

# CHAPTER 4280

## DEPARTMENT OF ENERGY AND ECONOMIC DEVELOPMENT

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**4280.0100 PURPOSE AND AUTHORITY.**

Certain renewable energy source expenditures qualify for income tax credit treatment by the Minnesota Department of Revenue. After December 31, 1980, expenditures for a solar collector qualify for the individual income tax residential energy credit only if the Minnesota Department of Energy and Economic Development has certified the solar collector, pursuant to Minnesota Statutes, section 290.06, subdivision 14. The purpose of this chapter is to establish the criteria for certification of solar collectors and the procedures for obtaining certification.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** 8 SR 531

**4280.0200 DEFINITIONS.**

Subpart 1. **Scope.** For purposes of this chapter, the following definitions apply.

Subp. 2. **Absorber.** "Absorber" means the part of the solar collector that receives the incident solar radiation and transforms it into thermal energy. It usually is a solid surface through which energy is transmitted to the transfer fluid; however, the transfer fluid itself could be the absorber in certain configurations.

Subp. 3. **Ambient air.** "Ambient air" means the outdoor air in the vicinity of the solar collector being tested.

Subp. 4. **Approved.** "Approved" means accepted, in writing, by the department.

Subp. 5. **Certification.** "Certification" means the act of attesting officially to something as being true and as meeting a standard.

Subp. 6. **Collector.** "Collector" means a solar collector.

Subp. 7. **Collector enclosure.** "Collector enclosure" means the structural frame that supports the components of the collector and protects internal components from the environment.

Subp. 8. **Concentrating collector.** "Concentrating collector" means a solar collector that uses reflectors, lenses, or other optical elements to concentrate the radiant energy passing through the aperture onto an absorber that has a surface area smaller than the aperture.

Subp. 9. **Concentrator.** "Concentrator" means the part of the concentrating collector that directs the incident solar radiation onto the absorber.

Subp. 10. **Corrosion.** "Corrosion" means the deterioration of a substance or its properties caused by a chemical or electrochemical reaction with its environment.

Subp. 11. **Cover plate.** "Cover plate" means the material or materials covering the aperture and most directly exposed to the solar radiation: These materials generally are used to reduce the heat loss from the absorber to the surroundings and to protect the absorber.

Subp. 12. **Crazing.** "Crazing" means the formation of minute surface cracks in a major component or subassembly

Subp. 13. **Credit.** "Credit" means the residential energy credit authorized by Minnesota Statutes, section 290.06, subdivision 14

Subp. 14. **Custom-built solar collector.** "Custom-built solar collector" means a site-dependent collector fabricated from components that do not constitute a solar collector kit.

Subp. 15. **Deformation.** "Deformation" means a change in shape or form of any material in the collector from the conditions that existed before testing.

Subp. 16. **Delamination.** "Delamination" means separation into constituent layers.

Subp. 17. **Department.** "Department" means the Minnesota Department of Energy and Economic Development.

Subp. 18. **Domestic hot water.** "Domestic hot water" means heated tap water, as distinguished from water heated by a hydronic hot water space heating system.

Subp. 19. **Express warranty.** "Express warranty" means an affirmation of fact or promise made in connection with the sale or installation of a solar collector or component to a customer that relates to the nature of the material or workmanship and affirms or promises that the material or workmanship is defect free or will meet a specified level of performance over a specified period of time. "Express warranty" also means an undertaking in connection with the sale or installation of a solar system or component to refund, repair, replace, or take other remedial action with respect to the solar system or component. To be an express warranty, the affirmation, promise, or undertaking must become part of the basis of the bargain resulting in the purchase or installation of a solar collector by a customer.

Subp. 20. **Gross collector area.** "Gross collector area" means the maximum projected area of the complete collector module, including integral mounting means.

Subp. 21. **Home-built solar collector.** "Home-built solar collector" means a collector built by the owner according to purchased plans or the owner's own design from supplies or components that do not constitute a solar collector kit.

Subp. 22. **Inch-pound units.** "Inch-pound units" means measurement units that have traditionally been used in the United States, including but not limited to foot, gallon, pound-mass, hour, ampere, degree Fahrenheit, and British thermal unit (Btu).

Subp. 23. **Innovative collector.** "Innovative collector" means a solar collector that, because of its design, cannot be evaluated fairly and adequately by the test methods described in parts 4280.1500 to 4280.1800.

Subp. 24. **Instantaneous efficiency.** "Instantaneous efficiency" of a solar collector means the amount of energy removed by the transfer fluid over a given measuring period divided by the total solar radiation incident onto the gross collector area during the measuring period.

Subp. 25. **Integrity of construction.** "Integrity of construction" means the physical and mechanical properties of a solar collector that collectively are responsible for the overall thermal performance and physical structure of the solar collector.

Subp. 26. **International System of Units.** "International System of Units" means the measurement system defined in the "Standard for Metric Practice," issued by the American Society for Testing and Materials as ASTM E380-81 (Philadelphia, 1981). It is commonly referred to as the "metric system," though it does not include many metric terms in use before 1960.

Subp. 27. **Irradiance.** "Irradiance" means the rate of solar radiation received by a unit surface area.

Subp. 28. **Irradiation.** "Irradiation" means incident energy per unit area on a surface over a specified time.

Subp. 29. **Material category.** "Material category" means a class of materials of the same generic type; for instance, glass, fiberglass, and plexiglass are materials in the category of collector glazings.

Subp. 30. **Manufactured solar collector.** "Manufactured solar collector" means a solar collector made of components that have been fitted together at an assembly plant. None of the components needs to have been fabricated by the assembly plant for the collector to be classified a manufactured collector.

Subp. 31. **Model.** "Model" means a solar collector distinguishable by a specified size, set of materials, construction, and performance. A change in any of these basic characteristics constitutes a new model.

Subp. 32. **Nonpublic data.** "Nonpublic data" means "trade secret information" as that term is defined in Minnesota Statutes, section 13.37, subdivision 1, clause (b), that is, government data, including a formula, pattern, compilation, program, device, method, technique, or process:

A. that was supplied by the affected individual or organization;

B. that is the subject of efforts by the individual or organization that are reasonable under the circumstances to maintain its secrecy; and

C. that derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use.

Subp. 33. **Outgassing.** "Outgassing" means the generation of vapors from materials during exposure to elevated temperature or reduced pressure.

