

## Sisyan YC-32 Collector

### Introduction

The collector array is the highest-cost component of a solar system. The YC-32 flat-plate collector (patent pending) is expected to provide **20% more energy per dollar** than standard designs due to high thermal efficiency and lower installation and operating costs. It has been operating on several pilot installations since 2008 and is currently undergoing the certification process through the Solar Rating and Certification Corporation (SRCC).



### Low pressure

In the YC-32 (named for its 32ft<sup>2</sup> surface area), water is guided between two aluminum plates spaced approximately 1/4" (6mm) apart, as shown in Figure 1. Max operating pressure is under 1.9psi (for 1.4gpm and 90 degrees of tilt), about one tenth of the lowest operating pressure of conventional collectors. The panel is sealed with silicone rubber compressed between the plates.

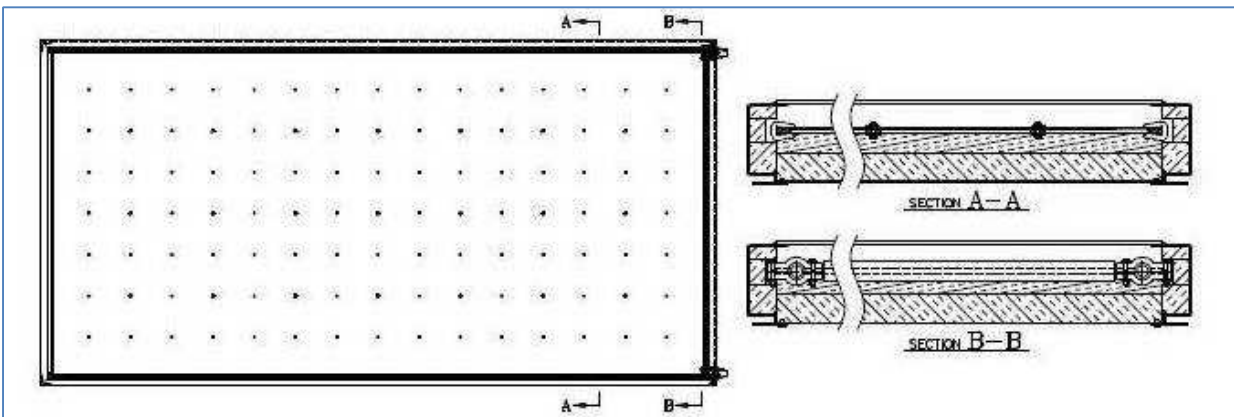


Figure 1: YC-32 assembly

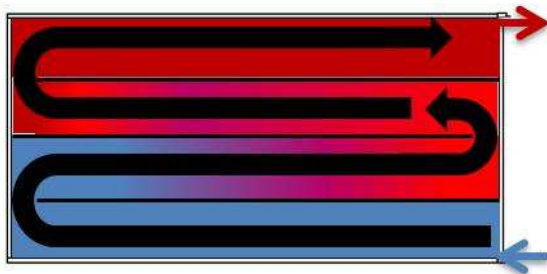
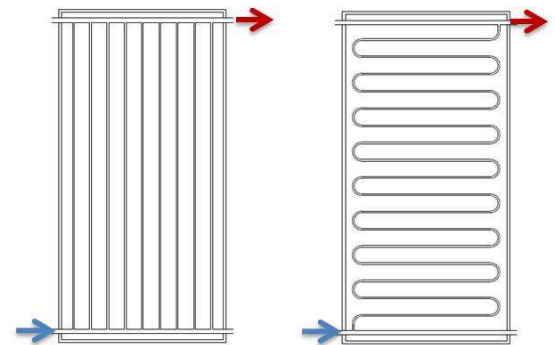


Figure 2: Fluid flow through the YC-32.



