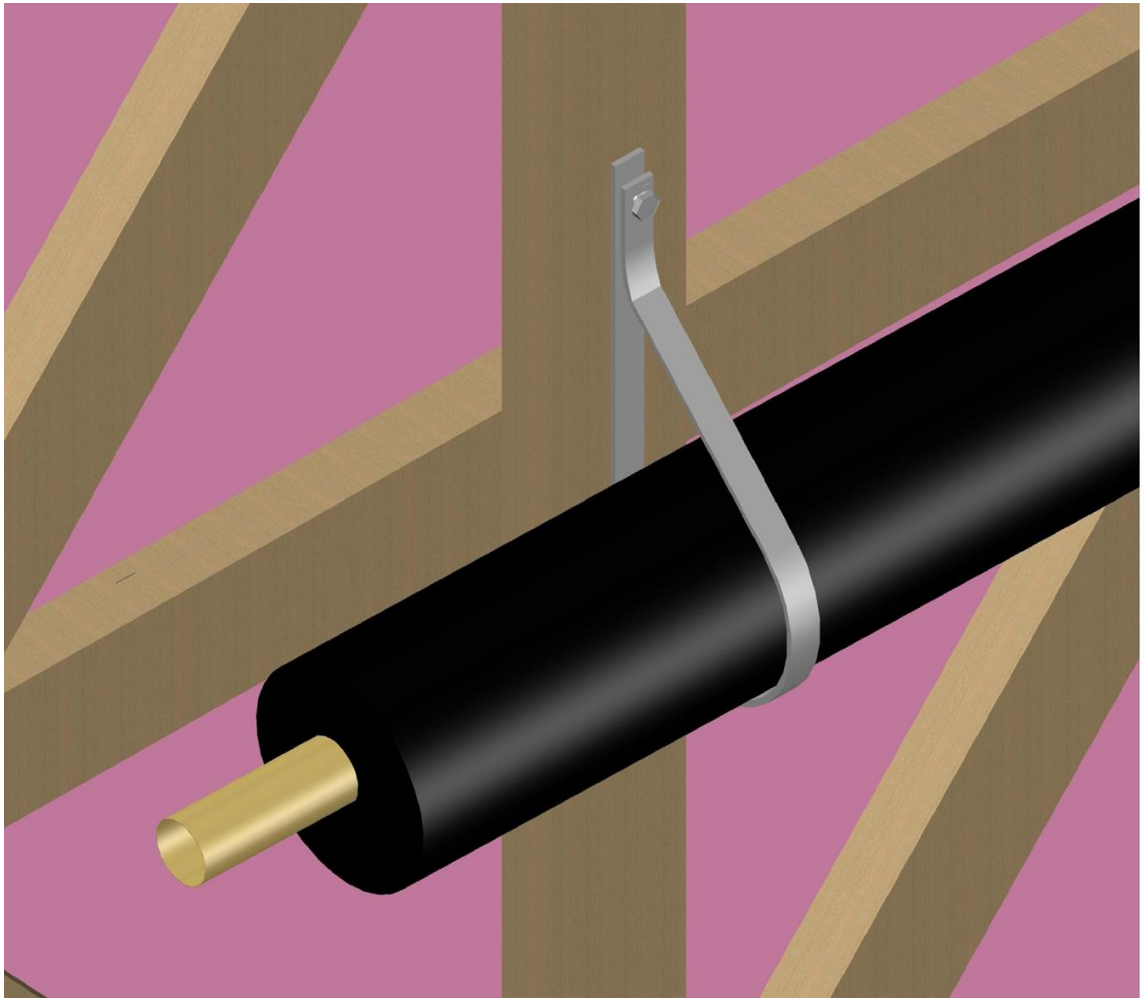
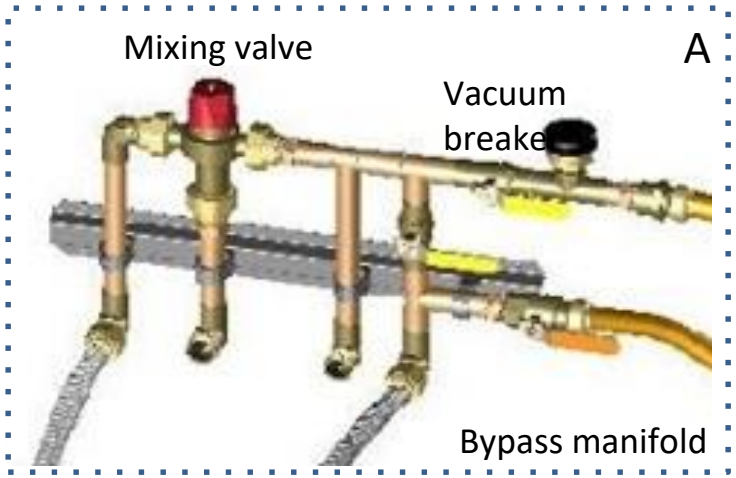
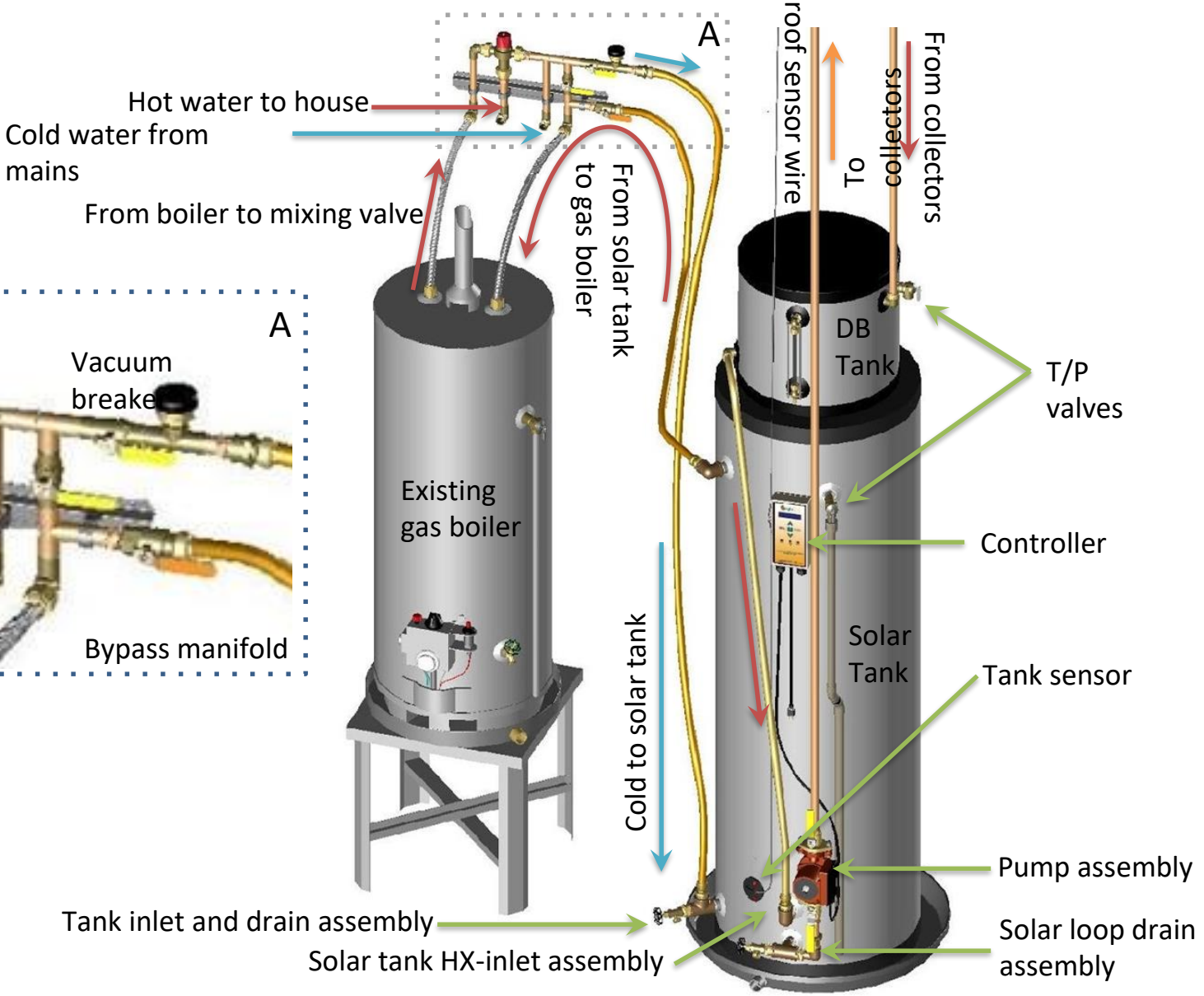
Running the pipes in the attic

- **Attach copper tubing to framework using piping straps**
- **Be careful not to crush the insulation**