Subp. 34. **Performance rating.** "Performance rating" means the rating values based on thermal output characteristics of solar collectors as determined by tests specified in parts 4280.1500 to 4280.1800.

Subp. 35. **Reference collector.** "Reference collector" means a solar collector currently certified by the department to which a second collector is being compared for the purposes of certification under the similar collector rules found in parts 4280.0800 and 4280.2600.

Subp. 36. **Reflector or reflective surface.** "Reflector" or "reflective surface" means a surface intended primarily to reflect radiant energy.

Subp. 37. **Registered.** "Registered" means recorded as an eligible expenditure for Minnesota income tax credit.

Subp. 38. **Revoke certification.** "Revoke certification" means to withdraw certification from a solar collector. When certification is revoked, the collector is no longer eligible for the credit. A new application is required to certify a collector for which certification has been revoked.

Subp. 39. **Service hot water.** "Service hot water" means heated tap water in nonresidential applications.

Subp. 40 **Severe corrosion.** "Severe corrosion" means corrosion that impairs the function of a collector or that exhibits evidence that it will progress to the point where it will impair the function of the collector.

Subp. 41 **Severe deformation.** "Severe deformation" means deformation that impairs the function of a collector or that exhibits evidence that it will progress to the point where it will impair the function of the collector.

Subp. 42 **Similar solar collector.** "Similar solar collector" means a collector that is substantially identical to a certified reference collector manufactured by the same firm. The criteria to be used to determine eligibility as a similar collector are found in part 4280.2600.

Subp. 43. **Site-dependent collector.** "Site-dependent collector" means a collector intended to be assembled only at the site of application because parts of the building, such as rafters or insulation, are part of the collector or because the size of the collector makes delivery impractical.

Subp. 44. **Solar collector.** "Solar collector" means a device designed to absorb incident solar radiation, to convert it to thermal energy, and to transfer the thermal energy to a fluid in contact with it through either forced or natural convection. For purposes of this chapter, "solar collector" refers to one specific model of solar collector.

Subp. 45. **Solar collector kit.** "Solar collector kit" means a collection of substantially all major components required to assemble a solar collector which is sold as a unit for the purpose of making a solar collector.

Subp. 46. **Solar system.** "Solar system" means an assembly of solar collectors installed or intended to be installed at a single site, all of which perform a uniform function.

Subp. 47. **Solar energy.** "Solar energy" means the photon energy originating from the sun's radiation primarily encountered in the wavelength region from 0.3 to 2.7 micrometers.

Subp. 48. **Standard.** "Standard" means a document that specifies the performance, durability, or safety requirements for a product.

Subp. 49. **Standard solar collector.** "Standard solar collector" means a solar collector that can be fairly and adequately evaluated under the test sequence identified in parts 4280.1500 to 4280.1800.

Subp. 50. **State business day.** "State business day" means a weekday, Monday through Friday, except a holiday listed in Minnesota Statutes, section 645.44, subdivision 5.

Subp. 51. **Suspend certification.** "Suspend certification" means to temporarily withdraw certification of a solar collector. A collector purchased while its certification is suspended is not eligible for the credit. Certification may be reinstated by complying with this chapter.

Subp. 52. **Time constant.** "Time constant" means the time required for the fluid leaving a solar collector to attain 63.2 percent of its steady state value following a step change in irradiation or inlet fluid temperature.

Subp. 53. **Transfer fluid.** "Transfer fluid" means the medium such as air, water, or other fluid that passes through or in contact with the solar collector and carries the thermal energy away from the collector.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

**4280.0300 GENERAL SCOPE OF RULES.**

All solar collectors must be certified or registered according to this chapter at the time of sale to be eligible for the credit. If certification is required for a collector but the collector has not been certified, neither the collector nor other solar system components are eligible for the credit. The collector certification requirements apply no matter who installs the system, whether homeowner, contractor, solar installer, or dealer. All solar collectors which are exempted, registered, or certified by the Minnesota Department of Energy and Economic Development are deemed certified for the purposes of the individual income tax residential energy credit solar collector certification, pursuant to Minnesota Statutes, section 290.06, subdivision 14.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

**4280.0400 EXEMPTIONS TO CHAPTER REQUIREMENTS FOR CERTIFICATION.**

Exemptions include the following:

- A. Home-built solar collectors are exempt from certification.
- B. Custom-built solar collectors are exempt from the test requirements but must be registered by the department to be eligible for the credit.
- C. Solar collector kits or manufactured solar collectors of a single model used in systems with sales in Minnesota of 20 or fewer solar systems in any consecutive 12-month period are exempt from the certification test requirements, but solar systems using these collectors must be registered by the department to be eligible for the credit. The department shall deny registration of more than 20 solar systems in any consecutive 12-month period unless the collectors used in the system have been certified under the provisions of this chapter.
- D. A manufacturer of a solar collector required to be certified which has had the collector tested or contracted to be tested before the effective date of this chapter may use the results of that test in its application for certification instead of the test procedures outlined in parts 4280.1500 to 4280.1800. The tests must have been performed at a department-approved laboratory in accordance with ASHRAE Standard 93-77, "Methods of Testing to Determine the Thermal Performance of Solar Collectors," issued by the Standards Committee of the American Society of Heating, Refrigerating, and Air Conditioning Engineers (New York, 1978); ASHRAE Standard 95-1981, "Method of Testing to Determine Thermal Performance of Solar Domestic Water Heating Systems," issued by the Standards Committee of the American Society of Heating, Refrigerating, and Air Conditioning Engineers (New York, 1982); or ASHRAE Standard 96-1980, "Method of Testing the Thermal Performance of Unglazed Flat Plate Liquid Type Solar Collectors," issued by the Standards Committee of the American Society of Heating, Refrigerating, and Air Conditioning Engineers (New York, 1980).
- E. Solar collectors that have been certified by the California Energy Commission, the state of Florida, the Solar Rating and Certification Corporation, the Solar Energy Industry Association, or the Air-Conditioning and Refrigeration Institute before the expiration of the grace period specified in item F, or by a national organization that meets the criteria in this chapter, are eligible for automatic certification by the department. However, the manufacturer must file an application with the department in order to receive Minnesota solar collector certification.
- F. A blanket exception is granted for a period of nine months following the effective date of this chapter to provide for timely and orderly

testing, rating, and certification of solar collectors. All expenditures for solar collectors after the expiration of the grace period must be in accordance with this chapter to be eligible for the credit.

