



Solar Rating & Certification Corporation™
The Industry Standard Since 1980.

OG100

APPLICATION

INSTRUCTIONS

FOR

SOLAR

COLLECTOR

CERTIFICATION

PROGRAM

August 2010

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OVERVIEW OF THE SRCC

The modern solar industry was founded in 1974, following the original oil embargo of the previous year. In the years which followed, energy in all its forms became a national priority. While commercial and residential solar systems were available on a limited regional basis, a mechanism had to be put in place which would encourage consumers to purchase these relatively unknown products and new technology with confidence that the technology was valid and that the products would perform in terms of energy and dollar savings.

States with potentially large solar markets, such as California and Florida, were the first entities to establish such a mechanism by establishing state testing and rating programs for solar collectors. However, since there was little consistency between each state's testing requirements and approach to rating solar equipment, such programs soon became an impediment to manufacturers who marketed in more than one state. The need for a single national program which manufacturers could test their equipment to and which would benefit consumers by providing a uniform, national approach for rating and comparing solar equipment soon became evident. In an unprecedented move, the trade association for the solar energy industry and a national consortium of state energy offices and regulatory bodies joined together to lay the groundwork for such a program which would soon lead to the founding of the Solar Rating & Certification Corporation.

The Solar Rating & Certification Corporation (SRCC™) is an independent third-party certification organization that administers national certification and rating programs for solar energy equipment. The SRCC was incorporated in October 1980 as a non-profit corporation. It is governed by a thirteen member Board of Directors with representation from the public, private, and generalist sectors.

The combined programs of the SRCC provide one-time certification, national recognition, product credibility, and standardized comparisons of solar energy products. The SRCC programs serve three primary constituencies: the solar energy industry, solar consumers, and state and federal regulatory bodies. All three constituencies benefit from the SRCC programs by obtaining a national state-of-the-art rating system, a mechanism to develop consumer confidence, and a rational and defensible criteria for tax credit qualification and other solar incentive programs.

Solar equipment manufacturers benefit from SRCC certification and rating in three fundamental ways: the ability to have a product certified only once; national recognition and/or reciprocity of the certification; and a reliable means for judging product durability and performance on a relative standard basis. The solar contractor benefits from the SRCC certification in three fundamental ways also: certification provides product credibility; provides one with a standard of comparison to be used in sales literature; and provides a defense against unethical competition and false claims. The solar consumer also benefits from the SRCC programs. These benefits include obtaining a measurement of quality, a measurement of performance, third-party independent corroboration, and a national standardized method to compare solar equipment and thereby determine the best buy.

Finally the government and states benefit from SRCC's programs in that certification provides a rational basis for tax credit qualifying regulation as well as a basis for setting codes and standards.

The corporation is governed by a twelve-member Board of Directors comprised of solar experts from both the public and private sectors. Four members of the board represent the solar energy industry, five members represent the public sector, and three members represent general interests (utilities, solutions, research, building industry, etc.). Adding to the governance of the corporation are a variety of standing and ad hoc committees. Committee members are appointed by the Board of Directors and are representatives from the industry sector, state and federal agencies, consumer organizations, and academia. A sampling of these committees and their respective purposes is as follows:

- o Technical Compliance Committee. Acts in a technical oversight capacity with respect to the programs in SRCC in order to insure that technical matters addressed in the program have been appropriately resolved and reviews the technical decisions made by SRCC program administrators to insure the accuracy of the test results and the appropriateness of the assigned ratings.
- o Design Review Committee. Reviews applications for certification for compliance with the appropriate requirements.
- o Consumer Advisory Committee. Enables the SRCC to more fully serve its consumer constituency by making available the programs to the solar consumer buyer and user in a more direct and understood manner and governs the presentation, interpretation, publication, and use of the performance information.
- o Test Program Accreditation Committee. Oversees the SRCC laboratory accreditation program and insures that accredited test facilities continually meet the criteria for accreditation.