Figures 3-4: Conventional "harp" (left) and "serpentine" configurations

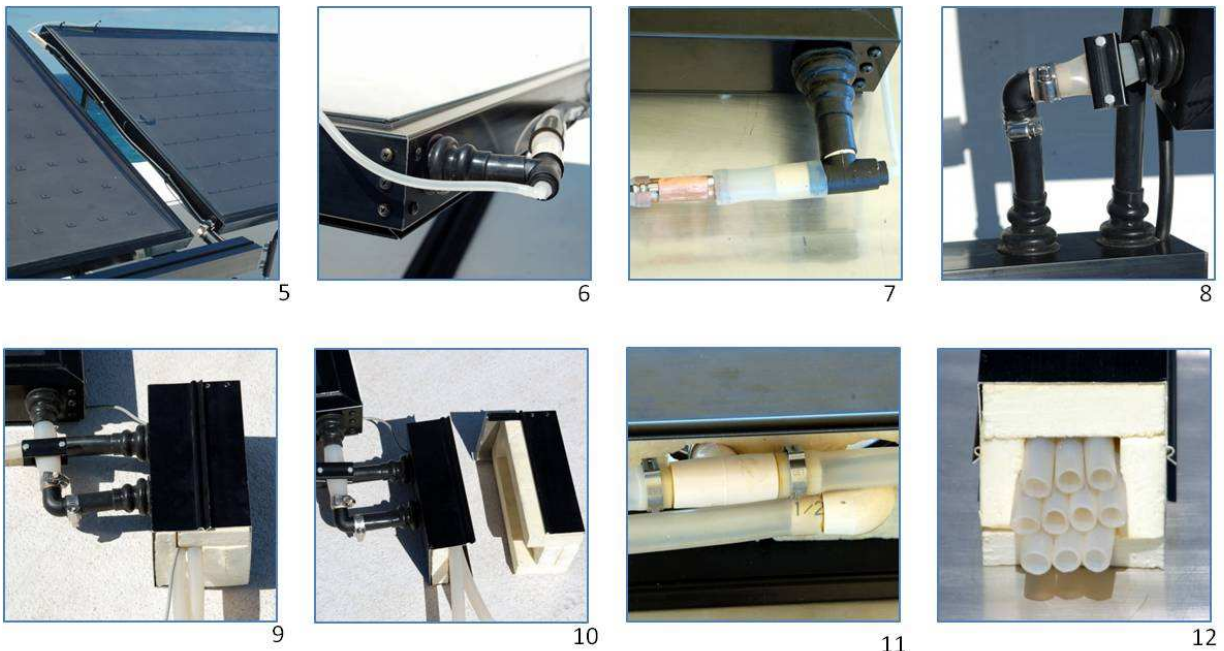
## Sisyan YC-32 Collector

### High thermal efficiency

Based on in-house comparisons, the YC-32's thermal performance should at least rival that of the top conventional flat-plate collectors, although it uses aluminum instead of copper. About **98% of the absorber surface** is in direct contact with water (see Figure 2). In conventional flat-plate collectors, however, which use copper tubes and fins, only **3-5% of the absorber surface** is in direct contact with the tubes carrying the solar fluid (see Figures 3-4).

### Lower installation costs

Plumbing accounts for a large portion of installation costs and thermal losses. The uniquely low operating pressure allows a highly innovative approach: silicone tubing surrounded by rigid insulation and rectangular ducting, as shown in Figures 5-12.



**Figures 5-12: Plumbing and insulation details**

This unique plumbing and insulation system is expected to generate significant savings over other flat-plate collectors:

- The tubing is assembled by hand, and flows are adjusted with simple clamps (see Figure 8).
- Each collector is permanently vented (Figures 5-6). This provides a fail-safe siphon for drainback, prevents over pressurization, and allows a collector to be off-line without disrupting the system.
- A single supply line can serve several collectors (Figure 11).
- The rectangular ducting can support a span up to 10 feet, house up to ten ½" lines, and provide insulation from R-5 to R-10 (Figure 12).
- Tees and elbows are CPVC-CTS assembled with hose clamps (Figures 9-11).
- The silicone is rated for 200C (392F), well above the highest rooftop temperatures.

## Sisyan YC-32 Collector

### Failsafe protection against extreme temperatures

Sisyan’s solar loop is a water-filled, drainback circuit. Whenever it is too cold to collect heat, or the tank has reached its maximum temperature, the circulating pump stops and the collectors and plumbing automatically drain without operating any valves or venting mechanisms. Should water remain in the solar loop for any reason and freeze, the absorber and tubing can easily expand to tolerate the 9% volume increase and will not burst if frozen solid. Should water stagnate and turn to steam, the collectors cannot be over pressurized since they are individually vented.