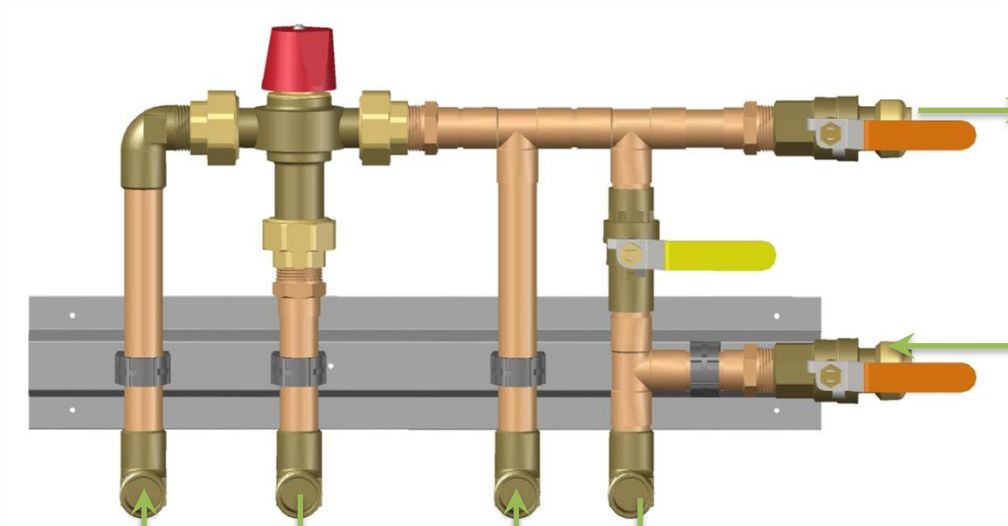


Installing the manifold and tank





Installing the system manifold



To cold water port of solar storage tank

FROM Hot Water Port of Solar Storage Tank

Cold Water Supply IN

FROM Hot Water Port of Existing Hot Water Heater

Tempered Hot Water to Fixtures

To cold water port of Existing hot water heater

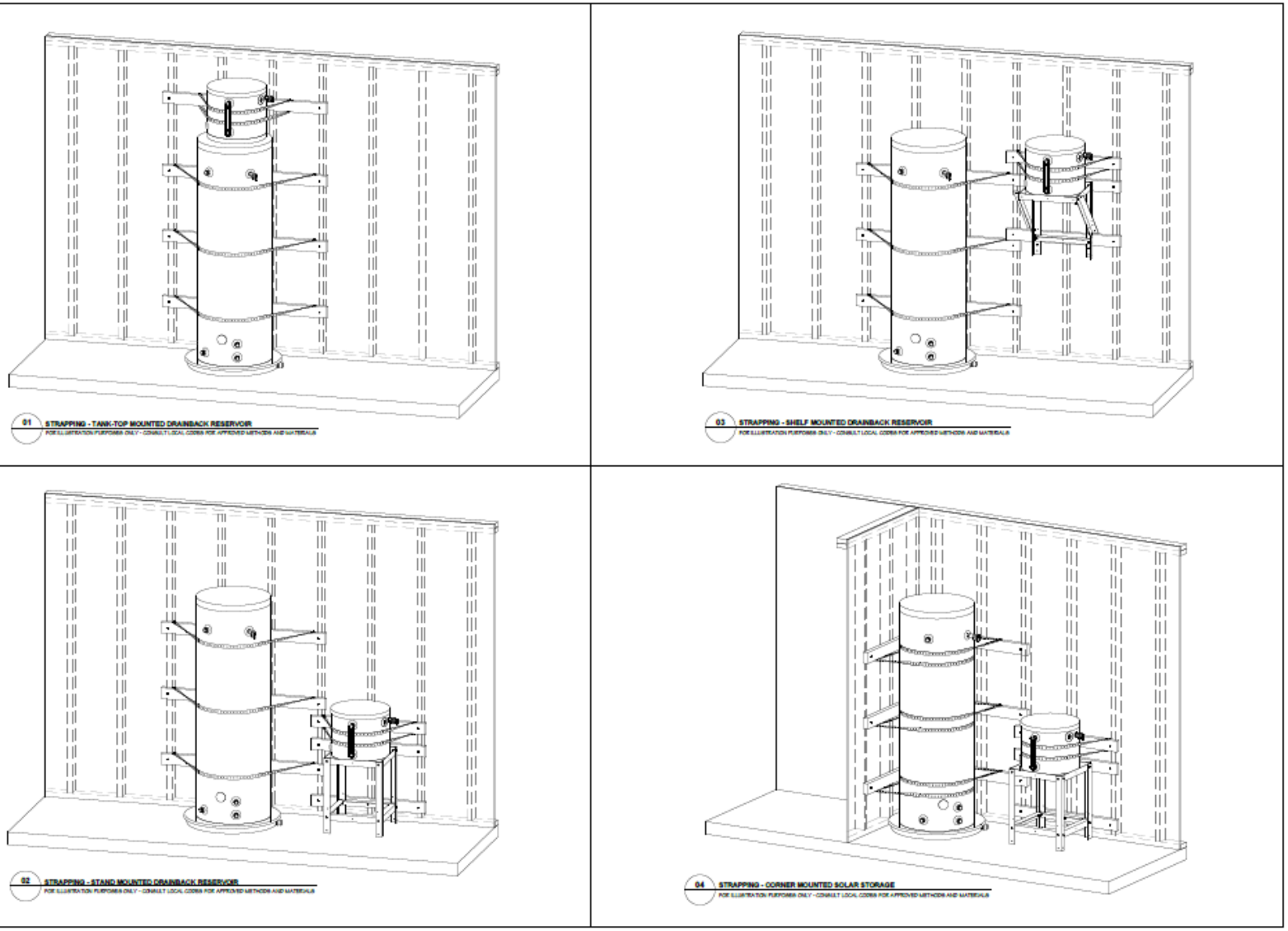
Note: Valves shown in Pre-Feed Configuration

ALTERNATE ENERGY TECHNOLOGIES, LLC.

Installing the system manifold

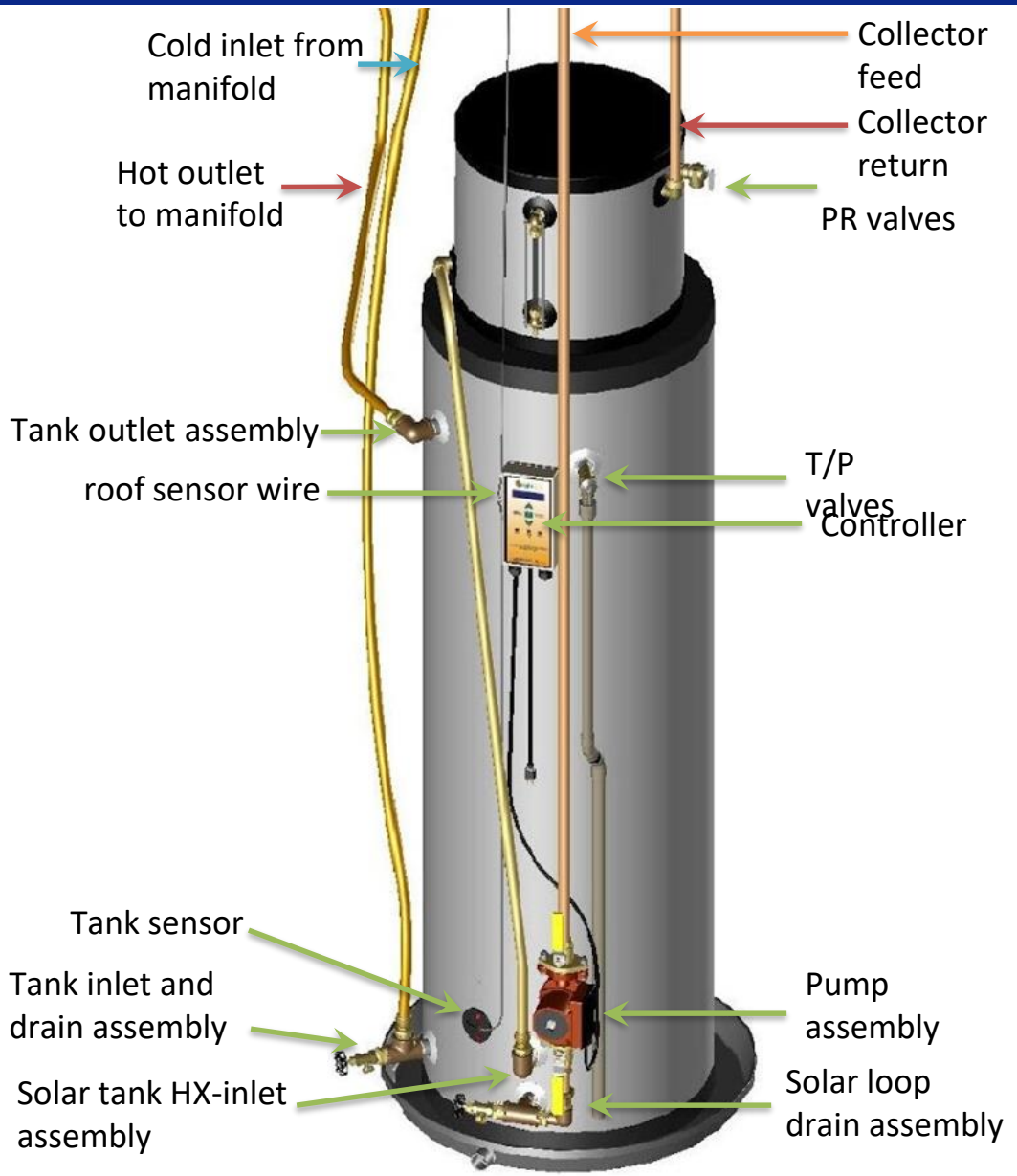
ALTERNATE ENERGY TECHNOLOGIES, LLC.

Installing the tank 5 steps



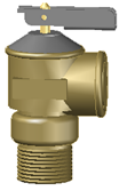
Installing the tank 5 steps

1. **Position tank on tank tray**
2. **Position DB-Tank (On top, side or wall)**
3. **Connect the assemblies and valves**
    1. "Inlet and drain assembly"
    2. "Solar tank HX-inlet assembly"
    3. "Solar loop drain assembly"
    4. "Pump assembly"
    5. "Tank outlet assembly"
    6. Install the T/P and PR valves
4. **Plumb 5 pipes:**
    1. Tank out to manifold hot inlet
    2. Manifold cold outlet to tank inlet
    3. DB-tank inlet to collector return
    4. Pump assembly outlet to collector feed
    5. DB-tank outlet to Solar tank HX-inlet
5. **Install controller**
    1. Mount controller on tank fixture
    2. Connect roof sensor wire
    3. Check tank and sensor and connect wire
    4. Connect to the power supply
    5. Check controller settings



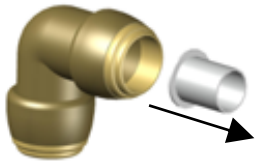
Just a Reminder…

T&P (Temperature and Pressure Relief) Valve **on Tank**



PRV (Pressure Relief Valve) **on Solar Loop**

Use the SharkBite plastic insert **only with PEX tubing**

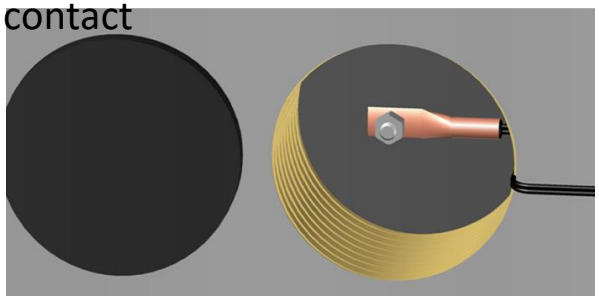


For **copper tubing remove** plastic insert

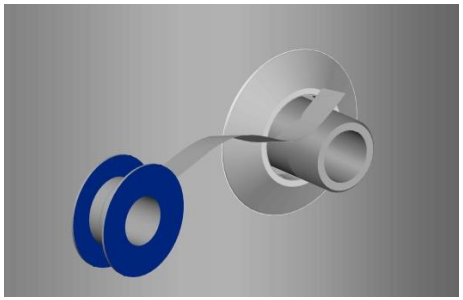
Properly **insert SharkBite**

Pipe Size	Insertion Depth
1/4"	0.813"
3/8"	0.875"
1/2"	0.938"
5/8"	1.125"
3/4"	1.125"
1"	1.313"