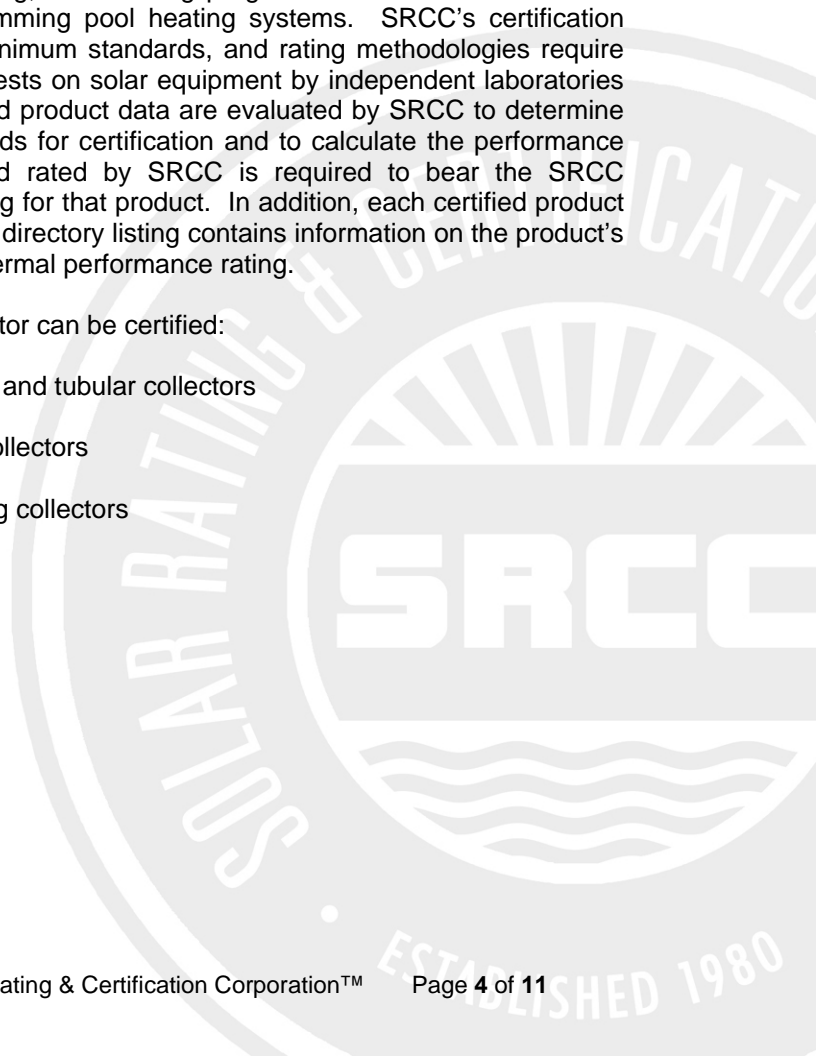
The SRCC currently administers a certification, rating, and labeling program for solar collectors and a similar program for complete solar water and swimming pool heating systems. SRCC's certification program operating guidelines, test methods and minimum standards, and rating methodologies require the performance of nationally accepted equipment tests on solar equipment by independent laboratories which are accredited by SRCC. The test results and product data are evaluated by SRCC to determine the product's compliance with the minimum standards for certification and to calculate the performance ratings. Equipment which has been certified and rated by SRCC is required to bear the SRCC certification label which shows the performance rating for that product. In addition, each certified product is published by SRCC in a directory. Each product's directory listing contains information on the product's material and specifications as well as the certified thermal performance rating.

There are three standards under which a solar collector can be certified:

Standard 100 – applies to standard flat plate and tubular collectors

Standard 150 – applies to innovative solar collectors

Standard 600 – applies to solar concentrating collectors





THE SRCC SOLAR COLLECTOR CERTIFICATION PROGRAM

In November of 1980 SRCC established its certification and rating program for solar collectors. The program provides a means for evaluating the maintainability of solar collectors and a thermal performance rating characteristic of all-day energy output of a solar collector under prescribed rating conditions. The scope of the program includes swimming pool and recreational heating, space heating, cooling, and water heating. The program is administered according to SRCC Document OG-100, "Operating Guidelines for Certifying Solar Collectors," and its companion document, SRCC Standard 100, "Test Methods and Minimum Standards for Certifying Solar Collectors." All manufacturers of applicable products are eligible to participate in the SRCC solar collector certification program.

In order for a collector model to be certified and rated by SRCC, the collector must first pass a series of tests performed on a sample unit which has been randomly selected by SRCC from the manufacturer's production. The series of tests are conducted according to the methods specified in SRCC Standard 100 by an independent laboratory accredited by SRCC. Testing is a combination of durability and performance with the test procedures for performance being specified by the International Organization for Standardization (ISO 9806, "Test Methods for Solar Collectors").