G. Any solar collector included in a renewable energy source expenditure after February 3, 1982, and before the effective date of this chapter shall be deemed certified by the Department of Energy and Economic Development for the purposes of Minnesota Statutes 1980, section 290.06, subdivision 14, so long as the expenditure qualifies for the federal renewable energy source residential credit of Section 44C of the Internal Revenue Code of 1954 (United States Code, title 26, section 44C), as amended through December 31, 1978, and any regulation promulgated pursuant thereto.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

#### 4280.0500 APPLICATION FEES.

Fees for processing an application are.

A. \$300 for an application for certification of a standard or innovative collector based on new or previous testing;

B. \$100 for an application to certify a similar collector;

C. \$50 for an application based on previous certification by the Solar Rating and Certification Corporation, Solar Energy Industry Association, Air-Conditioning and Refrigeration Institute, California Energy Commission, or the state of Florida as authorized by part 4280.0400, item E;

D. \$50 for an application to certify a collector manufactured under license to a previous recipient of certification on the collector;

E. \$50 for a resubmitted application after the 180-day time limit; and

F. \$10 for an application for registration of a solar system using a custom-built collector or registration of a solar system using a solar collector kit or a manufactured solar collector with sales in Minnesota of 20 or fewer solar systems in any consecutive 12-month period

Checks in payment of fees must be made payable to "Treasurer, State of Minnesota."

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

#### 4280.0600 UNITS OF MEASURE.

The International System of Units is the preferred measurement system for purposes of certification.

The information in the certification label must be in the International System of Units specified in part 4280.3800, subpart 4. Values in inch-pound units, if included, must be placed in parentheses following the value in the International System of Units. Note that the measurements in parts 4280.1500 to 4280.1800 and succeeding rules are given in the International System of Units followed by the measurements in inch-pound units in parentheses, as illustrated by part 4280.1700, subpart 3.

Inch-pound units may be used in the application for certification until further notice. If inch-pound units are used, however, the applicant is encouraged to include the values in the International System of Units in parentheses following the values in inch-pound units to facilitate the use of the information in the application after the transition to the International System of Units has been completed. Contact the department for assistance with measurement units.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

## CERTIFICATION PROCEDURES

**4280.0700 STANDARD SOLAR COLLECTOR.**

The provisions of items A to H govern certification procedures for standard solar collectors.

A. The manufacturer shall request the department to select a solar collector from the manufacturer's stock.

B. Within two weeks of the request, or at a mutually agreeable time, a representative of the department shall randomly select one solar collector sample from an existing stock of at least five units at the manufacturer's plant or at a distribution point.

C. The manufacturer shall have the designated sample tested in accordance with the test procedures contained in parts 4280.1500 to 4280.1800 at a department-approved laboratory of the manufacturer's choice and at the manufacturer's expense.

D. If the sample completes the prescribed series of performance and durability tests and passes the inspection, the manufacturer may submit an application for certification. The application must be signed and dated by an authorized agent of the company and two witnesses. The manufacturer may designate information submitted to the department as nonpublic data by requesting that designation plainly and legibly on the application. Test results required for certification shall be considered public only if certification is granted. The application must contain the following:

(1) It must contain product label information in the format provided by part 4280.3800, subpart 4.

(2) It must contain the product warranty.

(3) It must contain a test report including thermal performance curve, incident angle modifier, collector time constant, conditions used to establish performance such as flow rate and fluid, exposure or stagnation test results, and results from final inspection after disassembly.

(4) It must describe the following products or materials by type and commercial designations: cover plates; absorber plate; absorber coatings; reflectors or lenses; collector enclosure; insulation; caulking, sealants, and gaskets; thermal and mechanical bonds, including the bonding used for reflecting materials that are not the same material as the reflector backing; trim, retaining strips, mounting brackets, or other hardware; connecting hoses; control system sensors; and reflector mounting frame. Upon request by the department, the applicant shall furnish information relating to the reflector mounting frame's thermal or flame spread properties, electrical corrosion resistance, ultraviolet radiation, pollutants, or optical characteristics, as specified by the supplier. The application must also contain a component-by-component declaration of combustibility, including the rating, the rating method, and the test standard used.

(5) It must contain collector drawings of sufficient detail to accurately represent: aperture cover plate dimension and mounting detail; absorber plate dimensions including thickness, location, and spacing of fluid flow paths, cross-section dimensions and shape of flow channels, tube wall thickness, and plate-to-tube heat transfer provisions; collector enclosure dimensions, provisions for attaching absorber and plate, and size and location of holes; collector assembly detail specifying fasteners and other attachment methods indicating overall dimensions; and for concentrator type, a cross-sectional view, dimensions, and mounting detail.

(6) It must contain working fluid or flow rate recommendations or restrictions. If a heat transfer fluid other than water is to be used, fluid properties of specific heat, density, viscosity, thermal conductivity, and toxicity must be provided.

(7) It must contain installation, operation, and maintenance considerations.

(8) It must contain the following statement of commitment by the manufacturer:

"As the manufacturer (importer) of the solar collector described in this application, I (we) affirm that all of the information contained herein is correct. Furthermore, if certification for this collector is granted, I (we) agree to: represent a collector as certified only when it is manufactured of the same materials and specifications as the collector that was originally certified; permanently affix the certification label to all production units of the certified collector sold in Minnesota; notify the department of changes in collector materials or construction; provide copies of the department's solar collector certificate to the consumer upon request; permit the department to select, at any time, a certified collector offered for sale or on display for a retest of the collector to verify its compliance to the original specifications and performance; notify the department of licenses awarded to manufacture this collector and other model or brand names under which this collector is marketed; and honor the warranty expressed in the application for certification for the full term of the warranty."

E. The department shall evaluate the application and notify the manufacturer in writing of the approval or rejection of the application within 40 state business days after receiving the application.

If certification is granted, the department shall calculate the thermal performance rating and provide a signed Solar Collector Certificate as provided in part 4280.3800, subpart 4 and photo-ready copies of the certification symbol.