### Elegant, functional racking

Racking is also a significant cost. Sisyan’s solution integrates the collector, plumbing, and insulation into an efficient, visually appealing system. The YC-32 is always oriented in “landscape” which reduces wind and visual exposure, and does not require any inclination to properly drain back.



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**Figures 13-17: YC-32 racking system**

Key aspects include:

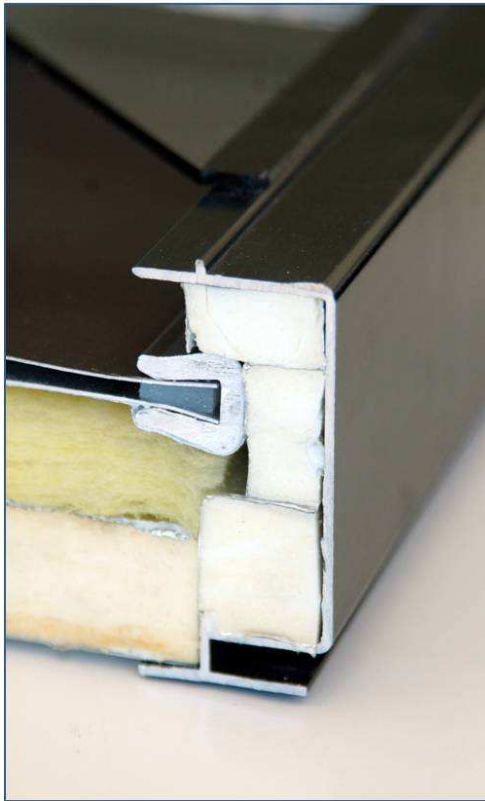
- Anodized extruded aluminum for excellent durability (Figures 13,14)
- Clamped connections for simple assembly and adjustable tilt. Minimum of four per panel (14, 15).
- Can be solidly locked down for extreme winds (16, 17). This is unique in the industry, since it requires each collector to be individually plumbed with flexible lines, which is only true of the YC-32.

## Sisyan YC-32 Collector

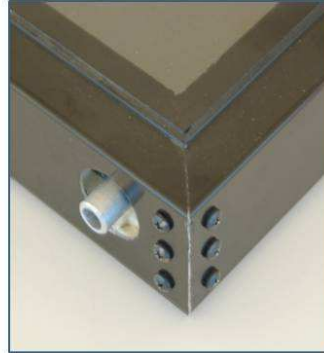
### Rugged construction and ease of maintenance

The YC-32 is designed for long life and minimal maintenance costs:

- Anodized aluminum frame provides high structural integrity (Figures 18, 19)
- Edges sealed with proprietary clamp and silicone strip (Figures 18, 20)
- 1/8" low-iron glass bonded using automotive windshield glazing technology (Figure 18)
- Absorber panel easily removable using hand tools (Figure 22)