Check tank sensor for good contact



Remember your **pipe tape**



Soldered connections should be made with 95/5 solder

Do not use aggressive water

Controller Settings

- **Eagle Sun Controller**
- LCD Display
- Turns pumps on and off based on preset temperature differential
- Can vary the speed of the pump
- Drainback Setting
- Vacation Mode Setting
- 4 Temperature Sensor Ports
- Upper Limit Control

DTC-ES-1C Eagle Sun Control and BTU Meter w/2 Sensors

Controller Settings

Eagle Sun Controller Settings

Collector Temperature Displayed

Storage Temperature Displayed

Controller Settings

Eagle Sun Controller Settings

Control Modes:

OFF – system off

ON – pump comes on at full speed

AUTO – controller regulates pump according to settings

Controller Settings

Eagle Sun Controller Settings

AUX 1 and AUX 2

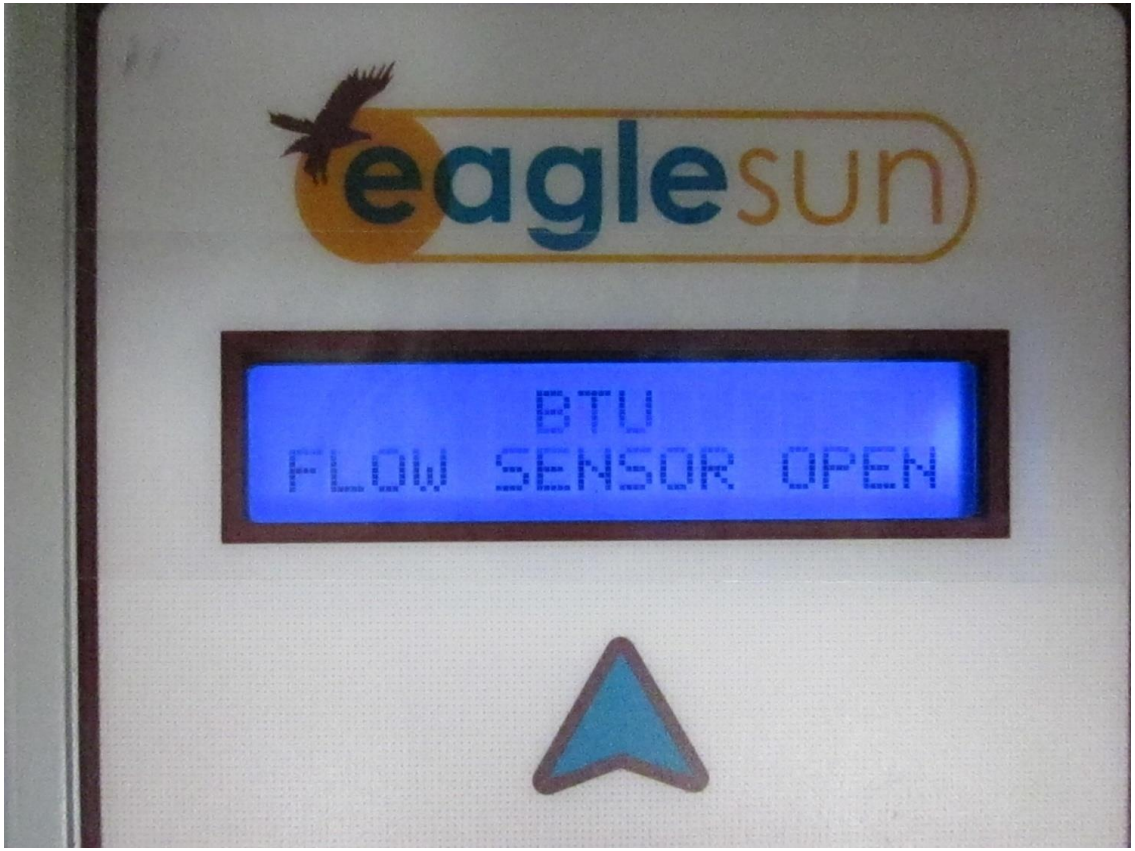
Will display temperatures of gauges installed in auxiliary 1 and 2 ports

Controller Settings

Eagle Sun Controller Settings

BTU Display

Displays Calculated BTU Readings



Controller Settings

Eagle Sun Controller Settings

Holiday Feature

OFF, 100 and 150°F

Allows for continued pump operation above the storage high limit temperature, until the feature setting is reached.

Recommended setting is the temperature setup temperature of the backup electric heat.

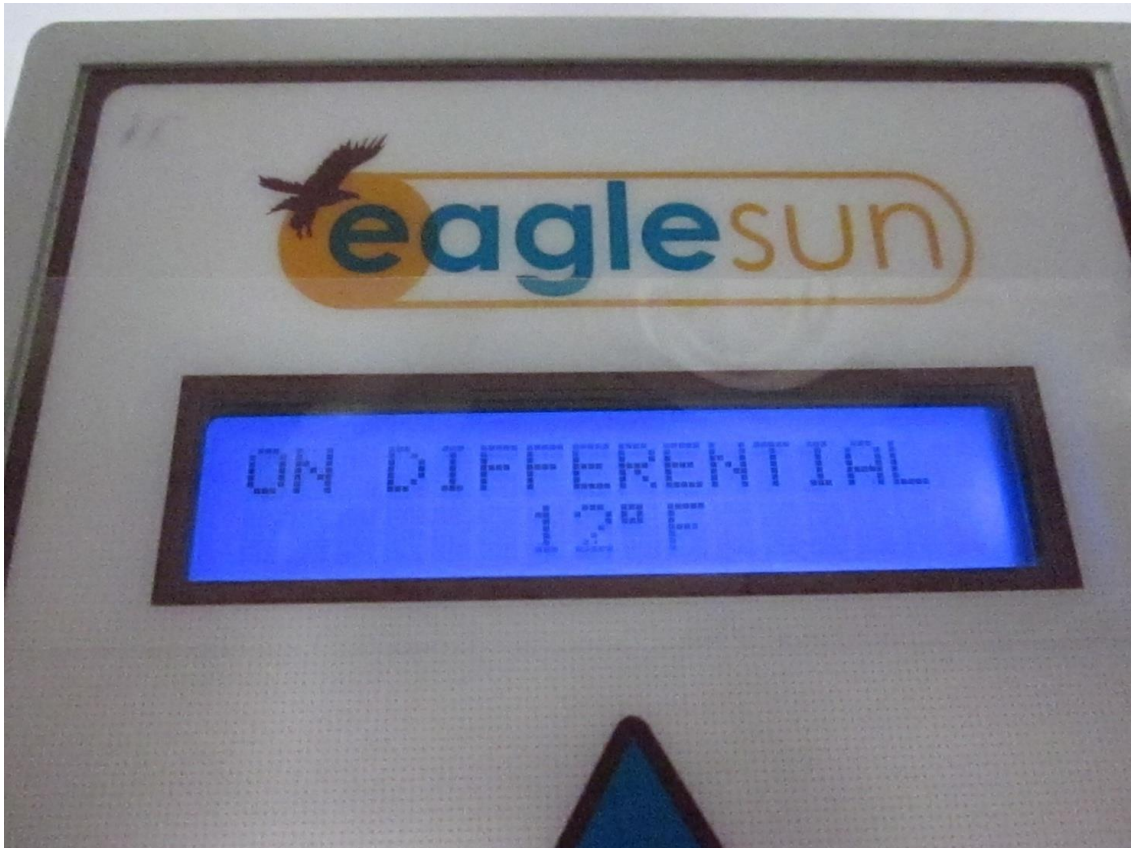
Setting is accessed by pressing the MENU button (■) three times

Controller Settings

Eagle Sun Controller Settings

Compares the temperature at the solar collector outlet (hot temperature) with the temperature at the bottom of the storage tank (cold temperature)

Turns the pump on when this temperature difference is higher than the setting



Controller Settings

Eagle Sun Controller Settings

Compares the temperature at the solar collector outlet (hot temperature) with the temperature at the bottom of the storage tank (cold temperature)

Pump will not turn on until this the system experiences this temperature difference

setting is adjustable from 2°F to 8°F. *(Default is 2° F)*

Controller Settings

Eagle Sun Controller Settings

When the temperature of the storage tank reaches this limit, the pump turns off

110°F to 200°F

(Default is 150° F)

Controller Settings

Eagle Sun Controller Settings

Minimum temperature required at the collector in order for the pump to turn on

OFF, 50°F to 70°F

(Default is 50° F)

Controller Settings

Eagle Sun Controller Settings

Minimum operational speed of the pump

Calculated as a percentage of full speed

20% to 50%.

