



# **SOLAR SKIES SERIES SOLAR THERMAL COLLECTOR INSTALLATION GUIDELINES**



Solar Skies Mfg, LLC  
106 Donovan Drive • Alexandria, MN 56308 • Ph 320-762-1151 Fax 320-762-1460



## **Introduction**

Solar Skies Mfg., LLC solar thermal panels are built using the highest quality standards and materials and will perform for many years provided that they are installed and maintained correctly. Please take time to read and understand this booklet thoroughly.

Solar Skies Mfg., LLC is unable to provide explicit instructions for every type of roof and building system that will be encountered. This booklet outlines some common situations and provides suggestions, but it is ultimately the installers responsibility to determine applicability with local codes, structural integrity of the existing building, and to consult with a Structural Engineer when appropriate.

## **Precautions**

Care must be taken when handling solar thermal panels. During installation make sure that the collector face is covered with cardboard, tarps, or some other similar material to block the sun. The panels can become dangerously hot!

Header blocks are provided to protect the headers. Leave these strapped to the collector for as long as possible during installation. Do not lift the collectors by the headers alone.

Installation of solar thermal panels requires the use of tools that can be very dangerous. Additionally the work environment itself poses many safety threats due to height, weather, etc and the physical size, and weight of the collectors. It is not the purpose of this booklet to address these safety concerns. It is the installers' responsibility to understand and follow all appropriate safety measures for any tools, work supports, ladders and environments/conditions encountered during installation. There are many good sources of this information, such as the manufacturer of the tool in question, OSHA, and various trade organizations. If there is any question in this area do not proceed until the concerns are addressed.

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## Collector Location

Proper location and orientation of the solar collectors is important for maximum system efficiency. The collectors should be located as close to the storage tank as possible to minimize heat loss in the piping. The collectors must be free of shading between the hours of 9:30 AM to 3:00 PM year around for best performance. When mounting multiple collectors, make sure that the southern most collectors do not shade the other collectors.

Figure 1 below shows many alternatives for collector mounting. Placing the collectors as close as possible to the peak of the roof will make installation easier due to increased attic access.

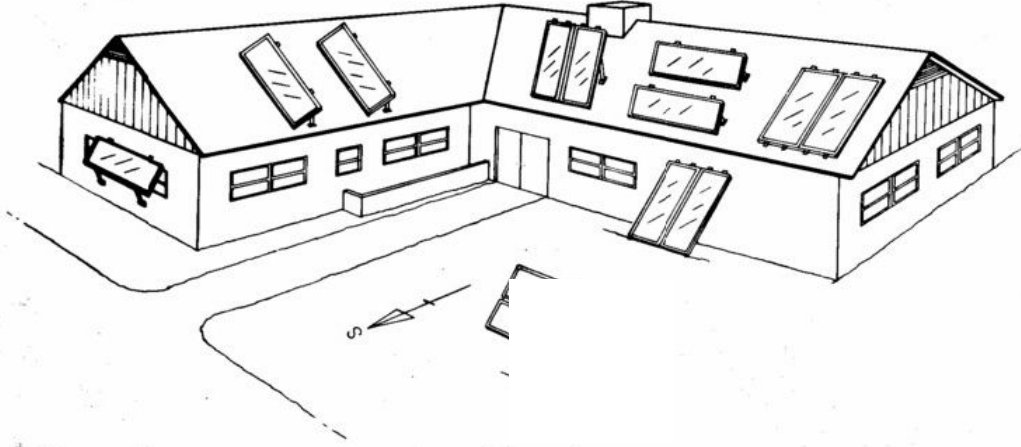


Figure 1

## Collector Orientation

Collectors should be positioned to face true south. In the northern hemisphere a maximum deviation of 20° of true south is allowable, however this will degrade performance.

For year around domestic hot water the collector should be tilted to an angle off of horizontal equal to latitude. To optimize for winter performance (space heating) add 15°. To optimize for summer performance (pool heating) subtract 15°.

Collectors can be mounted with the long dimension vertical or horizontal for closed loop pressurized systems. In drain back systems the collectors must be mounted vertical.