TEST	PURPOSE
o Random Selection	To assure that the collector tested is representative of what the manufacture actually provides to the consumer.
o Receiving Inspection	To establish the original condition of the collector so that any changes as a result of the tests can be identified.
o Static Pressure Test	To subject the collector to an internal pressure higher than its normal operating pressure.
o 30-Day Exposure Test	To subject the collector to a severe thermal and radiation environment to determine or reveal any propensity for material degradation or design failure.
o Thermal Shock/Water Spray Test	Performed on three different days during peak stagnation, the collector is subjected to deluge water sprays to assess the collector's resistance to sudden thermal expansion or contraction.
o Thermal Shock/Cold Fill Test	To test the absorber and its assembly to determine integrity of the absorber to rapid expansion/contraction, resistance to leak, deformation or structural damage.

- o Post Exposure Static Pressure Test
To determine if a loss of pressure, evidence of fluid leakage, or fluid path deterioration occurs after a collector has been stagnated under worst case conditions.
- o Time Constant Determination
To determine the transient behavior of the collector or the time required to respond to abrupt changes in either insulation or inlet temperatures.
- o Thermal Performance Test
To determine the instantaneous efficiency of the collector over a wide range of operating temperatures. ("Efficiency" is defined as the ratio of collected energy to the available energy falling upon the entire collector area.)
- o Incident Angle Modifier Test
The incident angle modifier needs to be determined in order to predict collector performance over a wide range of conditions. The modifier algorithm is used to modify the efficiency curve to account for changes in performance as a function of the sun's angle of incidence.
- o Disassembly and Final Inspection
To visually inspect the major components and subassemblies and to report their conditions after testing has been completed.

Once a collector test unit has successfully completed the above battery of tests, the results are sent to SRCC for evaluation and computation of the thermal performance ratings. If there is sufficient evidence of degradation, water penetration, corrosion, or potential failure of parts or materials, SRCC certification is denied. In addition to the successful completion of testing, the SRCC must also be satisfied that, based on product documentation and information submitted, the collector meets the SRCC requirements for durability in design and construction. Once certification has been awarded, SRCC may conduct unannounced random site-inspections of manufacturers' facilities to assure that the product is continually being produced with the same materials and specifications as certified and that the performance rating information is still valid.




THE SRCC COLLECTOR THERMAL PERFORMANCE RATINGS

SRCC calculates collector ratings according to SRCC Document RM-1, "Methodology for Determining the Thermal Performance Rating for Solar Collectors" for collectors certified in accordance with Standard 100 and Standard 150. This rating methodology utilizes the data from the ISO or ASHRAE test on the collector. The SRCC thermal performance rating is an analytically derived set of numbers representing the characteristic all-day energy output of the solar collector under prescribed rating conditions. It is valid only when either the ISO or ASHRAE standard sufficiently characterize the thermal performance of the collector panel. The SRCC rating numbers are valid only for the fluid and flow rate used to generate the test data. The ratings are only measures of performance under a specified set of conditions. Since the performance of a solar collector will vary from minute to minute, depending upon the amount of sunshine, the air temperature, the collector's tilt and orientation, etc., the purpose of the rating is to show a consumer how two or more collectors would perform under an assumed set of conditions.

The SRCC collector performance ratings are, in some respects, analogous to energy efficiency ratings as applied to household appliances and mileage ratings as applied to automobiles. The numbers contained on the SRCC label say to the solar user that under standard conditions this collector will collect "x" number of megajoules Btu's (British Thermal Units), which may or may not be as many as a competing model.

The following is a sample copy of the SRCC collector rating table. The rating matrix contained in the table is designed to show collector heat output and contains the collector's thermal performance ratings.

COLLECTOR THERMAL PERFORMANCE RATING								
METRIC (SI Units)				 SRCC Standard 100	ENGLISH (Inch-Pound Units)			
Megajoules per Panel per Day					Thousands of Btu per Panel per Day			
Category (Ti-Ta)	Clear Day 23 MJ/m ² d	Mildly Cloudy 17 MJ/m ² d	Cloudy Day 11 MJr/m ² d		Category (Ti-Ta)	Clear Day 2000 Btu/ft ² d	Mildly Cloudy 1500 Btu/ft ² d	Cloudy Day 1000 Btu/ft ² d
A (-5°C)					A (-9°F)			
B (5°C)					B (9°F)			
C (20°C)					C (36°F)			
D (50°C)					D (90°F)			
E (80°C)					E (144°F)			

The numbers that appear horizontally in the table relate to the total daily solar radiation which depends on the season of the year and on the cloud conditions. A clear sky would be characterized by the 2,000 Btu/ft² column, while a cloudy sky would be characterized by the 1,000 Btu/ft² column. The 1,500 Btu/ft² column characterized a mildly cloudy condition. Thus, a consumer who knows the solar radiation conditions of his or her area would know which of the columns to pay particular attention to. Nevertheless, it is quite useful to know how well a particular collector will perform under varying degrees of solar radiation.