If certification is denied, the department shall specify the reasons for rejection and identify the necessary corrective action. If all identified corrections are made and the manufacturer has resubmitted the application to the department within 180 days after the date of the rejection notice, the department shall approve the application and certify the collector without additional fees. After that time a resubmittal fee must accompany the application. If the manufacturer has resubmitted the application and the department has made a final decision to deny certification, the manufacturer may initiate the appeal process of part 4280.3700.

F. The manufacturer shall permanently affix the certification symbol and the required label information, in a form approved by the department, to all production units of the certified model and not to any other piece of the solar system.

The manufacturer may produce labels from the certification symbol and label design provided by the department; design its own label that includes the certification symbol and required label information; or include the certification symbol and required label information in the manufacturer's nameplate.

The manufacturer shall submit a sample of the proposed label or nameplate and written request for approval to the department before using the label or nameplate. The department shall grant approval if all the required label information is presented clearly and legibly, the certification symbol is accurately presented, and the label or nameplate material will reasonably withstand exposure to the climate.

The department shall send the manufacturer written approval or rejection of the sample and, if appropriate, the reasons for rejection within 15 state business days after receiving the sample and written request.

The certification symbol may be used in advertising, catalogs, or sales promotion material. The symbol must clearly refer only to certified collectors.

G. The manufacturer shall promptly notify the department of licenses awarded to manufacture this collector and other model or brand names under which the solar collector is marketed.



H. The department shall maintain a list of all certified collectors and provide the product label information to consumers.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** 8 SR 531

#### **4280.0800 SIMILAR SOLAR COLLECTOR.**

A collector that is substantially identical to a certified or reference collector manufactured by the same firm is eligible for certification based upon the test results from the reference collector. The following procedure must be used:

A. The manufacturer shall provide to the department the following material:

- (1) a copy of the application for certification of the reference collector;
- (2) an application in accordance with part 4280.0700, item D for certification of the similar collector;
- (3) a statement completely describing all physical differences between the reference and similar collectors;
- (4) a statement projecting any changes in performance, reliability, or durability that are expected because of the change in physical properties;
- (5) the data, assumptions, and procedures used to develop the projections in subitem (4); and
- (6) the appropriate application fees.

The manufacturer may designate new information submitted to the department as nonpublic data by requesting the designation plainly and legibly at the time the information is supplied.

B. The department shall evaluate the application for certification of the similar model and supporting documentation and notify the manufacturer in writing of the approval or rejection of the application within 40 state business days after receiving the application.

If certification is granted, the department shall calculate the thermal performance rating and provide a signed collector certificate and photo-ready copies of the certification symbol.

If certification is denied, the department shall specify the reasons for rejection. The manufacturer may develop additional supporting arguments and request a review by the department. The department shall send written notification of its final decision to the manufacturer within 20 state business days after receiving the request for review. If certification has been denied, the collector may be tested and a new application, with appropriate fees, may be filed with the department. The department's final decision is subject to the appeal process under part 4280.3700.

C. The manufacturer of a collector certified under this part shall follow the labeling, other model number, and brand name requirements of the procedures for a standard solar collector required by part 4280.0700, items F and G.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** 8 SR 531

#### **4280.0900 INNOVATIVE SOLAR COLLECTOR.**

The following provisions govern certification procedures for innovative solar collectors:

A. The manufacturer shall describe the collector and explain why it cannot be fairly and adequately evaluated by the standard solar collector procedure contained in part 4280.0700. The manufacturer shall propose a procedure to the department for testing and evaluating the innovative collector. The detail of both the description and the procedure should be sufficient to allow

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the department to fairly assess the validity of the proposed evaluation criteria. The manufacturer may designate information submitted to the department as nonpublic data by requesting the designation plainly and legibly at the time the information is supplied

B The department shall evaluate the proposed procedure and notify the manufacturer of its decision on the proposal within 40 state business days after receiving the proposal

If the proposal is accepted, the manufacturer shall follow the process outlined in the proposal. The appropriate fees must be included in the formal application for certification.

If the proposal is rejected, the department shall specify the reasons for its decision. The manufacturer may revise the criteria or procedure or both and resubmit the proposal to the department. If the department makes a final decision to reject the proposal, or if it denies certification in a final decision under the terms of the accepted evaluation procedures, the manufacturer may appeal.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

**4280.1000 COLLECTOR MANUFACTURED BY LICENSEE.**

A certified collector that is also manufactured and sold under license is eligible for certification by the department to the licensee without additional testing. The following procedure must be used:

A. The licensee shall provide the department with the following material: a copy of the application submitted by the original manufacturer for original certification of the collector, an application in accordance with part 4280.0700, item D for certification of the collector, and appropriate application fees

The licensee may designate new information submitted to the department as nonpublic data by requesting the designation plainly and legibly at the time the information is supplied.

B The licensee shall request the licensor to send to the department a written authorization to certify the licensed collector and a declaration that the collector is identical in all respects to the originally certified collector.

C. The department shall review the application and letter of authorization and notify the licensee in writing of the approval or rejection of the application within 40 state business days after receiving the application.

If certification is granted, the department shall provide a signed collector certificate and photo-ready copies of the certification symbol.

If certification is denied, the department shall specify the reasons for rejection. The licensee may request a review by the department and offer additional material in support of the application. The department shall send the manufacturer written notification of its final decision within 20 state business days after receiving the request for review. The department's final decision is subject to the appeal process of part 4280.3700.

D. The manufacturer of a licensed collector certified by the department shall follow the labeling, other model number, and brand name requirements of the procedures for a standard solar collector required by part 4280.0700, items F and G.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

**4280.1100 CUSTOM-BUILT SOLAR COLLECTORS.**

Subpart 1. **Application.** The contractor of a custom-built solar collector shall apply to the department for tax credit registration for the solar system the contractor intends to build. Though custom-built solar collectors are not required to be tested, the contractor must supply sufficient information about the collector to allow the department to register it as a unique collector. The application must include the following information:

- A. name, firm, and address of the contractor;
- B. name and address of the customer;
- C. gross collector area;
- D. collector dimensions;
- E. cover plate material;
- F. absorber plate material;
- G. insulation;
- H. framing material;
- I. sealants;
- J. heat transfer fluid;
- K. mounting surface type;
- L. orientation;
- M. slope angle from horizontal;
- N. product warranty, if any;
- O. owner's manual or instructions, if any; and
- P. thermal performance estimates, if any.