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## Installation

1. Always check and comply with local codes.
2. Copper pipe must be used for collector feed and return lines in all applications. Under no circumstances should galvanized pipe be used.
3. Verify the condition of the supporting structure. Consult local codes, building inspectors and/or a Structural Engineer as appropriate.
4. Mounting hardware must be securely attached to structural members of the supporting building or frame to withstand local environmental (wind, snow, seismic, etc.) conditions in your area. Consult local codes and or a Structural Engineer as appropriate.
5. Use only Solar Skies Mfg., LLC mounting hardware (MT-TM, MT-FM, or MT-RM) to attach collectors to the previously verified structural members. A minimum of 4 connection points per collector are required. Refer to the appropriate mounting hardware instructions included in the mounting hardware package.
6. In drain back system installations there must be proper pitch (minimum  $\frac{1}{4}$ " per foot) for the collectors and system piping to ensure freeze protection. Collectors cannot be mounted horizontally in drain back systems.
7. Heat transfer fluid must enter in the bottom corner of the collector (array) and exit the opposite top corner (reverse return fluid flow) to achieve equal flow through all risers.
8. Connect collectors (up to 8 per array) using ground joint unions or copper sweat couplings. Use caution when soldering. Shield the header grommets and point flame away them. If using optional Solar Skies Mfg. optional EZ connect unions apply pipe joint compound to lubricate the threads.
9. Before commissioning the system, pressure test (350 psi max) and thoroughly flush the collectors and solar loop of flux, oil, and any other contaminants.

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## Other Considerations

1. Excessive flow rates are detrimental to the collectors. Flow rates must be between 0.5 and 1.8 GPM.
2. For systems using antifreeze use a solution of propylene glycol and distilled water. The antifreeze used must be manufactured specifically for use in a closed loop solar system. Follow the recommendations of the manufacturer for proper freeze protection in your area.
3. Water quality is very important. Make sure that any fluid circulated through the collectors is non-corrosive to copper. Scale deposits will reduce collector efficiency and could plug risers. Failures due to scale or corrosion are not covered under warranty.
4. Do not allow heat transfer fluid to freeze or boil out in the collector.
5. Water vapor may show up on the inside of the collector glass when initially installed. This is not a problem and will clear after a few days of operation. Consult with your dealer or factory representative if it does not clear within a week of sunny weather.

## Maintenance

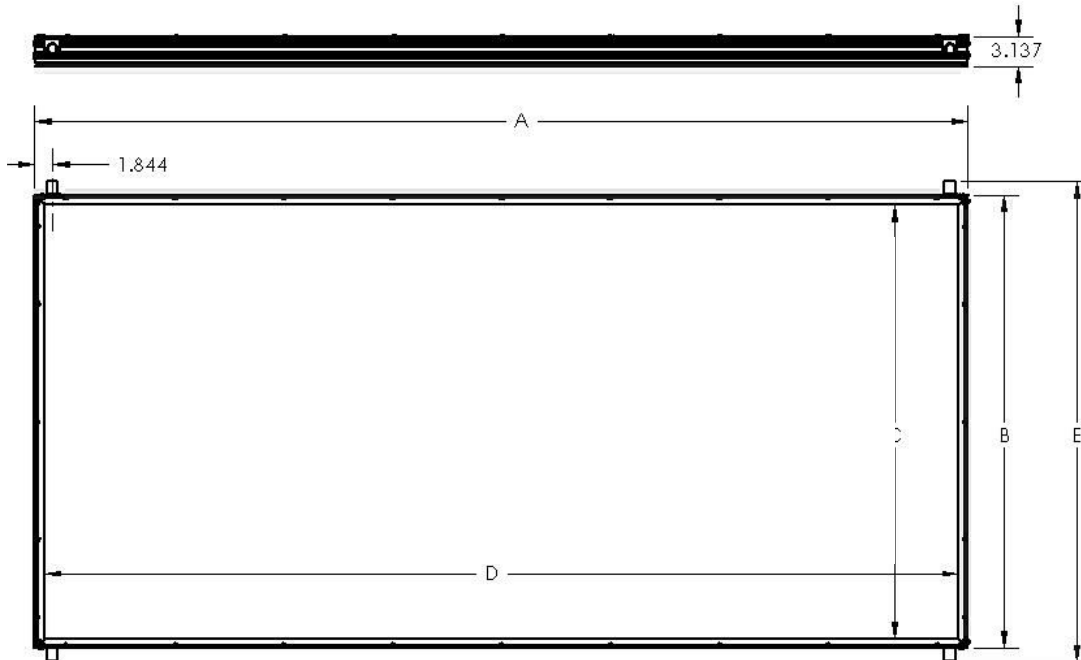
Collectors should be regularly checked (annual inspection recommended) along with the balance of the solar system.