(Default is 30%)

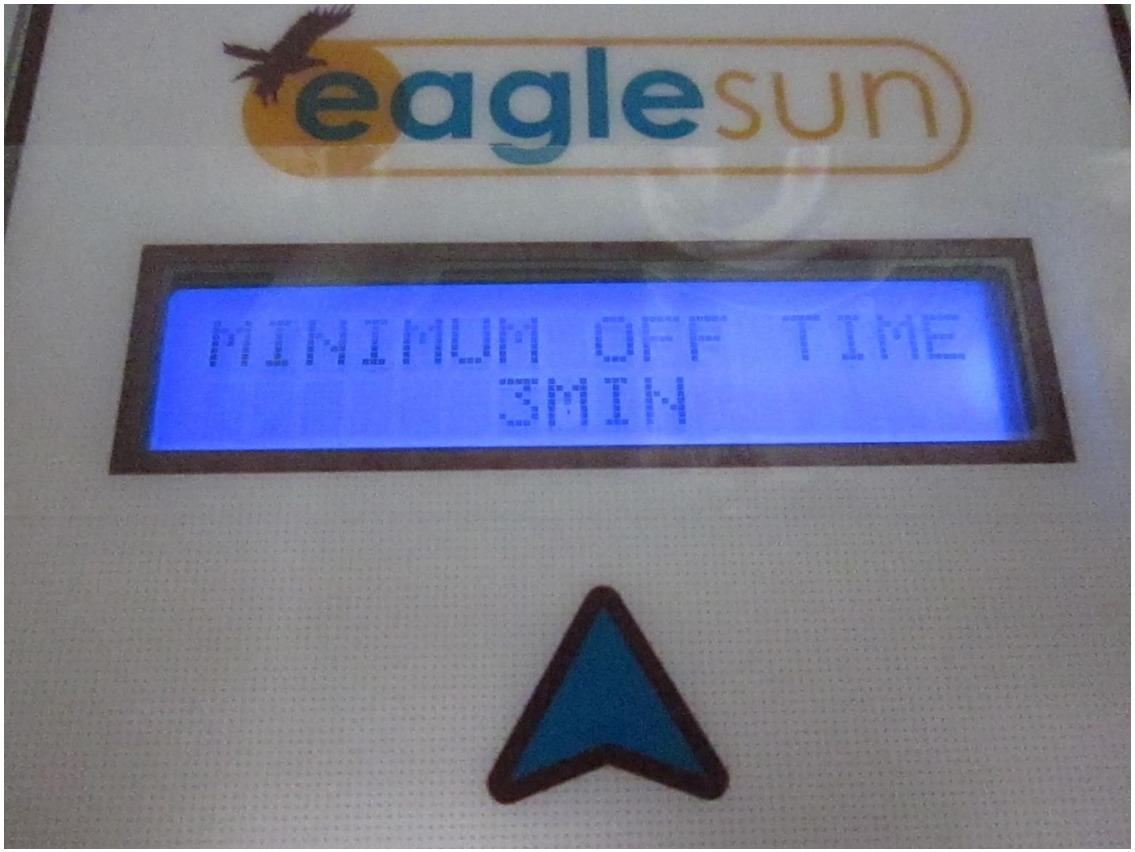
Controller Settings

Eagle Sun Controller Settings

Minimum time that the pump must remain off before turning back on

Prevents short cycling of the pump (i.e., on a cloudy day)

3 to 10 minutes.
(Default is 5 min)



Controller Settings

Eagle Sun Controller Settings

Flow sensor setting (VFS 1-20, VFS 2-40, VFS 5-100, VFS 10-200 and VFS 20-400) enables the AUX1

sensor terminal to accept temperature input from the flow sensor and enables BTU calculation.

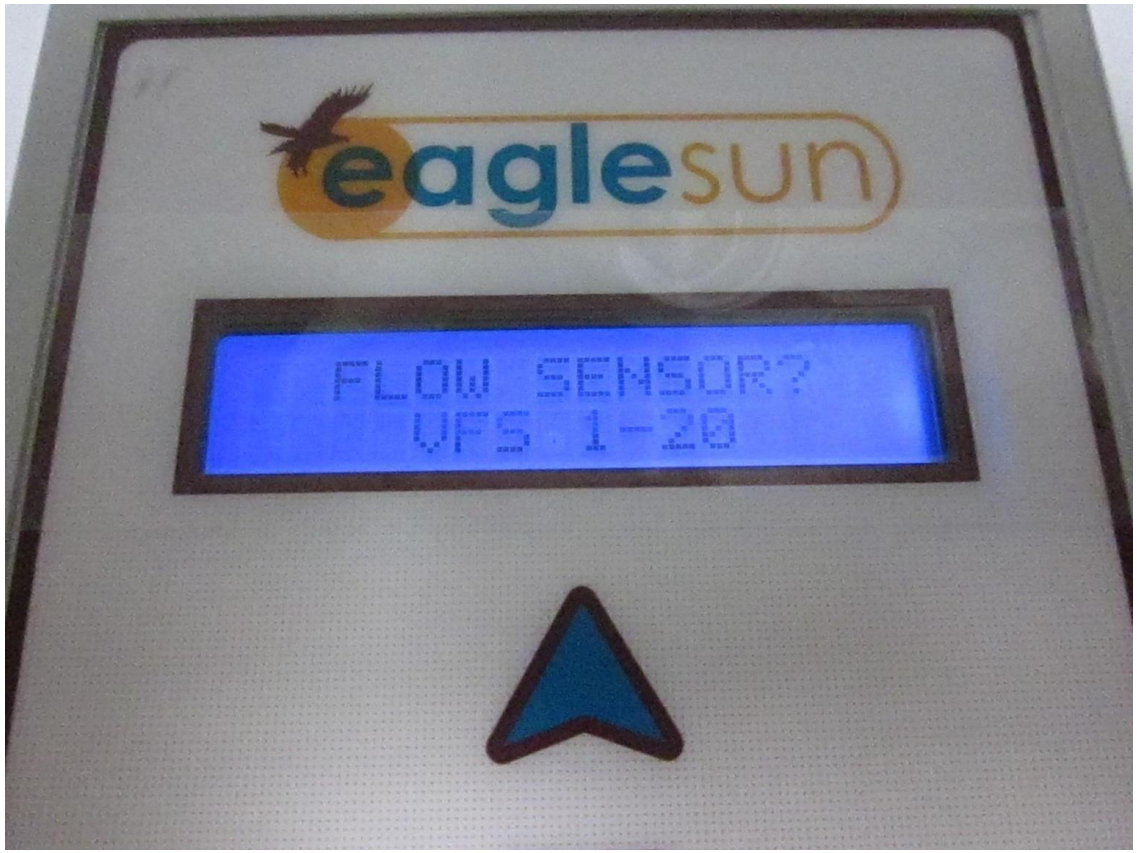
Alternatively, the Flow Sensor

setting will allow for manual adjustments between 0.0 and 106.0 gpm (in 0.1 increments). The installer must measure the actual

flow rate by using an ultrasonic flow meter, or similar equipment, before manually setting the control.

(Default is 0.00 GPM – no

BTU calculation)



Controller Settings

Eagle Sun Controller Settings

Yes – for Drainback

No – for all other systems

ALTERNATE ENERGY TECHNOLOGIES, LLC.

Operation and Maintenance

Routine Maintenance

4 x year:

Visibly **inspect** the **collector** glazing: Clean with a hose if necessary.

2 x year:

Check water level in **sight glass**. System off – water should come within 1” of top of sight glass.

2 x year:

Flush Solar Storage **Tank.**

As needed:

Treat exterior pipe **insulation** with **Exterior UV inhibitor paint**.

REPAIR KITS ARE AVAILABLE!

Pre-approved Permit Package

SOLAR WATER HEATING IMPROVEMENTS
FOR

(ENTER CUSTOMER NAME)

SCOPE: USE THIS PLAN ONLY FOR SOLAR DOMESTIC HOT WATER (SDHW) SYSTEMS HAVING AN ESTIMATED OUTPUT OF EQUAL TO OR LESS THAN 69,000 BTUS OR 0.821 THERMS (< 30 KWTH) ON THE ROOF OF A ONE OR TWO-FAMILY DWELLING OR ACCESSORY STRUCTURE AND USED FOR DOMESTIC WATER HEATING. ARTICLES OF THE 2016 CRC, CBC, CPC, CEC + CALIFORNIA ENERGY CODES OR OTHER CALIFORNIA HEALTH AND SAFETY CODES SHALL APPLY.

MANUFACTURER'S SPECIFICATION SHEETS ARE PROVIDED FOR PROPOSED COLLECTOR, CONTROLLER, PUMP, STORAGE TANK/HEAT EXCHANGER, HEAT TRANSFER FLUID (IF APPLICABLE) AND MOUNTING SYSTEMS. EQUIPMENT INTENDED FOR USE WITH SDHW SYSTEM SHALL BE IDENTIFIED AND LISTED FOR THE APPLICATION.

JOB ADDRESS: _____ PERMIT #: _____

CONTRACTOR/ENGINEER NAME: _____ LICENSE # AND CLASS: _____

SIGNATURE: _____ DATE: _____ PHONE NUMBER: _____

EMAIL: _____

CIRCLE (A) OR (B):

TOTAL # OF COLLECTORS INSTALLED: 2 TOTAL AREA OF COLLECTORS: (A) 84 SQFT (B) 40 SQFT)

COLLECTOR CERTIFICATION NUMBER (INCLUDE CERTIFYING AGENCY): (A) SRCC OG-100 #10001908 (B) SRCC OG-100 #10002012

SYSTEM CERTIFICATION NUMBER (INCLUDE CERTIFYING AGENCY): (A) SRCC OG-300 #20100170 (B) SRCC OG-300 #20004214

MAX HEIGHT ABOVE ROOF: NOT TO EXCEED ROOF HEIGHT HEIGHT ABOVE GROUND: NOT TO EXCEED 30 FT

MAJOR COMPONENTS (FOR SDHW SYSTEMS)

CIRCLE (A) OR (B):

SOLAR TANK MAKE/MODEL: THERMOMISER GALS: (A) 80 (B) 80 INSULATION: R-15.2 PRESSURIZED? TANK YES, COLLECTOR LOOP NO

HEAT EXCHANGER MAKE/MODEL: HX INTEGRAL TO SOLAR TANK NUMBER OF WALLS: SINGLE HEAT EXCHANGE FLUID: WATER

SOLAR CONTROL MAKE/MODEL: EAGLESUN DTC-ES-1 (MODEL AL0790-1)