Subp. 2. **Registration number and document.** If the necessary information has been provided, the department shall assign a registration number and send a solar system registration document to the customer, with a copy to the contractor, within ten state business days after receiving the application.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** 8 SR 531

**4280.1200 SOLAR COLLECTOR KIT OR MANUFACTURED SOLAR COLLECTOR.**

Subpart 1. **In general.** A solar system using a model of a solar collector kit or a manufactured solar collector is eligible for registration for the tax credit if 20 or fewer solar systems using the collector have been registered by the department during a consecutive 12-month period. If 20 solar systems have been registered during a 12-month period, additional solar systems are eligible for registration only if the department has approved a grace period in accordance with subpart 3.

Subp. 2. **Sale of 20 solar systems or fewer.** If 20 or fewer solar systems using a model of a solar collector kit or manufactured solar collector have been registered during a consecutive 12-month period, the manufacturer or dealer of the solar collector kit or manufactured solar collector must apply to the department for registration in order for the solar system to be eligible for the credit. The application must include the following information: product label information required by part 4280.3800, subpart 4 excluding information on the thermal performance efficiency and performance rating; name and address of purchaser; description of the major components in the kit or manufactured solar collector, including glazing material, absorber material and surface, insulation, enclosure, and sealants; and working fluid and flow rate recommendations or restrictions.

If the manufacturer has complied with the requirements in the paragraph above, the department shall assign a registration number and send a solar system registration document to the customer, with a copy to the dealer or manufacturer, within ten state working days after receiving the application.

**Subp. 3. Sale of more than 20 solar systems in Minnesota.** The manufacturer of a solar collector kit or manufactured solar collector may apply to the department for a six-month grace period in order to complete testing and certification requirements. The application must include evidence that a collector sample has been selected by the department and submitted to an accredited laboratory for Minnesota certification testing.

The department shall review the application. If the criteria have been met, the department shall approve the grace period. All systems using the model of solar collector kit or manufactured solar collector sold during the grace period are eligible for tax credit registration by the department.

The manufacturer shall follow the steps for certification as a standard solar collector.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

### **TEST METHODS AND MINIMUM STANDARDS FOR SOLAR COLLECTORS**

#### **4280.1500 PURPOSE.**

Parts 4280.1500 to 4280.1800 specify the test methods to be followed and the standards to be met in determining the thermal performance and the durability of solar collectors used for space heating and cooling and water heating. Only collector models meeting the standards are eligible for the certification label.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

#### **4280.1600 SCOPE.**

**Subpart 1. In general.** Parts 4280.1500 to 4280.1800 apply to liquid and air collectors. They provide a means for evaluating the maintainability and structural integrity of solar collectors and data for determining a thermal performance rating for solar collectors.

**Subp. 2. Exceptions.** The procedures in part 4280.1700, subparts 8 to 10 cannot be followed for devices meeting the following description: the device is intended for solar domestic water heating systems; its collectors cannot be appropriately tested under the requirements of ASHRAE Standard 93-77, "Methods of Testing to Determine the Thermal Performance of Solar Collectors," issued by the Standards Committee of the American Society of Heating, Refrigerating, and Air Conditioning Engineers (New York, 1978); and its collection function cannot be separated from the system function, commonly referred to as an integral collector storage (ICS) device.

For these devices, the procedures in part 4280.1700, subparts 8 to 10 must be replaced by the procedures contained in ASHRAE Standard 95-1981, "Method of Testing to Determine Thermal Performance of Solar Domestic Water Heating Systems," issued by the Standards Committee of the American Society of Heating, Refrigerating, and Air Conditioning Engineers (New York, 1982), and SRCC Standard 200-82, "Test Methods and Minimum Standards for Certifying Solar Water Heating Systems," issued by the Solar Rating and Certification Corporation (Washington D.C., March 1982).

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

**4280.1700 TEST METHODS FOR SOLAR COLLECTORS.**

Subpart 1. **Testing sequence.** Solar collector testing shall be performed in the following sequence:

- A. receiving inspection;
- B. static pressure test;
- C. 30-day exposure test;
- D. thermal shock/water spray test;
- E. thermal shock/cold fill test;
- F. static pressure test;
- G. collector time constant determination test;
- H. thermal performance test;
- I. incident angle modifier test; and
- J. disassembly and final inspection.

Subp. 2. **Condition of collector.** Upon receiving a collector for tests, the test laboratory shall inspect and document the condition of the collector.

Subp. 3. **Pre-exposure static pressure test.** The laboratory shall conduct a static pressure test before exposure testing.

The test method must be specific to the type of collector. Collectors are categorized as follows: street pressure solar collectors (collectors which, by virtue of their installation in a municipal water system, will be directly subjected to variations in street water pressure and hot water tank pressure); low pressure service hot water collectors (collectors which, by virtue of their installation, will not have a direct fluid interchange with an auxiliary heater or street pressure, but use an appropriate heat exchanger); or alternate fluid solar collectors (collectors which, by virtue of design, are not intended to have a direct fluid connection to a solar water heating system). Alternate fluid solar collectors may or may not be designed to accept street pressure.

The test pressure must be 1100 kPa gauge (160 psig) for street pressure collectors. This test pressure is two times the allowable street pressure, 550 kPa gauge (80 psig), in a dwelling as set out in section 1213.9 of the "Standard Plumbing Code," issued by the Southern Building Code Congress International (Birmingham, Alabama, 1976) and exceeds the required pressure-temperature valve relief setting on hot water tanks, which is 1030 kPa gauge (150 psig).

Collectors specified for positive operating pressure less than street pressure 550 kPa gauge (80 psig) must be pressure-tested at one and one-half times the manufacturer's rated operating gauge pressure, but at a minimum of 170 kPa gauge (25 psig).

Collectors specified for operating pressures greater than 550 kPa gauge (80 psig) must be pressure tested at 1.5 times the manufacturer's rated operating gauge pressure or 1100 kPa gauge (160 psig), whichever is greater.

Collectors specified for operation at atmospheric pressure or below must be pressure tested at the discretion of the test director, but at no greater than 170 kPa gauge (25 psig).

Determination of test pressure must be based on documentation supplied by the manufacturer in the application for certification as specified in part 4280.0700, item D.