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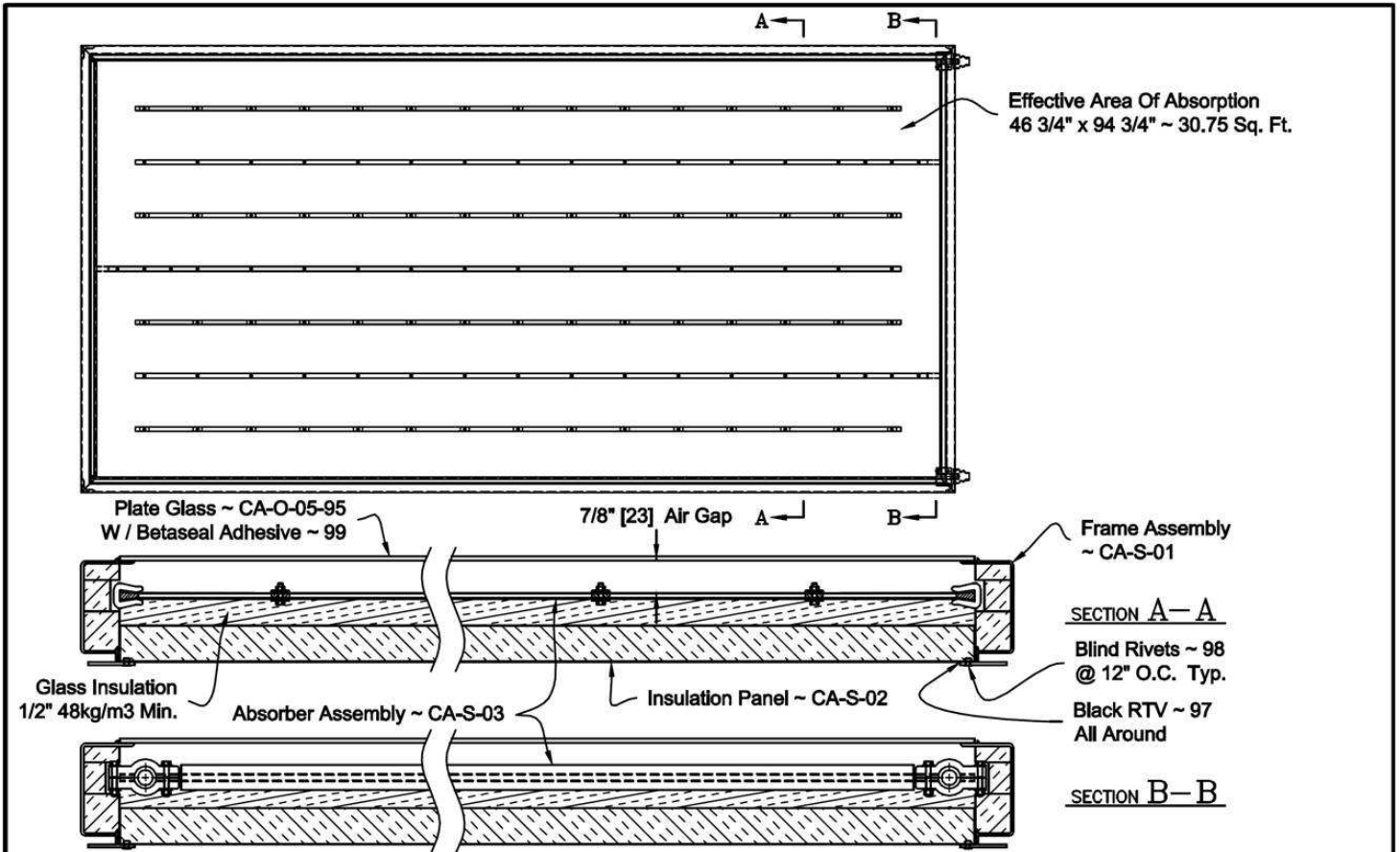


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**Figures 18-22: Details of collector and absorber construction**

Sisyan YC-32 Collector

Drawings



Effective Area Of Absorption  
46 3/4" x 94 3/4" ~ 30.75 Sq. Ft.

Frame Assembly  
~ CA-S-01

SECTION A-A

Blind Rivets ~ 98  
@ 12" O.C. Typ.  
Black RTV ~ 97  
All Around

SECTION B-B

PART NUM.	QUAN	DESCRIPTION	LENGTH		REMARKS
			FT.	IN.	
CA-S-01	One	Frame Assembly			Sub Assembly
CA-S-02	One	Insulation Panel Assembly			Sub Assembly
CA-S-03	One	Absorber Assembly			Sub Assembly
CA-O-05	One	Tempered Plate Glass 1/8" x 48"	8'	0"	95
99		Betaseal Adhesive			Dow 58702 FSHN
98	24	Blind Rivets ~ 1/8"		1/4"	Aluminum / Black
97		Black RTV ~ ProSeal 80047 or Eq.			
96		Glass Insulation ~ 1/2" 48kg/m3			

See Sheet T-02 For Additional Details

**SISYAN LLC**

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Carson City, Nevada 89706 1-888-538-4498