The numbers and letters that appear vertically in the table relate to the end-use for which a collector is intended. The following provides general guidelines for translating the categories into applications:

CATEGORY	APPLICATION
A (-5°C) (-9°F)	<ul style="list-style-type: none"> o Certain types of solar assisted heat pumps. o Swimming pool heating.
B (5°C) (+9°F)	<ul style="list-style-type: none"> o Liquid collectors with certain types of solar assisted heat pumps. o Swimming pool heating. o Space heating - air systems.
C (20°C) (+36°F)	<ul style="list-style-type: none"> o Service hot water systems. o Space heating - air systems.
D (50°C) (+90°F)	<ul style="list-style-type: none"> o Service hot water systems. o Space heating - liquid systems. o Air conditioning.
E (80°C) (+144°F)	<ul style="list-style-type: none"> o Space heating - liquid systems. o Air conditioning. o Industrial process heat.

The numbers associated with each category are temperature differences representing the difference between the collector inlet and ambient air temperatures. In order for ratings to be awarded in any of the categories, test data must have been taken within $\pm 10^{\circ}\text{F}$ of the maximum temperature differential.

The numbers that appear in the matrix itself represent the all-day energy output of the collector. This energy is expressed in megajoules and in thousands of Btu's (British Thermal Units). With these ratings a consumer can compare the energy production of one collector with that of another. This enables the consumer to select the best collector for a particular application.

Another method for comparing collectors involves the coupling of the performance rating with the cost of the product. This provides the consumer with another gauge of the collector's value, i.e., the MJ/\$ or Btu/\$ ratio. This can be easily computed. Simply divide the thermal performance rating of the collector by its cost. This will give you a ratio of megajoules or Btu per dollar. For example, say Collector "XYZ" was being selected for a pool heating application. The rating in the 2,000 Btu/ft² and A(-9°F) box in the SRCC label reports 27.5 (27,500 Btu per day per panel), let us say. Furthermore, let us say that the unit sells for \$387. Then:

$$\frac{27500 \text{ Btu}}{\$387} = 71.06 \text{ Btu/Dollar}$$

By doing this same calculation for another collector panel, one can compare its performance per dollar.

The consumer should keep in mind, however, that these ratings are only relative. Actual performance may vary as function of the load, location, and application. In addition, the SRCC collector ratings apply to the collector panel and not to individual collector components or other solar system components. Finally, a direct comparison between the SRCC thermal performance ratings for collectors and the SRCC performance ratings for complete solar water heating systems cannot be made because each set of ratings is developed using a separate set of assumed conditions.

OG-100 APPLICATION ATTACHMENTS

The following items must be submitted:

- A. Collector Documentation Form
- B. Request for Random Selection Form
- C. Transmittal of Test Results Form
- D. Copy of the product warranty
- E. Copy of the installation, operation, and maintenance manuals

AGREEMENTS FOR CERTIFYING AND LABELING SOLAR COLLECTORS

There are two documents which will govern the relationship between SRCC and the manufacturer, distributor, or seller of a solar collector under the OG-100 certification program as defined in SRCC Document OG-100, "Operating Guidelines and Minimum Standards for Certifying Solar Collectors."

The first document is called the Solar Collector Certification Program Agreement. This agreement defines the roles of SRCC and the Manufacturer with regard to the OG-100 certification program. It is executed upon certification of the first solar collector approved by SRCC and is renewed annually.

The second document is called Solar Collector Certification and License. This document constitutes official notice that the specified solar collector meets the requirements of the OG-100 program. The Solar Collector Certification and License must be executed with each grant of collector certification and rating.

Sample copies of these agreements are provided in the OG-100 document for your review. The official documents will be forwarded for your signature upon SRCC's determination that all certification requirements have been met.



OG-100 Certification Label Artwork

The Supplier is responsible for having labels printed and affixed or applied to every certified collector. The label must be installed in a location that will be in plain view for inspection when the collector is installed.

Specifications for the dimensions and content of the label are as follows:

Minimum Size: 1 inch x 2.5 inches

Material: Any material and ink with a 2-year warranty in outdoor applications may be used. Etching of this information on a visible portion of the solar collector is acceptable, so long as a 2-year warranty of the readability of the etched information is made by the certificant.