For liquid collectors, either hydrostatic or pneumatic pressure sources may be used. The test laboratory shall follow the following test procedures: a pressure gauge must be attached to read pressure at the exit port of the collector, the collector completely filled with unheated fluid, and the exit port closed off. Hydraulic pressure must be applied via the inlet port until the gauge indicates the test pressure. After stable test pressure has been reached, the exit port must be closed and the pressure monitored for 15 minutes.

Pneumatic pressure sources must be used for air collectors. The following test procedures must be followed: a pressure tap of pipe or tubing must be

sealed into the exit port of the test specimen and connected to a manometer which can be read directly to 2.5 Pa (0.01 inch water column) or to a pressure gauge of equivalent accuracy. An air volume meter accurate to within 150 mL ( $\pm 0.5$  cubic feet) must be placed in the air supply system between the supply source and the collector. Pressure of 125 Pa gauge (0.5 inch water column) must be applied via the inlet port and the pressure monitored for one hour. The volume of air added or removed in order to maintain the required pressure must be documented.

**Subp. 4. Exposure test.** The test laboratory shall conduct an exposure test to verify integrity of construction after at least 30 days of exposure to adverse conditions. The following methods must be followed:

A. Liquid collectors must be filled completely with clean liquid, following which the liquid must be allowed to gravity-drain for 15 minutes with the collector mounted at a 45-degree tilt angle. The collector inlet and outlet must be loosely sealed.

B. Exposure conditions must consist of 30 days of cumulative exposure to a minimum daily incident solar radiation flux of 17 MJ/m<sup>2</sup>.day (1500 Btu/ft<sup>2</sup>.day) as measured in the plane of the collector aperture. The exposure conditions must include at least one consecutive four-hour period with a minimum instantaneous flux of 950 W/m<sup>2</sup> (300 Btu/ft<sup>2</sup>.hr). The average baseline ambient temperature must be 27 degrees Celsius (80 degrees Fahrenheit) or higher during the four-hour period.

C. Data recorded and reported during exposure testing must include integrated daily solar radiation data. A regularly scheduled weekly visual inspection must also be made, and a record of changes in the physical appearance of the collector must be kept.

**Subp. 5. Spray tests.** The laboratory shall conduct a thermal shock/water spray test. During a five minute period on three different days of the exposure test, the collector must be subjected to heavy spray from above or in front of the collector. Spray testing must be conducted after at least one hour of direct sun at a minimum intensity of 850 W/m<sup>2</sup> (270 Btu/ft<sup>2</sup>.hr) and within two hours of solar noon. These three spray tests must be conducted during the last 10 days of the exposure test.

Water delivery must be at a rate not less than 20 mL/s per square meter of collector (1.8 gallons/ft<sup>2</sup>.hr) (2.9 inches of rainfall per hour), with the spray pattern designed to wet the surface that would be wet during a normal rain shower. Temperature of the water must be between 19 and 29 degrees Celsius (65 and 85 degrees Fahrenheit) during the spray test. The procedure of NBSIR 1305A, test 7.3, in "Provisional Flat Plate Solar Collector Testing Procedures" by D. Waksman et al., first revision, issued by the National Bureau of Standards (Washington D.C., June 1978) must be used.

**Subp. 6. Fill tests.** The laboratory shall conduct a thermal shock/cold fill test for liquid collectors. At one time during the test sequence the unfilled collector must be exposed to full sun, not less than 950 W/m<sup>2</sup> (300 Btu/ft<sup>2</sup>.hr), for one hour. While the collector is still so exposed, liquid must be circulated through the collector for five minutes at a flow rate of approximately 17 mL/s per square meter of collector (1.5 gallons/hr.ft<sup>2</sup>). The temperature of the entering liquid must be between 19 and 29 degrees Celsius (65 and 85 degrees Fahrenheit) during this test. The procedure of NBSIR 1305A, test 7.4 must be used.

Solar collectors may be certified without the thermal shock/cold fill if their designs are such that cold refill of a hot collector is not allowed. The manufacturer shall state this limitation in writing and the limitation must be included in the test report.

**Subp. 7. Post-exposure static pressure test.** The laboratory shall conduct a static pressure test following the provisions of subpart 3 after exposure and before thermal performance testing.

**Subp. 8. Time constant test.** The laboratory shall conduct a time constant test to determine the time required for the outlet fluid temperature to attain 63.2 percent of its steady state value following a step change in the input. This figure is used to determine the time period over which temperature and irradiance data are integrated to obtain the computed efficiency values for the thermal performance test. The test method must conform to ASHRAE Standard 93-77, "Methods of Testing to Determine the Thermal Performance of Solar Collectors," issued by the Standards Committee of the American Society of Heating, Refrigerating and Air Conditioning Engineers (New York, 1978).

**Subp. 9. Thermal performance test.** The laboratory shall conduct a thermal performance test on those collectors that have met the criteria of part 4280.1800, items A to E and for which the collector time constant has been determined. The thermal performance test determines "instantaneous" efficiency of the solar collector over a wide range of operating temperatures. Efficiency is defined as the ratio of collected energy to the total available energy falling upon the entire collector area. Collected energy is determined by the product of fluid mass flow, specific heat, and integrated temperature gain across the collector. Available energy is determined by the integrated solar irradiance. Typically, four data points of at least five minutes duration are taken at each of four different inlet fluid temperatures. For unglazed collectors, the inlet fluid temperatures include test temperatures below and above ambient air temperature. Glazed collectors are normally tested over a range of inlet fluid temperatures from near ambient to approximately 70 degrees Celsius (126 degrees Fahrenheit) above ambient temperature.

The test method used for glazed collectors must conform to ASHRAE Standard 93-77, "Methods of Testing to Determine the Thermal Performance of Solar Collectors," issued by the Standards Committee of the American Society of Heating, Refrigerating, and Air Conditioning Engineers (New York, 1978). The test method used for unglazed collectors must conform to ASHRAE Standard 96-80, "Method of Testing the Thermal Performance of Unglazed Flat Plate Liquid Type Solar Collectors," issued by the Standards Committee of the American Society of Heating, Refrigerating, and Air Conditioning Engineers (New York, 1980). Any deviations from either standard must be delineated in the test report. Normal incidence data must be taken as specified by ASHRAE Standard 93-77 or 96-80. Test data must be taken within plus or minus five degrees Celsius (nine degrees Fahrenheit) of the maximum temperature differential for which a rating is desired.