1. Examine the collector frame, glazing, and gaskets for any damage. Report problems to your dealer or factory representative.
2. Examine mounting hardware, brackets and connection points for structural integrity and water infiltration.
3. Check all plumbing connections for leaks. Ensure that all pipe hangers and attachments are connected and solid.
4. Check all pipe insulation. Ensure that it is in place and in functional condition.
5. Check for proper flow rates.
6. Check condition of heat transfer fluid. Ensure that it has not become corrosive or in any other way, detrimental to the collector or system.

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## Solar Skies Series Collectors – Mechanical Specifications



Spec	SS-21	SS-24	SS-26	SS-28	SS-32	SS-40
A	85.188	97.188	77.188	85.188	97.188	121.188
B	35.188	35.188	47.188	47.188	47.188	47.188
C	33.192	33.192	45.192	45.192	45.192	45.192
D	83.192	95.192	75.192	83.192	95.192	119.192
E	38.000	38.000	50.000	50.000	50.000	50.000
Gross Frontal Area (ft <sup>2</sup> )	20.8	23.7	25.3	27.9	31.8	39.7
Transparent Frontal Area (ft <sup>2</sup> )	19.2	21.9	23.6	26.1	29.9	37.4
Absorber Plate Area (ft <sup>2</sup> )	19	21.8	23.2	25.7	29.5	36.9
Fluid Capacity (gals)	.7	.76	.90	.96	1.05	1.22
Weight (lbs)	74	84	90	99	113	153