SOLAR PUMP/CIRCULATOR MAKE/MODEL: GRUNDFOS UP 15-10SF

EXPANSION TANK MAKE/MODEL: NOT APPLICABLE APPROPRIATELY SIZED FOR USE? N/A

MOUNTING HARDWARE MAKE/MODEL OR TYPE: MSC SERRS FLUSH MOUNT, MSC-FM

DOES ALL THE ABOVE DATA MATCH SUBSTANTIALLY THE DATA USED FOR CERTIFICATION? _____

LOCATION MAP

TABLE OF CONTENTS

INSTALLATION NOTES

1. THIS IS A PLAN SET TAILORED TO THE AET DRAINBACK SYSTEM WHICH IS INTENDED TO ENABLE CONTRACTORS TO SATISFY THE REQUIREMENTS AND THE INTENT OF THE STATE WIDE EXPEDITED PERMITTING PROCESS.
2. THIS PLAN IS INTENDED TO CONFORM TO CURRENT VERSIONS OF THE CALIFORNIA BUILDING CODE, CALIFORNIA PLUMBING CODE AND SOLAR GUIDELINES PUBLISHED AND ENFORCED IN ACCORDANCE WITH:
   a. UNIFORM SOLAR ENERGY CODE (USEC), NSFA/NSI 91
   b. CONTRACTOR SHALL PROVIDE AHJ WITH SITE-SPECIFIC ROOF SKETCH FOR PROJECT AND OTHER INFORMATION REQUIRED BY GUIDELINES. OTHERWISE, CONTRACTOR SHALL ARRANGE WITH ENGINEER OF RECORD FOR SITE SPECIFIC PLAN.
   c. CONTRACTOR SHALL CONFORM TO WHATEVER APPLIES IN SOLAR GUIDELINES AS WELL AS ANY OTHER JURISDICTIONAL REQUIREMENTS ESTABLISHED BY RESPECTIVE AHJ.
3. THIS PLAN IS INTENDED TO PROVIDE ALL ESSENTIAL INFORMATION (EXCEPT ADDITIONAL SPECIAL REQUIREMENTS OF a., b., AND c. ABOVE) NEEDED BY AHJ AND INSTALLERS FOR INSTALLATION ON BUILDINGS WHICH ARE:
   a. RISK CATEGORY I OR II
   b. EXPOSURE CATEGORY B OR C
   c. ROOF SLOPE RANGING FROM 1 TO 29 DEGREES (0.212 – 6.7 12)
   d. MID COLLECTOR HEIGHT 30 FT OR LESS
   e. ROOF PRESSURE ZONES 21 OR 22 PER ASCE 7
   f. CONTRACTORS HAVING PROJECTS WITH MORE SEVERE SITE CONDITIONS ARE DIRECTED TO CONTACT ENGINEER OF RECORD FOR SITE-SPECIFIC ENGINEERING.
   g. UPLIFT WIND PRESSURES LESS THAN 48 PSF (POUNDS PER SQUARE FOOT).
4. SOLAR COLLECTORS SHALL BE INSTALLED:
   a. AT TILT ANGLE NOT LESS THAN 1 DEGREES NOR MORE THAN 29 DEGREES FROM HORIZONTAL
   b. AT AN AZIMUTH ORIENTATION OF 90 DEGREES TO THE EAST AND 269 DEGREES TO THE WEST (COMPASS)
   c. IN ACCORDANCE WITH ORIGINAL EQUIPMENT MANUFACTURER INSTRUCTIONS
   d. IN ACCORDANCE WITH ATTACHED DETAILS SHOWN HEREON AND APPROVED BY AHJ FOR PROJECT.
   e. WITHIN ROOF PRESSURE ZONES 21 AND 22
      Z3 SHALL NEVER BE USED WITHIN LADBS JURISDICTION
      Z3 MAY ONLY BE USED WITH SITE-SPECIFIC ENGINEERING ELSEWHERE.
5. WIND PRESSURE RATING: AET SDHW COLLECTORS HAVE PASSED MIAMI TESTING LABS WIND LOAD TESTING OF -102 PSF PER ASTM E-330 (MTL FILE NUMBER 95-1249).
6. ENGINEER OF RECORD CERTIFIES THAT OEM INSTALLATION KITS ARE COMPLIANT WITH CBC AND CPC. THERE SHALL BE NO SUBSTITUTION OF MATERIALS FROM OTHER VENDORS.
7. CONTRACTOR SHALL SELECT AND SUBMIT WITH PERMIT APPLICATION SPECIFIC INFORMATION AND DETAILS SHOWN HEREON OR LINKED HERETO BY PRINTING, CIRCLING, CHECK MARKING, INITIALING, AND/OR OTHER METHOD APPROVED BY AHJ.
8. PLEASE CONTACT engineering@aetsolar.com FOR ADDITIONAL QUESTIONS

SOLAR UNIT WIND FORCES

SOLAR COLLECTORS INSTALLED PER THIS PLAN SHALL NOT FORM PART OF THE BUILDING ENVELOPE LIKE A WINDOW, DOOR, SKYLIGHT, OR BIPV. SOLAR COLLECTORS SHALL BE MOUNTED ABOVE THE ROOF SURFACE SIMILAR AN AC CONDENSER, THEREFORE, SOLAR COLLECTORS THUS INSTALLED DO NOT REQUIRE A PRESSURE RATING AS DO COMPONENTS SUCH AS WINDOWS, DOORS, & SKYLIGHTS.

STRUCTURAL NOTES

1. SOLAR COLLECTORS ARE TO BE MOUNTED IN PRESSURE ZONES Z1 AND Z2. SEE TABLE 3 FOR RIDGE OFFSET TO Z1, Z2, OR Z3. **THE COLLECTOR SHOULD NEVER EXCEED THE EXISTING BUILDING HEIGHT AT THE HIGHEST POINT.**
2. WHEN MOUNTED PER THESE INSTRUCTIONS, THE SOLAR SYSTEM DOES NOT EXCEED FOUR POUNDS PER SQUARE FOOT (4 PSF).
3. SOLAR COLLECTORS ARE TO BE INSTALLED IN THE SAME PLANE AS THE ROOF, THE MOUNTING SYSTEM RAISES THE SOLAR COLLECTORS 3.75" ABOVE THE FINISHED ROOF TO ALLOW THE SHEDDING OF WATER AND WIND-BORNE DEBRIS.
4. THE CONCENTRATED LOAD IMPOSED BY THE ADDITION OF THE FULLY WETTED SOLAR COLLECTOR(S) IS 51.5 LBS PER MOUNTING POINT.
5. SOLAR COLLECTORS MOUNTS ARE TO BE ANCHORED DIRECTLY ABOVE AND INTO THE SOLID ROOF RAFTERS WITH 3/8"-16 DIAMETER LAG SCREWS, 4 INCHES IN LENGTH WHICH EXCEED THE MINIMUM REQUIREMENT OF 5/16" DIA x 2½" EMBEDMENT. CONTRACTOR SHALL CONSULT THE ENGINEER OF RECORD FOR MOUNTING ALTERNATIVES SHOULD THE INSTALLATION REQUIRE SUCH.

WIND LOAD CALCULATIONS FOR THIS PROJECT HAVE BEEN DETERMINED IN ACCORDANCE WITH ASCE 7-10, CHAPTER 30, TABLE 30.5-1, COMPONENTS AND CLADDING - METHOD 1. THE BASIC WIND SPEED AND SNOW LOAD DATA IS AS DETERMINED FROM APPLIED TECHNOLOGY COUNCIL (ATC), WINDSPEED BY LOCATION WEB APPLICATION IN ACCORDANCE WITH THE 2012 IBC, SECTION 1609.1.1.
(REF: http://windspeed.atcouncil.org/)

SEISMIC LOAD CALCULATIONS FOR THIS PROJECT HAVE BEEN DETERMINED IN ACCORDANCE WITH ASCE 7-10, CHAPTER 13, SEISMIC DESIGN REQUIREMENTS FOR NONSTRUCTURAL COMPONENTS, UTILIZING VALUES DETERMINED FROM THE UNITED STATES GEOLOGICAL SURVEY (USGS) U.S. SEISMIC DESIGN MAPS WEB APPLICATION IN ACCORDANCE WITH THE 2012 IBC, SECTION 1613.3.3.
(REF: https://earthquake.usgs.gov/hazards/designmaps/)

LOAD CALCULATIONS ARE BASED ON EXPOSURE CATEGORY "C" CONDITIONS EXPECTED THROUGHOUT THE CENTRAL VALLEY REGION OF THE STATE. CALCULATIONS CAN BE FOUND IN APPENDIX "C" OF THE SUBMITTAL DOCUMENTS.

(1) DRAWINGS, CALCULATIONS AND ASSOCIATED TABLES DEVELOPED REQUIRE A P.E. SEAL AND SIGNATURE.

(2) SUPPORT DOCUMENTS, CUT SHEETS, TABLES AND REPRINTS FROM PUBLICATIONS SUCH AS ASCE 7-10 DO NOT REQUIRE A P.E. SEAL AND SIGNATURE.

ENGINEER OF RECORD
NELSON HELLMUTH

PROFESSIONAL ENGINEER
FL. LICENSE NO. 31488

1045 Energy Cove Court
Cove Springs, FL 32043
903-574-2100
www.aetsolar.com

DRAWING TITLE:
TITLE PAGE

SOLAR WATER HEATING IMPROVEMENTS

REVISIONS

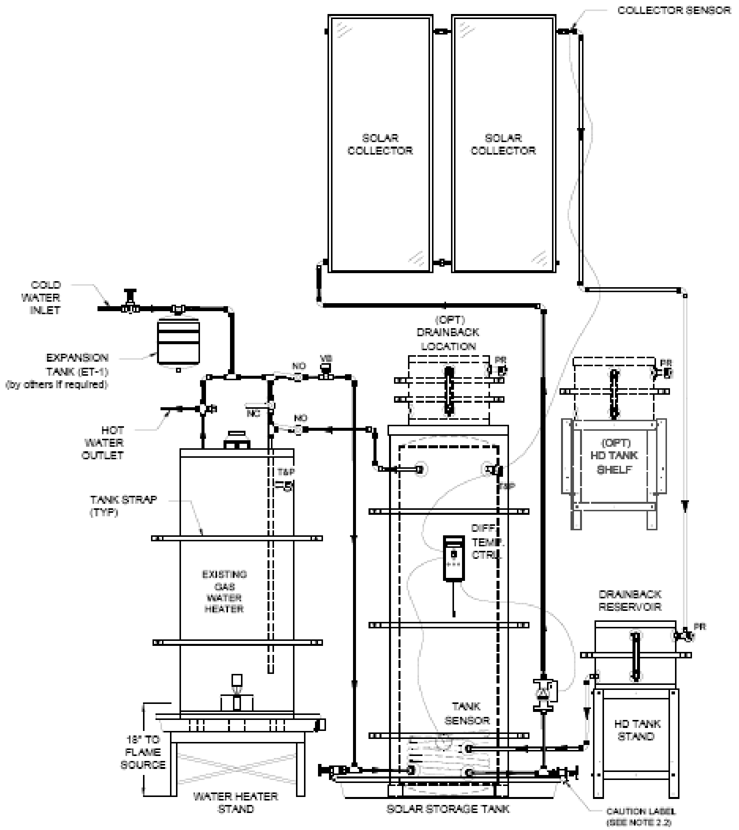
REV	DATE	BY	DESCRIPTION

DRAWING INFORMATION

DATE:	8/9/17
DRAWN BY:	---
SCALE:	N.T.S.
SHEET NO:	ST01

ALTERNATE ENERGY TECHNOLOGIES, LLC.