**Subp. 10. Collector incident angle modifier determination.** A collector incident angle modifier determination must be made. The thermal performance curve for a collector is determined when the irradiance incident on the collector is within 30 degrees of normal to the aperture of the collector. To predict collector performance over a wide range of conditions, the test laboratory shall conduct tests to determine the collector incident angle modifier. This is used to modify the efficiency curve (determined within 30 degrees of normal incidence) to account for changes in performance as a function of the sun's incidence angle. The test method used must conform to ASHRAE Standard 93-77, "Methods of Testing to Determine the Thermal Performance of Solar Collectors," issued by the Standards Committee of the American Society of Heating, Refrigerating, and Air Conditioning Engineers (New York, 1978) or ASHRAE Standard 96-80, "Methods of Testing to Determine the Thermal Performance of Unglazed Flat Plate Liquid Type Solar Collectors," issued by the Standards Committee of the American Society of Heating, Refrigerating and Air Conditioning Engineers (New York, 1980).

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Biaxial incident angle modifiers are required on collectors which are nonsymmetrical in their response to irradiance as solar altitude and azimuth change. These types of collectors have optical characteristics that depend on direction in the aperture plane, so that the incident angle modifier depends on both the solar azimuth in the aperture plane and the angle of incidence. Examples of this type of collector include tubular collectors and collectors employing trough structures, mirrors, or lenses such that the geometries are characterized by biaxial symmetry.

In the case of anisotropic collectors, data must be taken in each of the two perpendicular planes that characterize the collector geometry.

In all cases, the test laboratory shall take enough incident angle modifier data to describe adequately the relationship between the incidence angle and the incident angle modifier.

**Subp. 11. Disassembly and final inspection.** The test laboratory shall disassemble the collector and shall visually inspect the major components and subassemblies and shall report their condition. All abnormalities must be reported and accompanied by a photograph. The test laboratory shall use the guide in subpart 12 to identify conditions to be reported.

**Subp. 12. Guide for collector inspection.**

Major Components or Subassemblies	Conditions to be Reported
A. Collector case and enclosure fasteners	Cracking, warping, corrosion
B. Mounting means (mounting brackets, flanges, etc.)	Loss of mounting integrity
C. Seals, gaskets	Cracking, loss of elasticity or adhesion
D. Covers and reflectors	Cracking, crazing, buckling, delamination, warping
E. Absorber:	
Coating	Crazing, cracking, blistering
Inlet and outlet tubes	Deformation, corrosion, leakage
Flow tubes	Deformation, corrosion, leakage, loss of bonding
Headers	Deformation, corrosion, leakage
Absorber Mountings	Loss of mounting integrity
F. Insulation	Water retention, swelling, outgassing

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

**4280.1800 COLLECTOR STANDARDS.**

The following criteria represent the requirements for durability in collector design and construction in order to qualify for certification.

- A. All glass cover plates must be of a nonshattering or tempered type.



B. The collector must be designed to prevent condensate buildup. The use of desiccants to control condensation is permitted. The test report should note any unusual condensate buildup.

C. Pressure test results criteria must be as follows:

(1) Liquid collectors after testing must be considered passable if: a loss of pressure does not occur; there is no evidence of fluid leakage; and there is no evidence of fluid path deterioration such as by swelling or stretching.

(2) Air collectors after testing must be considered passable if there is no evidence of fluid path deterioration such as swelling or stretching.

D. Thermal shock/water spray test results must show that the collector structure and performance are not degraded by moisture penetration. There must be no cracking, crazing, warping, or buckling of the cover plate.

E. The test laboratory shall terminate the test if it is apparent without collector disassembly that the unit no longer meets the quality requirements of item F.

F. The department may deny certification if the tests show disassembly and final inspection conditions that, in its judgment, may lead to an abnormally short collector life. The conditions are:

(1) severe deformation of the absorber;

(2) severe deformation of the fluid flow passages;

(3) loss of bonding between fluid flow passages and absorber plate;

(4) leakage from fluid flow passages or connections;

(5) loss of mounting integrity;

(6) severe corrosion or other deterioration caused by chemical action;

(7) crazing, cracking, blistering, or flaking of the absorber coating or delamination of reflective surfaces;

(8) retention of water in the insulation;

(9) swelling, severe outgassing, or other detrimental changes in collector insulation that adversely affect collector performance;

(10) cracking, loss of elasticity, or loss of adhesion of gaskets and sealants;

(11) leakage or damage to hoses used inside the collector enclosure or leakage from mechanical connections;

(12) cracking, crazing, permanent warping, or buckling of the cover plate; and

(13) cracking or warping of the collector enclosure materials.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

#### **EVALUATION CRITERIA, RATINGS, AND WARRANTIES**

#### **4280.2500 STANDARD SOLAR COLLECTOR.**

The department shall certify a standard solar collector if:

A. the collector sample has successfully completed the specified testing;

B. the collector has passed the evaluation of the disassembly and final inspection;

C. the application for certification is complete;

D. the warranty meets the minimum requirements; and

E. the appropriate application fee is included.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

**4280.2600 SIMILAR SOLAR COLLECTOR.**

Subpart 1. **Eligibility.** A collector is eligible for certification as a similar collector only if all materials and construction techniques are identical to the reference collector except that:

- A. the collector size has been increased;
- B. the cover plates are in the same material category but of a different material;
- C. the cover plates are of the same material but of minor differences in thickness; or
- D. there are other changes in material or techniques that the manufacturer deems to be insignificant.

Subp. 2. **Special condition.** If the application is based on either subpart 1, item B or C the thermal performance of a similar collector must be calculated from the test results of the reference collector and the difference in transmissivity between the two cover plates.