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## Technical Data

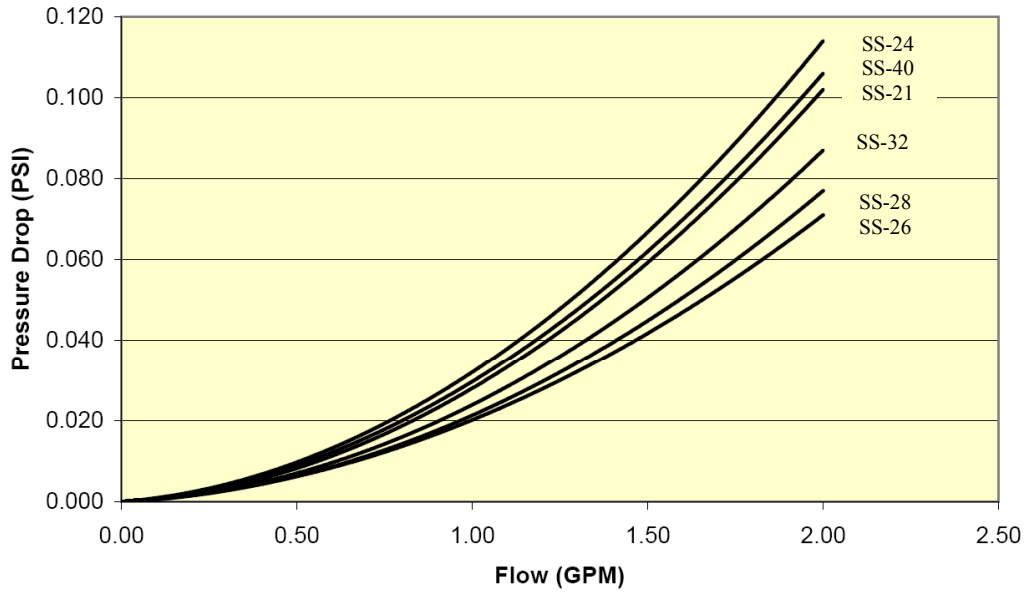
Frame:	6063-T6 extruded aluminum frame and battens per ANSI H35.1 with an architectural grade medium bronze polyester finish.									
Back-sheet:	Type 3105-H14, 0.019" thick stucco embossed aluminum, painted.									
Insulation:	Foil faced, glass fiber reinforced, polyisocyanurate rigid foam board manufactured using a free rise process. 1 ¼" R8.0 in back and ¾" R5.0 in sidewalls. Insulation complies with ASTM C1289, Type I, Class 2 codes.									
Absorber:	Parallel flow plate composed of 1" type M copper header tubes per ASTM B 88 specification with NSF-61 certification, brazed to ½" level-wound H58 temper, full hard alloy copper tube risers per ASTM B 743 using a brazing alloy that meets AWS-5.8, Class BCuP-4. A copper fin (ASTM B 152, UNS C1100 electrolytic tough pitch, H02 temper, minimum tensile strength 42.5 ksi) is welded to the riser tube using a high frequency forge weld to create an homogenous weld (no filler) with full thickness retained. The fin is coated with Thermafin™ Selective Crystal Clear coating. $\alpha = 0.96$ $\epsilon = 0.08$									
Glazing:	Low-Iron (<100ppm), "High T" Tempered (ASTM C-1948 & ANSI Z97.1 with a CPSC 16 CFR 1201 Category II break pattern) glass with total solar transmission (NREL 290-2600 nm) of 89% and maximum transmission of 91.57% at 565 nm.									
Gaskets/Grommets:	UV durable EPDM, continuous U-channel gasket with over-molded corners to prohibit water penetration and assure long life. Grommets made from extruded silicone.									
Fasteners:	1/8" 5056 aluminum rivets with shear strength of 930 N and tensile strength of 1450 N typical secure the back-sheet. Corners are made using ¼" aluminum structural rivets with retained mandrels (BS 1473 standards). Shear strength is 6.0 kN with a tensile strength of 4.2 kN typical. All screws are 18-8 Stainless Steel with black oxide coating for aesthetics.									
SRCC Test Data:	<table border="0"> <tr> <td>Efficiency Equation [Note: Based on gross area and (P)=Ti-Ta</td> <td>Y Intercept</td> <td>Slope</td> </tr> <tr> <td>S I Units: <math>\eta = 0.691 - 3.3960 (P)/I - 0.0197 (P)^2/I</math></td> <td>0.706</td> <td>-4.9099 W/m<sup>2</sup> °C</td> </tr> <tr> <td>I P Units: <math>\eta = 0.691 - 0.5985 (P)/I - 0.0019 (P)^2/I</math></td> <td>0.706</td> <td>-0.865 Btu/hr-ft<sup>2</sup> °F</td> </tr> </table>	Efficiency Equation [Note: Based on gross area and (P)=Ti-Ta	Y Intercept	Slope	S I Units: $\eta = 0.691 - 3.3960 (P)/I - 0.0197 (P)^2/I$	0.706	-4.9099 W/m <sup>2</sup> °C	I P Units: $\eta = 0.691 - 0.5985 (P)/I - 0.0019 (P)^2/I$	0.706	-0.865 Btu/hr-ft <sup>2</sup> °F
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Pressure Test:	350 PSI									
Stagnation Temp:	Tested to 400° F without significant degradation									
Flow rate:	0.5 to 1.8 GPM (recommended)									
Warranty	10 year full warranty									

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### Collector Pressure Drop Curves



Model	Area	Flow GPM	$\Delta p$ PSI	Flow kg/s	Flow kg/s <sup>2</sup>	$\Delta p$ in of H <sub>2</sub> O	$\Delta p$ Pa
SS-21	20.82	0.00	0.000	0.0000	0.000000	0.000	0
		1.00	0.028	0.0631	0.003975	0.775	193
		2.00	0.102	0.1261	0.015901	2.823	703
SS-24	23.75	0.00	0.000	0.0000	0.000000	0.000	0
		1.00	0.032	0.0631	0.003975	0.886	221
		2.00	0.114	0.1261	0.015901	3.156	786
SS-26	25.29	0.00	0.000	0.0000	0.000000	0.000	0
		1.25	0.030	0.0788	0.006211	0.830	207
		2.00	0.071	0.1261	0.015901	1.965	490
SS-28	27.92	0.00	0.000	0.0000	0.000000	0.000	0
		1.25	0.032	0.0788	0.006211	0.886	221
		2.00	0.077	0.1261	0.015901	2.131	531
SS-32	31.85	0.00	0.000	0.0000	0.000000	0.000	0
		1.25	0.036	0.0788	0.006211	0.996	248
		2.00	0.087	0.1261	0.015901	2.408	600
SS-40	39.71	0.00	0.000	0.0000	0.000000	0.000	0
		1.50	0.062	0.0946	0.008945	1.716	427
		2.00	0.106	0.1261	0.015901	2.934	731