Drawn DKY Dec-31-08

Checked

Scale: 1/16

Note: DEBURR EDGES

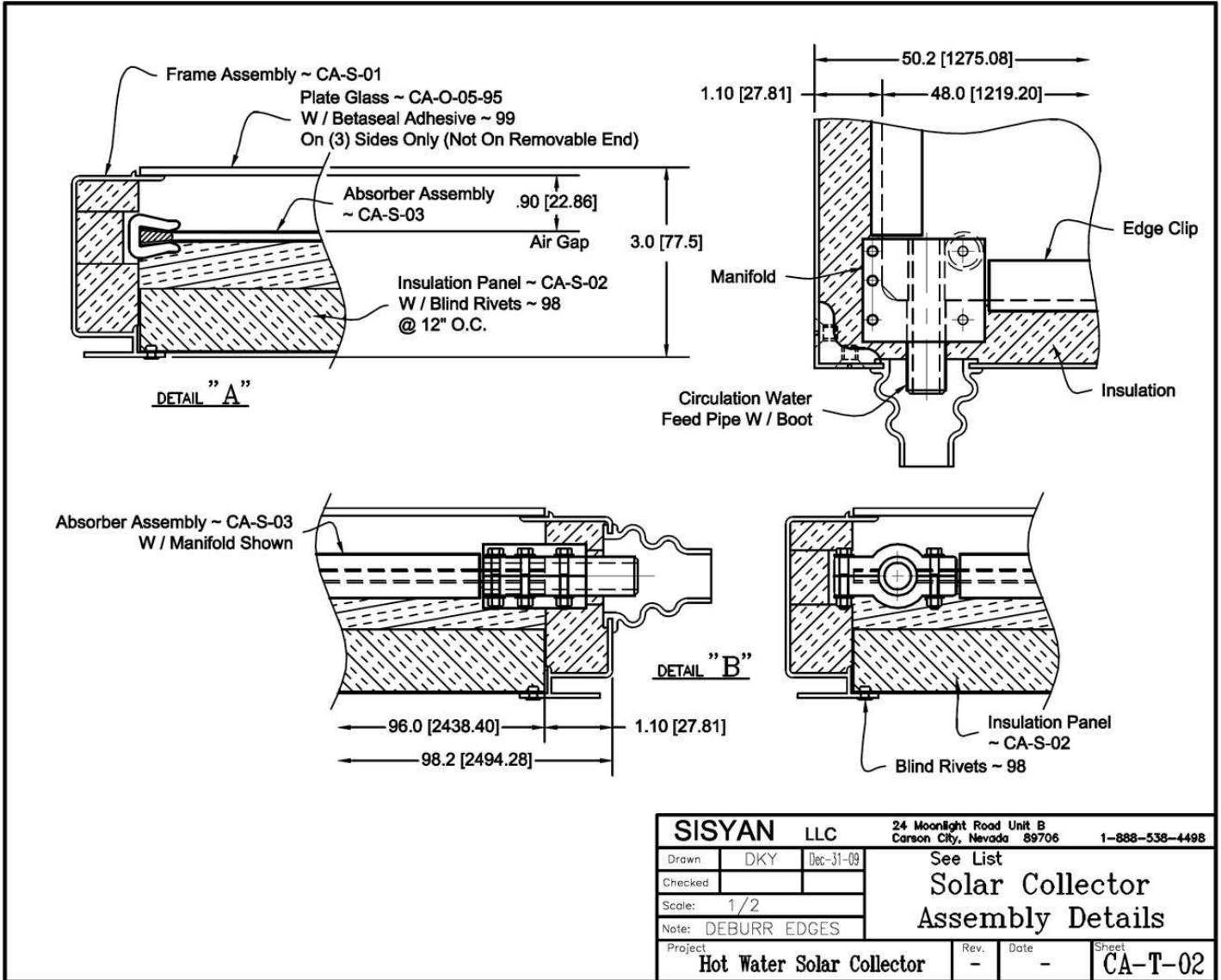
Project

See List  
**Hot Water Solar  
Collector Assembly**

Hot Water Solar Collector

Rev. - Date - Sheet CA-T-01

Sisyan YC-32 Collector



### Sisyan YC-32 Collector

Use Sealant ~ 91 At All Corners  
 Panel Seal Retainer ~ CA-O-16-99 (8x)  
 Water Guide Retainer ~ CA-O-16-98 (6x)  
 Edge Clip ~ CA-O-04-97  
 Absorber Retainers W / Fasteners ~ 95  
 Edge Seal  
**SECTION A-A**  
 Edge Clip W / 4-40 ~ 90 Retainer Screws  
 Water Seals ~ 96  
**SECTION B-B**  
 Edge Clip ~ 98  
 Edge Seal ~ 98  
 Overlapping Corner Detail  
 Manifold ~ CA-O-11 1 LH & 1 RH W / (5) 6-32 Fasteners  
 Manifold Tube ~ CA-O-12  
**VIEW B-B**  
 (5) 6-32 x 7/8" Screws W / Nuts & Washers 93 & 94  
 Edge Clip W / 4-40 ~ 92 Retainer Screws  
 Absorber Plate ~ CA-O-05 W / Black Surface ~ 90 Above Absorber Plate W / Thermal Coating ~ 89 Below  
 Spacer Ring ~ CA-O-14 W / Seal Ring ~ CA-O-06  
 CA-O-04-98 CA-O-04-99

PART NUM.	QUAN	DESCRIPTION	LENGTH		REMARKS
			FT.	IN.	
CA-O-05	2	Absorber Plate .032 x 48" ~ 99			AL 5053 H32
CA-O-04	2	Edge Clip ~ 99			AL 6063 T5
CA-O-04	One	Edge Clip ~ 98			AL 6063 T5
CA-O-04	One	Edge Clip ~ 97			AL 6063 T5
CA-O-11	4	Manifold Halves ~ 2 LH - 2 RH			AL 6063 T5
CA-O-12	2	Manifold Tubes			AL 6063 T5
CA-O-14	2	Manifold Spacer Rings			AL 6063 T5
CA-O-06	2	Seal Rings ~ $\phi$ .45"			Silicone/Rub 70D