Pre-approved Permit Package



NOTE:

1. RELIEF VALVES SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND SHALL BE DISCHARGED IN ACCORDANCE WITH CPC: SECTION 608.5, WHEREBY, DISCHARGE PIPING SERVING A TEMPERATURE RELIEF VALVE, PRESSURE RELIEF VALVE, OR COMBINATION OF BOTH SHALL HAVE NO VALVES, OBSTRUCTIONS, OR MEANS OF ISOLATION AND BE PROVIDED WITH THE FOLLOWING:
   - 1.1. Equal to the size of the valve outlet and shall discharge full size to the flood level of the area receiving the discharge and pointing down.
   - 1.2. Materials shall be rated at not less than the operating temperature of the system and approved for such use.
   - 1.3. Discharge piping shall discharge independently by gravity through an air gap into the drainage system or outside of the building with the end of the pipe not exceeding 2 feet (610 mm) and not less than 6 inches (152 mm) above the ground and pointing downward.
   - 1.4. Discharge in such a manner that does not cause personal injury or structural damage.
   - 1.5. No part of such discharge pipe shall be trapped or subject to freezing.
   - 1.6. The terminal end of the pipe shall not be threaded.
   - 1.7. Discharge from a relief valve and into a water heater pan shall be prohibited.
2. AN INDIRECT-FIRED WATER HEATER THAT INCORPORATES A SINGLE-WALL HEAT EXCHANGER SHALL BE IN ACCORDANCE WITH CPC: 505.4.1 AND THE FOLLOWING REQUIREMENTS:
   - 2.1. The heat transfer medium shall be either potable water or contains fluids recognized as safe by the Food and Drug Administration (FDA) as food grade.
   - 2.2. Bear a label with the word "caution", followed by the following statements:
     - 2.2.1. The heat-transfer medium shall be potable water or other nontoxic fluid recognized as safe by the FDA.
     - 2.2.2. The maximum operating pressure of the heat exchanger shall not exceed the maximum operating pressure of the potable water supply.
   - 2.3. The word "caution" and the statements in letters shall have a uppercase height of not less than 0.120 of an inch (3.048 mm). The vertical spacing between line of type shall be not less than 0.046 of an inch (1.168 mm). Lowercase letters shall be compatible with the uppercase letter size specification.
3. DRAINBACK HAS THREE MOUNTING OPTIONS; FLOOR TANK STAND, WALL TANK MOUNT, AND ATOP OF SOLAR STORAGE TANK. DRAINBACK FLOOR AND WALL MOUNT TANK STAND PROVIDED BY ALTERNATE ENERGY TECHNOLOGIES, LLC.
4. ONE STRAP FOR DRAINBACK FOR WALL MOUNT AND FLOOR STAND AND TWO STRAPS FOR DRAINBACK ATOP THE SOLAR STORAGE TANK.

FLAT PLATE SOLAR COLLECTORS

TAG	MANUFACTURER	MODEL	COLLECTOR DIMENSIONS	GROSS AREA SQ.FT.	NET APERTURE SQ.FT.	DRY WEIGHT LBS.	FLUID CAPACITY U.S. GALLONS	DESIGN FLOW RATE - GPM	DESIGN PRESSURE DROP @ DESIGN FLOW RATE - PSID	MAX. FLOW RATE - GPM	MAX. OPERATING PRESSURE - PSIG	STD. HEADER WIDTH - INCHES	STD. HEADER DIA. - INCHES	HEADER CENTER TO CENTER - INCHES
A	AET SOLAR, LLC	MSC-32	[illegible]	32.07	29.67	115	1.00	1.28	[illegible]	10	160	52"	1"	[illegible]
B	AET SOLAR, LLC	MSC-20	[illegible]	20.08	18.43	79	0.82	0.75	[illegible]	10	160	52"	1"	[illegible]
NOTE	1. INSTALL COLLECTORS PER MANUFACTURER'S RECOMMENDATIONS. INSTALLING CONTRACTOR IS RESPONSIBLE FOR ANGLE STANDS, ROOF ANCHORING FOR PANELS, AND ANCHORING. COLLECTORS ARE TO BE SRCC RATED.													

SOLAR STORAGE / TRANSFER TANKS(S)

TAG	LOCATION	MANUFACTURER	MODEL	STORAGE CAPACITY	HEIGHT	DIAMETER	SHIPPING WEIGHT	REMARKS
DB-1	GARAGE / UTILITY ROOM	AET SOLAR, LLC	DB-10	10 GALLONS	[illegible]	18"	30 LBS	N/A
A	GARAGE / UTILITY ROOM	AET SOLAR, LLC	[illegible]	80 GALLONS	72"	25"	[illegible]	INCLUDES INTERNAL, SINGLE-WALL HEAT EXCHANGER
B	GARAGE / UTILITY ROOM	AET SOLAR, LLC	[illegible]	[illegible]	62"	25"	[illegible]	INCLUDES INTERNAL, SINGLE-WALL HEAT EXCHANGER
ET-1	GARAGE / UTILITY ROOM	HONEYWELL	[illegible]	2 GAL (ACCEPT)	[illegible]	8"	6 LBS	(OR EQUIVALENT)

MAY BE OUTSIDE, MOUNTED IN AN APPROVED ENCLOSURE FOR CLIMATE ZONES [illegible]

CIRCULATION PUMP SCHEDULE

TAG	AREA OR SYSTEM SERVED	LOCATION	MFGR	MODEL	GPM	HEAD FT.	SUCTION / DISCHARGE SIZE	HP	WATTS	VOLTAGE / PHASE	REMARKS
P-1	DOMESTIC SOLAR STORAGE LOOP	GARAGE / UTILITY RM	GRUNDFOS	[illegible]	[illegible]	[illegible]	1"	1/25	[illegible]	115/1	[illegible]

MAY BE OUTSIDE, MOUNTED IN AN APPROVED ENCLOSURE FOR CLIMATE ZONES [illegible]

CONTROLS

TAG	AREA OF SYSTEM SERVED	LOCATION	MANUFACTURER	MODEL	VOLTS	HZ	REMARKS
DTC-1	DOMESTIC SOLAR STORAGE LOOP	GARAGE / UTILITY RM	AET SOLAR, LLC	[illegible]	120	60	DIFFERENTIAL TEMPERATURE CONTROL W/ [illegible] THERMISTOR SENSORS

MAY BE OUTSIDE, MOUNTED IN AN APPROVED ENCLOSURE FOR CLIMATE ZONES [illegible]

MISCELLANEOUS VALVES

TAG	LOCATION	MANUFACTURER	MODEL	SIZE CONNECTION	REMARKS
V-1	GARAGE / UTILITY ROOM	WATTS	[illegible]	3/4" THREADED	LEAD FREE CAST COPPER SILICON ALLOY BODY CONSTRUCTION
V-2	GARAGE / UTILITY ROOM	[illegible]	[illegible]	3/4" SWEAT	FULL PORT FORGED BRASS BALL VALVE W/ ADJUSTABLE PACKING GLAND

MAY BE OUTSIDE, MOUNTED IN AN APPROVED ENCLOSURE FOR CLIMATE ZONES [illegible]

LEGEND

VARIABLE SPEED PUMP WITH FLANGES AND ISOLATION VALVES	UNION
BALL VALVE	PIPE CAP
BOILER DRAIN (VALVE)	GATE VALVE
MIXING VALVE	HOT WATER
PIPE ELBOW	COLD WATER
VB VACUUM BREAKER	PIPE TEE
	T&P TEMP/ PRESS RELIEF VALVE
	PR PRESS RELIEF VALVE