Content: The label as shown below cannot be altered except to make it larger. The content or color of the label must not be altered. Additional content may be added outside the border of this label.

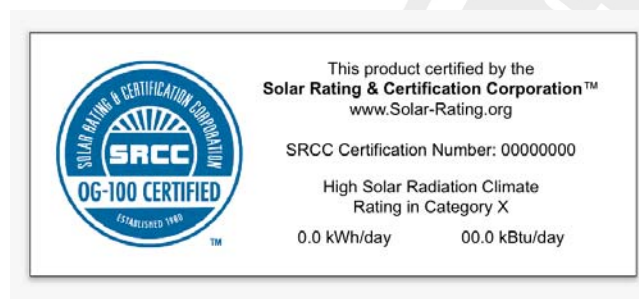
Color: The label may be printed in all black ink (white background) or with only the SRCC logo in this blue:

Pantone Blue 294 C

C 100 M 60 Y 0 K 0

R 0 G 102 B 179

Web: 336699



**SOLAR RATING & CERTIFICATION CORPORATION™
AWARD OF COLLECTOR CERTIFICATION**

The solar collector listed below has been evaluated by the Solar Rating & Certification Corporation™ (SRCC™) in accordance with SRCC Document OG-100, *Operating Guidelines and Minimum Standards for Certifying Solar Collectors*, and has been certified by the SRCC as specified in SRCC Standard 100, *Test Methods and Minimum Standards for Certifying Solar Collectors*. Certification and thermal performance ratings are based on the successful durability and performance testing of a sample unit where said tests have been conducted by an independent laboratory whose testing programs have been accredited by SRCC.

Collector Certification Number: 100-2008000A

Certification Date: 26-APR-11

Type: Tubular

Expiration Date: 01-OCT-22

Test Laboratory: LAB

Report Number: TR-456

Report Date: 09-SEP-09

Brand: ACME

Certified Model: ACME-SS

Supplier: ACME Solar
1234 School Lane
Anywhere, USA 00000
(321) 000-0000

Description: Aluminum or stainless steel frame. Borosilicate cover. Aluminum absorber with Selective coating. Fiber, vacuum side insulation and fiber, vacuum back insulation. Water was the fluid for performance tests. Gross Area: 2.32 m² (25 ft²). Aperture Area: 1.42 m² (15.3 ft²).

TUBULAR COLLECTOR THERMAL PERFORMANCE RATING

CATEGORY (Ti-Ta)	Killowatt Hours Per Panel Per Day			CATEGORY (Ti-Ta)	Thousands of BTU Per Panel Per Day		
	CLEAR DAY	MILDLY CLOUDY	CLOUDY DAY		CLEAR DAY	MILDLY CLOUDY	CLOUDY DAY
A (-5 °C)	6.0	4.6	3.1	A (-9 °F)	20.6	15.6	10.6
B (5 °C)	5.8	4.3	2.8	B (9 °F)	19.6	14.6	9.6
C (20 °C)	5.3	3.8	2.3	C (36 °F)	18.0	13.0	8.0
D (50 °C)	4.3	2.9	1.5	D (90 °F)	14.8	10.0	5.1
E (80 °C)	3.4	2.0	0.7	E (144 °F)	11.5	6.7	2.3

A- Pool Heating (Warm Climate) B- Pool Heating (Cool Climate) C- Water Heating (Warm Climate) D- Water Heating (Cool Climate) E- Air Conditioning

Efficiency Equation [NOTE: Based on gross area and (P)=Ti-Ta]

S I UNITS: $\eta = 0.363 - 1.15130 (P)/I - 0.00306 (P)^2/I$
I P UNITS: $\eta = 0.363 - 0.20280 (P)/I - 0.00030 (P)^2/I$

Y INTERCEPT

0.365
0.365

SLOPE

-1.36 W/m².°C
-0.20 Btu/hr.ft².°F

Incident Angle Modifier [(S)=1/cosθ - 1, 0°<θ<=60°]

Kτα = 1 0.71 (S) -0.260 (S)² Kτα = 1 0.21 (S) Linear Fit (S)²

REMARKS:

This award of certification is subject to all terms and conditions of the program Agreement and the documents incorporated therein by reference. It must be renewed annually. Any change in collector design, materials, specifications, parts, or construction must be reported to SRCC for evaluation of continued certification.



Technical Director March 02, 2012

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