99	2	Edge Seal ~ 5mm x 12mm	8'	4"	Silicone/Rub 50D
98	2	Edge Seal ~ 5mm x 12mm	4'	0"	Silicone/Rub 50D
97	3	Water Guides ~ 5mm x 12mm	7'	11 1/2"	Silicone/Rub 50D
96	60	Water Seals ~ 5mm x 12mm		2"	Silicone/Rub 50D
CA-O-16	8	Panel Seal Retainers ~ 99			AL 6063 T5
CA-O-16	6	Water Guide Retainers ~ 98			AL 6063 T5
95	111	SS 18-8 Panhead Screws 6-32		9/16"	W / Nuts
94	10	SS 18-8 Panhead Screws 6-32		7/8"	W / Nuts
93	20	SS 18-8 Flat Washers ~ #6			
92	28	SS 18-8 Panhead Screws 4-40		5/8"	
91		Dow 732 Clear RTV Sealant or Eq.			PN 2701880-0906
90		Black Paint ~ Dampney Thurmalox 250			
89		Thermal Coating W / Additive			

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Drawn DKY May-18-09  
 Checked  
 Scale: 1/16  
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Project: Hot Water Solar Collector

See List

**Absorber Panel Assembly**

Rev. - Date - Sheet CA-S-03

#### Technical Specifications

Length	98.2" (2494mm)
Width	50.2" (1275mm)
Depth	3" (76mm)
Weight (empty)	129 lbs (59 kg)
Max fluid content (at 1.4gpm and 90 degrees of tilt)	5.6 gallons (1.5l)
Gross surface area	34.23 ft <sup>2</sup> (3.18m <sup>2</sup> )
Net surface area	30.96 ft <sup>2</sup> (2.88m <sup>2</sup> )
Absorber coating	Black selective
Operating configuration	Drainback only
Max operating pressure	1.9 psi (0.13 bar)
Tubing connections	0.63" (16mm)
Recommended flow rates	0.5 - 1.4gpm (1.9 - 5.3 liters/min)
SRCC rating	Pending