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**SOLAR SKIES MFG, LLC  
FULL TEN YEAR WARRANTY on the NORTHSTAR  
& SOLAR SKIES SERIES SOLAR COLLECTORS MANUFACTURED by  
SOLAR SKIES MFG, LLC**

**1. SCOPE OF COVERAGE**

This warranty applies to a new solar collector purchased by the end user. The warranty covers the collector as a whole including all of its components and parts. It extends to the first buyer and to any subsequent owners of the system for a total of ten (10) years.

**2. WARRANTY ON THE COLLECTOR**

Solar Skies MFG, LLC fully warrants its solar collectors to be free from defects in both material and workmanship for a total period of ten (10) years from date of installation acceptance by the original owner. If a failure does occur during the warranty period, Solar Skies MFG, LLC will provide a new part, or at Solar Skies MFG, LLC's option, have repaired any part of the collector. A new warranty shall apply to any replacement part, but shall be limited in time to the remainder of the original warranty period. This warranty applies to collectors installed for use as a heat collector to provide energy for use in medium temperature range applications (110 to 210 degrees Fahrenheit) only.

**3. SERVICE LABOR RESPONSIBILITY**

This warranty covers labor expenses for removal and reinstallation. Solar Skies MFG, LLC will pay up to one hundred dollars (\$100.00) per collector for such expenses.

**4. ABSORBER SURFACE**

Solar Skies MFG, LLC warrants fully for a period of ten (10) years against any degradation of the absorber surface which would significantly affect the collector performance. In addition, the high frequency forge weld has a 30 year warranty by Thermafin, Inc.

**5. WARRANTY EXCLUSIONS:**

**A. This Warranty Will Not Apply To The Following Exclusions**

- 1) To defects or malfunctions resulting from failure to properly install, operate or maintain the collector.
- 2) To damage from abuse, accident, fire, flood, hail, wind or other acts of God.
- 3) To glass breakage.
- 4) To collector failure which occurs due to damage caused by heat transfer fluids.
- 5) If the collector is moved from the original installation location.
- 6) When the collector is installed as a roof membrane or as an integral part of an existing roof membrane.
- 7) To damage cause by freeze.

**B. Limitation on Exclusion from Coverage**

Conditions that may occur in the normal operation of the collector shall not be invoked by Solar Skies MFG, LLC to reduce the coverage of this warranty.

**6. OTHER RIGHTS AND REMEDIES**

**A. Consequential and Incidental Damages**

Solar Skies MFG, LLC shall not be liable for: (1) Consequential damages to the system in which the improperly functioning collector is installed, and (2) Incidental expenses incurred to repair or replace, as necessary, any other obligations or liability in connection with the collector.

**B. No Other Expressed Warranties**

Unless otherwise explicitly agreed to in writing, it is understood that these are the only written warranties given by Solar Skies MFG, LLC, and Solar Skies MFG, LLC neither assumes nor authorizes anyone to assume for it any other obligations or liability in connection with the collector.

**C. Implied Warranties**

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

**D. Right to Arbitration**

Any dispute between the buyer and Solar Skies MFG, LLC pertaining to this warranty may, at the option of the buyer, be resolved by arbitration in the state installed according to the rules of the American Arbitration Association.

**E. Right to Indemnity**

Solar Skies MFG, LLC will fully indemnify a licensed contractor who installs the collector and gives a written warranty as required by the California Solar Tax Credit Regulations, in the amount of any liability to the buyer under such warranty for a breach that is also a breach of the Manufacturer's warranty to the buyer.

**F. Filing a Claim**

All claims should be filed with the contractor or the Dealer from whom the collector was purchased. If unable to do so, please contact:

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