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DRAWING TITLE:
SYSTEM DIAGRAM
COMPONENT SCHEDULES

SOLAR WATER HEATING IMPROVEMENTS

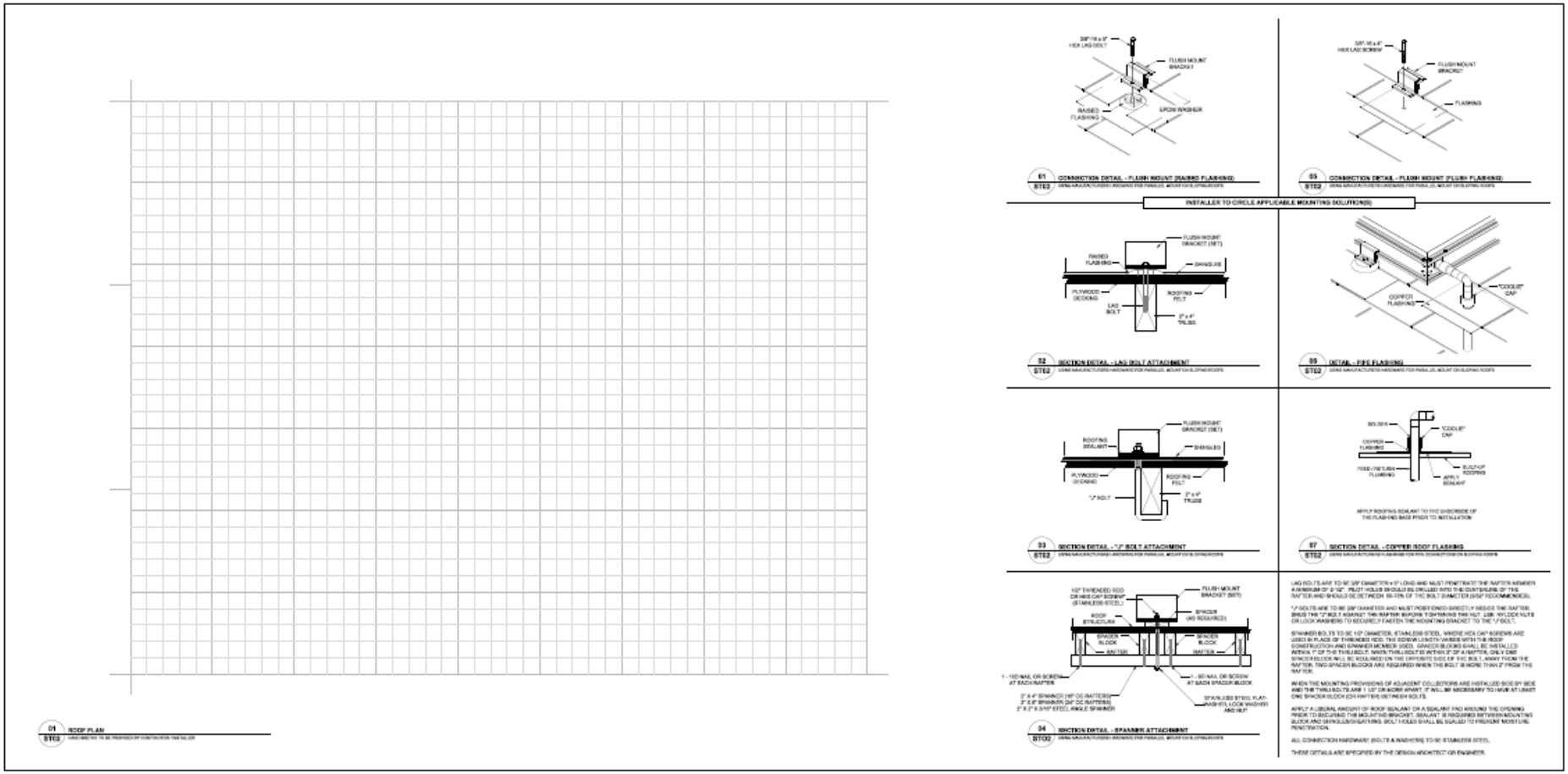
REVISIONS

REV	DATE	BY	DESCRIPTION

DRAWING INFORMATION	
DATE:	8/7/17
DRAWN BY:	RDV
SCALE:	N.T.S.
SHEET NO:	ST02

ALTERNATE ENERGY TECHNOLOGIES, LLC.

Pre-approved Permit Package



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DRAWING TITLE:

ROOF PLAN
MOUNTING ATTACHMENTS

SOLAR WATER HEATING
IMPROVEMENTS

REVISIONS

REV	DATE	BY	DESCRIPTION

DRAWING INFORMATION

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SHEET NO:	ST03

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ALTERNATE ENERGY TECHNOLOGIES, LLC.

SOLAR DOMESTIC WATER HEATING STANDARD PLAN

GENERAL REQUIREMENTS

- A. System size is 30 kWth (462 square feet of collector) or less ☐ Y ☐ N
- B. The solar array is roof-mounted on one- or two-family dwelling or accessory structure ☐ Y ☐ N
- C. The solar collector arrays will not exceed the maximum legal building height ☐ Y ☐ N
- D. Solar collectors are certified by an accredited listing agency ☐ Y ☐ N
- E. Solar domestic water heating system is certified by an accredited listing agency ☐ Y ☐ N
- F. Permit application is completed and attached ☐ Y ☐ N
- G. System schematic is included ☐ Y ☐ N
- H. List of major components to match system schematic ☐ Y ☐ N
- I. Heat transfer fluid is either water or a nontoxic fluid ☐ Y ☐ N

PLUMBING REQUIREMENTS

- A. Adequate extreme temperature protection is provided ☐ Y ☐ N

STRUCTURAL REQUIREMENTS

- A. A completed Structural Criteria and supporting documentation is attached (as required) ☐ Y ☐ N

Notes:
These criteria are intended for streamlined solar permitting process.
1. *If any items are checked NO, revise design to fit within Eligibility Checklist, otherwise permit application may go through standard process.*

NOTES/COMMENTS:

STRUCTURAL CRITERIA FOR RESIDENTIAL FLUSH-MOUNTED SOLAR ARRAYS

1. ROOF CHECKS

A. Visual Review/Contractor's Site Audit of Existing Conditions:
1) Is the roof a single roof without a reroof overlay? Y / N
2) Does the roof structure appear structurally sound, without signs of alterations or significant structural deterioration or sagging, as illustrated in Figure 1? Y / N

B. Roof Structure Data:
1) Measured roof slope (e.g. 6:12): ______ :12
2) Measured rafter spacing (center-to-center): ______ inch
3) Type of roof framing (rafter or manufactured truss): Rafter / Truss

2. SOLAR ARRAY CHECKS

A. Flush-mounted Solar Array:
1) Is the plane of the modules (panels) parallel to the plane of the roof? Y / N
2) Is there a 2" to 10" gap between underside of module and the roof surface? Y / N
3) Modules do not overhang any roof edges (ridges, hips, gable ends, eaves)? Y / N

B. Do the modules plus support components weigh no more than: 4 psf for photovoltaic arrays or 5 psf for solar thermal arrays? (collectors are 3.8 psf wet) Y / N

C. Does the array cover no more than half of the total roof area (all roof planes)? Y / N

D. Are solar support component manufacturer's project-specific completed worksheets, tables with relevant cells circled, or web-based calculator results attached? Y / N

E. Is a roof plan of the module and anchor layout attached? (see Figure 2) Y / N

F. Downward Load Check (Anchor Layout Check):
1) Proposed anchor horizontal spacing: ______'-____" ft-in
2) Horizontal anchor spacing per Table 1: ______'-____" ft-in
3) Is proposed anchor horizontal spacing equal to or less than Table 1 spacing? Y / N

G. Wind Uplift Check (Anchor Fastener Check):
1) Anchor fastener data (see Sheet ST02 - 02, 03, or 05:
a. Diameter of lag screw, hanger bolt or self-drilling screw: _____ inch
b. Embedment depth of rafter: _____ inch
c. Number of screws per anchor (typically one): _____
d. Are 5/16" diameter lag screws with 2.5" embedment into the rafter (min) used, OR does the anchor fastener meet the manufacturer's guidelines? Y / N

3. SUMMARY

A. All items above are checked YES. No additional calculations are required.
B. One or more items are checked NO. Attach project-specific drawings and calculations stamped and signed by a California-licensed civil or structural engineer.

Job Address: ______________________ Permit #: ______________

Contractor/Installer: ______________________ License # & Class: ______________

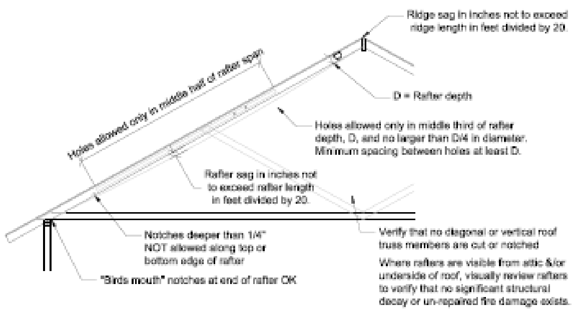
Signature: ______________ Date: __________ Phone #: ______________

Optional Additional Rafter Span Check Criteria
[At option of CBO, insert rows (4) to (7) below into table above after row 1.B.(3)]

1. ROOF CHECKS

B. Roof Structure Data:
4) Measured rafter size (e.g. 1½ x 3½, not 2x4): _____ x _____ inch
5) Measured rafter horizontal span: ______'-____" ft-in
6) Horizontal rafter span per Table 2: ______'-____" ft-in
7) Is measured horizontal rafter span less than Table 2 span (see next page)? Y / N / Truss

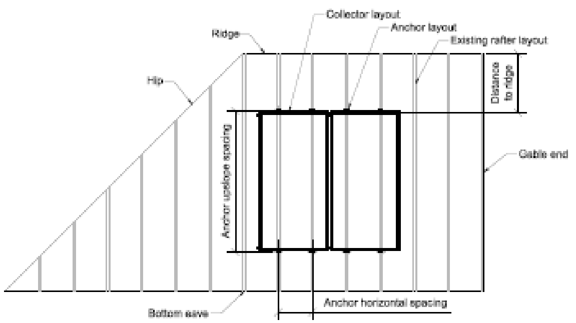
Figure 1. Roof Visual Structural Review (Contractor's Site Audit) of Existing Conditions



The site auditor should verify the following.
1. No visually apparent disallowed rafter holes, notches and truss modifications as shown above.
2. No visually apparent structural decay or unrepaired fire damage.
3. Roof sag, measured in inches, is not more than the rafter or ridge beam length in feet divided by 20.

Rafters that fail the above criteria should not be used to support solar arrays unless they are first strengthened.

Figure 2. Sample Solar Collector Array and Anchor Layout Diagram (Roof plan)



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NOTICES:

DRAWING TITLE:
STRUCTURAL CRITERIA AND REVIEW

SOLAR WATER HEATING IMPROVEMENTS

REVISIONS

REV	DATE	BY	DESCRIPTION

DRAWING INFORMATION	
DATE:	8/7/17
DRAWN BY:	RDV
SCALE:	N.T.S.
SHEET NO:	ST04

ALTERNATE ENERGY TECHNOLOGIES, LLC.

Table 1. Maximum Horizontal Anchor Spacing				
Roof Slope		Rafter Spacing		
		16" o.c.	24" o.c.	32" o.c.
Solar Thermal Arrays (5 psf max)				
Flat to 6:12	0° to 26°	4'-0"	4'-0"	5'-4"
7:12 to 13:12	27° to 45°	1'-4"	2'-0"	2'-8"
13:12 to 24:12	46° to 63°	Calc. Req'd	Calc. Req'd	Calc. Req'd

Solar support component manufacturer's guidelines may be relied upon to ensure the array above the roof is properly designed, but manufacturer's guidelines typically do NOT check to ensure that the roof itself can support the concentrated loads from the solar array. Table 1 assumes that the roof complied with the building code in effect at the time of construction, and places limits on anchor horizontal spacing to ensure that a roof structure is not overloaded under either downward loads or wind uplift loads. Note 4 below lists the basic assumptions upon which this table is based.

Table 1 Notes:

1. Anchors are also known as "stand-offs," "feet," "mounts" or "points of attachment." Horizontal anchor spacing is also known as "cross-slope" or "east-west" anchor spacing (see Figure 2).
2. If anchors are staggered from row-to-row going up the roof, the anchor spacing may be twice that shown above, but no greater than 6'-0".
3. For manufactured plated wood trusses at slopes of flat to 6:12, the horizontal anchor spacing shall not exceed 4'-0" and anchors in adjacent rows shall be staggered.
4. This table is based on the following assumptions:
   - The roof structure conformed to building code requirements at the time it was built.
   - The attached list of criteria is met.
   - Mean roof height is not greater than 40 feet.
   - Roof sheathing is at least 7/16" thick oriented strand board or plywood. 1x skip sheathing is acceptable.
   - If the dwelling is in Wind Exposure B (typical urban, suburban or wooded areas farther than 500 yards from large open fields), no more than one of the following conditions apply:
     - The dwelling is located in a Special Wind Region with design wind speed between 115 and 130 mph per ASCE 7-10.
     - The dwelling is located on the top half of a tall hill, provided average slope is less than 15%.
   - If the dwelling is in Wind Exposure C (within 500 yards of large open fields or grasslands), all of the following conditions apply:
     - Design wind speed is 110 mph or less (not in a Special Wind Region).
     - The dwelling is not located on the top half of a tall hill.
   - The solar array displaces roof live loads (temporary construction loads) that the roof was originally designed to carry.
   - The Structural Technical Appendix provides additional information about analysis assumptions.

Table 2. Roof Rafter Maximum Horizontal Span (feet-inches)1								
Assumed Vintage	Nominal Size	Actual Size	Non-Tile Roof[2]			Tile Roof[3]		
			Rafter Spacing					
			16" o.c.	24" o.c.	32" o.c.	16" o.c.	24" o.c.	32" o.c.
Post-1960	2x4	1½" x 3½"	9'-10"	8'-0"	6'-6"	8'-6"	6'-11"	5'-6"
	2x6	1½" x 5½"	14'-4"	11'-9"	9'-6"	12'-5"	10'-2"	8'-0"
	2x8	1½" x 7¼"	18'-2"	14'-10"	12'-0"	15'-9"	12'-10"	10'-3"
Pre-1960	2x4	1¾" x 3¾"	11'-3"	9'-9"	7'-9"	10'-3"	8'-6"	6'-9"
	2x6	1¾" x 5¾"	17'-0"	14'-0"	11'-3"	14'-9"	12'-0"	9'-9"
	2x8	1¾" x 7¾"	22'-3"	18'-0"	14'-6"	19'-0"	15'-6"	12'-6"

Note to contractor; highlight vintage and size as applicable.

Beyond a visual review by the contractor checking for unusual sagging or deterioration, some CBOs may want additional assurance that the roof structure complies with structural building code requirements. Table 2 is an optional table some CBOs may elect to use to provide additional assurance by requiring a check of existing roof rafter spans, and supports optional criteria 1.B.5 and 1.B.6. For post-1960 construction, these span tables match the rafter span tables found in the 2013 California Building and Residential codes. For pre-1960 construction, the rafter span tables are based on structural calculations with lumber sizes and wood species and grade appropriate for older construction. Note 5 below lists the basic assumptions upon which this table is based.

Table 2 Notes:

1. See Figure 4 for definition of roof rafter maximum horizontal span.
2. "Non-tile Roof" = asphalt shingle, wood shingle and wood shake, with an assumed roof assembly weight of 10 psf.
3. "Tile Roof" = clay tile or cement tile, with an assumed roof assembly weight of 20 psf
4. Unaltered manufactured plated-wood trusses may be assumed to be code compliant and meet intent of Table 2.
5. This table is based on the following assumptions:
   - Span/deflection ratio is equal to or greater than 180.
   - For post-1960 construction, wood species and grade is Douglas Fir-Larch No. 2.
   - For pre-1960 construction, wood species and grade is Douglas Fir-Larch No. 1.
   - Other wood species and/or grade are also acceptable if allowable bending stress is equal or greater to that listed.

Figure 3. Typical Anchor with Lag Screw Attachment

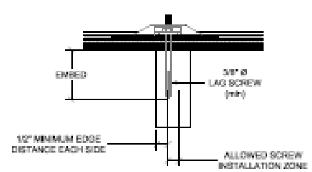
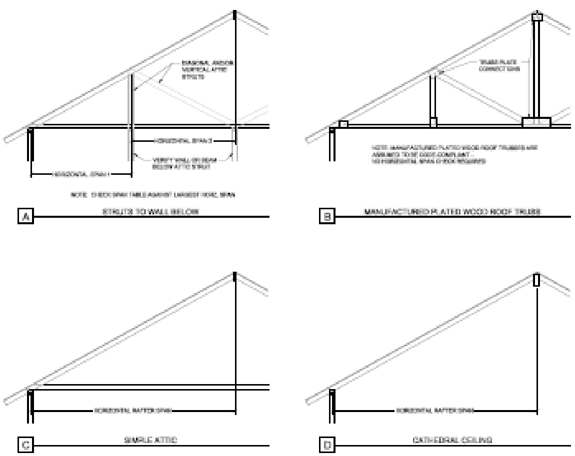


Table 3. Minimum Distance to Ridge "X" from Center of Collector Mount								
Roof Angle	Roof Pitch	Distance to Ridge, "X"	Roof Angle	Roof Pitch	Distance to Ridge, "X"	Roof Angle	Roof Pitch	Distance to Ridge, "X"
1	0.2 : 12	21'-8"	11	2.3 : 12	1'-10"	21	4.6 : 12	0'-11"
2	0.4 : 12	10'-9"	12	2.6 : 12	1'-8"	22	4.8 : 12	0'-10"
3	0.6 : 12	7'-2"	13	2.8 : 12	1'-6"	23	5.1 : 12	0'-9"
4	0.8 : 12	5'-4"	14	3.0 : 12	1'-5"	24	5.3 : 12	0'-9"
5	1.0 : 12	4'-3"	15	3.2 : 12	1'-4"	25	5.6 : 12	0'-8"
6	1.3 : 12	3'-6"	16	3.4 : 12	1'-3"	26	5.9 : 12	0'-8"
7	1.5 : 12	3'-0"	17	3.7 : 12	1'-2"	27	6.1 : 12	0'-8"
8	1.7 : 12	2'-7"	18	3.9 : 12	1'-1"	28	6.4 : 12	0'-7"
9	1.9 : 12	2'-4"	19	4.1 : 12	1'-0"	29	6.7 : 12	0'-7"
10	2.1 : 12	2'-1"	20	4.4 : 12	0'-11"			

Figure 4. Definition of Rafter Horizontal Span



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DRAWING TITLE:

ANCHOR LAYOUT DIAGRAM

SOLAR WATER HEATING IMPROVEMENTS

REVISIONS			
REV	DATE	BY	DESCRIPTION

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DATE:	8/7/17
DRAWN BY:	RDV
SCALE:	N.T.S.
SHEET NO:	ST05

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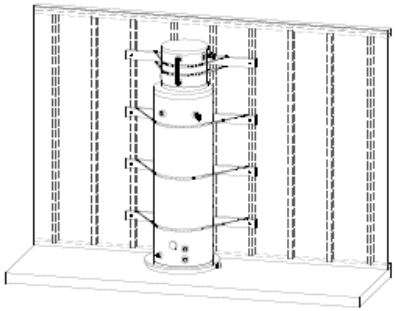
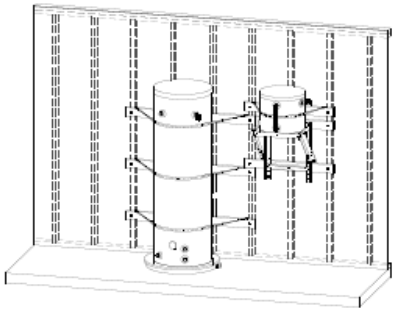
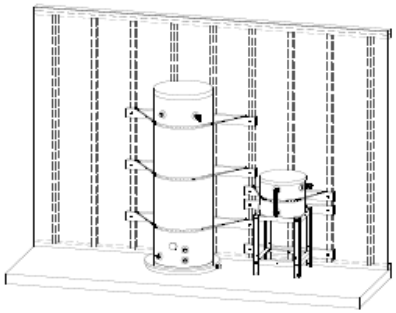


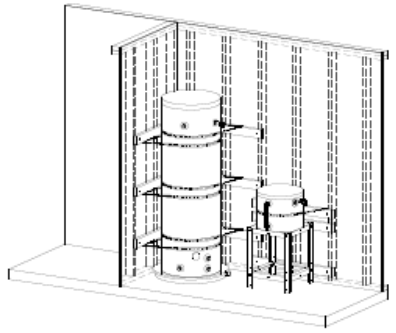
01 STRAPPING - TANK TOP MOUNTED DRAINBACK RESERVOIR
ST06



03 STRAPPING - SHELF MOUNTED DRAINBACK RESERVOIR
ST06



02 STRAPPING - STAND MOUNTED DRAINBACK RESERVOIR
ST06



04 STRAPPING - SHELF MOUNTED SOLAR STORAGE
ST06

NOTES:

1. THE SOLAR STORAGE TANK AND DRAINBACK RESERVOIR SPECIFIED IN THIS SOLAR SYSTEM SHALL BE STRAPPED FOR SEISMIC LOADING IN ACCORDANCE WITH IPC SEC 2 AND/OR APPLICABLE MODIFICATIONS REQUIRED BY THE LOCAL AUTHORITY HAVING JURISDICTION.
2. THE SOLAR STORAGE TANK, BEING OF A CAPACITY LARGER THAN 80 GALLONS, REQUIRES 3 STRAPS. WHERE AS THE DRAINBACK RESERVOIR WILL REQUIRE 2 STRAPS IF MOUNTED ON TOP OF THE SOLAR STORAGE TANK, OR 1 STRAP CLOSE TO THE TOP IF MOUNTED ON THE FACTORY SUPPLIED TANK STAND DUE TO THE FLANGE ON THE BOTTOM WHICH HOLDS THE RESERVOIR IN PLACE.
3. STRAPPING TO BE INSTALLED PER THE PRODUCT MANUFACTURER'S INSTALLATION INSTRUCTIONS. THE DRAWINGS SHOWN IN THIS DOCUMENT ARE FOR ILLUSTRATION PURPOSES ONLY - CONSULT LOCAL CODES FOR APPROVED METHODS AND MATERIALS.

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DRAWING TITLE:

SEISMIC STRAPPING

SOLAR WATER HEATING
IMPROVEMENTS

REVISIONS

REV	DATE	BY	DESCRIPTION

DRAWING INFORMATION

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