Subp. 3. **Certification requirements.** The department shall grant certification if:

- A. the application for certification is complete and all required supporting documents have been provided;
- B. the performance and durability of the collector can be accurately and reliably described by the information submitted on and with the application for certification;
- C. the warranty meets the minimum requirements; and
- D. the appropriate application fee is included.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

**4280.2700 INNOVATIVE SOLAR COLLECTOR.**

The manufacturer shall propose an evaluation procedure that will fairly and adequately test and evaluate the innovative solar collector and that will result in reliable information about the performance and durability of the collector. The procedure must include:

- A. testing of a random sample of a production collector for reliability, durability, and thermal performance by an independent laboratory;
- B. an application form that adequately describes the collector, its operation, and performance;
- C. a procedure for performance rating the collector; and
- D. the procedure from the rules for certifying standard collectors specifying the requirements for the manufacturer's commitment, part 4280.0700, item D, subitem 8; the department's decision, part 4280.0700, item E; labeling, part 4280.0700, item F; and marketing, part 4280.0700, item G.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

**4280.2800 COLLECTOR MANUFACTURED BY LICENSEE.**

A collector manufactured and sold by a licensee of a firm that has previously received certification for the collector must be certified upon:

- A. verification by the licensor that the collector manufactured under its license is identical in materials and construction to the collector already certified;
- B. written authorization from the licensor for the department to certify the collector being manufactured under its license; and
- C. payment of appropriate fees.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

**4280.2900 RATING.**

The thermal performance of the collector must be rated by using "Standard RM-1 Methodology for Determining the Thermal Performance of Solar Collectors," as adopted by the Solar Rating and Certification Corporation (Washington D.C., 1981). Rating values must be provided in at least two adjacent categories specified by "Performance Rating" in the solar collector label information in part 4280.3800, subpart 4

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

**4280.3000 WARRANTY.**

**Subpart 1. Purpose.** The intent of the warranty is to encourage the use of solar energy and promote the development of a viable solar industry by providing purchasers with effective, well-designed, carefully manufactured solar collectors and by providing warranty protection for certified solar collectors in accordance with the standards, terms, and conditions specified in the Magnuson-Moss Warranty -- Federal Trade Commission Improvement Act, United States Code, title 15, sections 2301-2312 (1976), and the regulations promulgated thereunder as found in Code of Federal Regulations, title 16, subchapter G (1981).

**Subp. 2. Terms of warranty required.** The manufacturer of a certified solar collector shall give a full warranty against defects in materials, manufacture, or design of the solar collector for a period equal to at least one year, which begins on the date of sale. In addition, the manufacturer shall provide a limited warranty on the collector for at least 20 percent of the claimed collector design life, beginning one year after the date of sale.

**Subp. 3. Plain written language.** The full warranty and any additional express warranties must be in writing and must clearly and conspicuously disclose the following information in readily understood language:

- A. the identity of persons to whom the warranty is extended;
- B. a clear description and identification of products, parts, characteristics, components, or properties covered by the warranty;
- C. a statement of what the warrantor will do in the event of a defect, malfunction, or failure, as provided in subpart 4;
- D. when the warranty term begins and how long it lasts;
- E. a step-by-step procedure that the customer should follow to obtain performance of warranty obligations, including a list of the class of persons authorized to perform warranty obligations;
- F. if applicable, information concerning the availability of an informal dispute settlement mechanism that the consumer is required to use;
- G. if applicable, any exclusion or limitation on incidental or consequential damages, and the statement: "Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you"; and
- H. the statement. "This warranty gives you specific legal rights, and you may also have other legal rights that vary from state to state."

**Subp. 4. Manufacturer's duties.** The manufacturer, as a warrantor, has the following duties:

A. In the case of a defect, malfunction, or failure of the solar collector to conform with the express warranty, the warrantor shall repair or replace the solar collector within a reasonable time and without charge.

B. If the solar collector contains a defect or malfunction after a reasonable number of attempts by the warrantor to remedy defects or

malfunctions, the warrantor shall permit the customer to choose a refund or a replacement of the solar system or component as appropriate. A replacement must include reinstallation without charge.

C. The warrantor need not perform the duties specified in items A and B if the warrantor can show that the defect, malfunction, or failure was caused by unreasonable use, or that the defect, malfunction, or failure resulted from improper or faulty installation of the solar system.

D. The warrantor may not require a customer to return a warranty registration card as a prerequisite of warranty coverage and performance. The warrantor may not impose any other duty as a condition of obtaining a remedy unless the warrantor can demonstrate that the other duty is reasonable.

E. The warrantor may not limit the duration of any implied warranty on the solar system.

F. The warrantor shall extend the warranty obligations during the term of the express warranty to any person to whom the solar system, or the building on which the solar system is installed, is transferred.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

#### **4280.3100 LABORATORY APPROVAL.**

The department shall approve all laboratories accredited by the Solar Rating and Certification Corporation for solar collector certification testing. The department shall maintain a list of approved laboratories.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

#### **4280.3500 VERIFICATION RETEST.**

Subpart 1 **In general.** To verify that a certified solar collector being marketed has the same physical and performance characteristics as the sample that was tested during the initial certification procedures, the department may require that the collector be reevaluated or retested or both. The procedures in subparts 2 and 3 must be used.

Subp. 2. **Sampling and testing.** The department shall select a sample of the certified collector from the manufacturer's existing stock and examine the materials and design or require that it be tested according to the procedures contained in part 4280.0700, items A to C. The manufacturer shall pay all fees and charges and submit the results of the retest to the department.

If the sample is constructed of the same materials and design as the originally certified collector and passes the retest, if performed, no change shall be made in the certification status and the department shall reimburse the manufacturer for testing and shipping charges actually incurred for the collector retest.

If the sample is constructed of different materials or design than the originally certified collector or fails the retest, the department shall suspend certification for the collector and shall notify the manufacturer of the suspension in writing. The collector shall pass the verification retest only if the retest thermal performance ratings are no less than 90 percent of the ratings in any of the categories completed for the certified collector.

Subp. 3. **Challenging results.** The manufacturer may challenge the results of the retest and evaluation by requesting, within 20 state business days after the date of the suspension notification, the department to select an additional sample for testing from the manufacturer's stock in accordance with the procedures contained in part 4280.0700, items A to C and by submitting the results of the retest to the department.

If the second sample passes the retest and evaluation, the department shall promptly reinstate certification.

If the second sample fails the retest or evaluation, the department shall formally revoke certification. The results from either test may be used, however, in a subsequent application for certification as a new collector model.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

#### **4280.3600 TERMINATING CERTIFICATION.**

Subpart 1. **In general.** Certification may be terminated as provided in subparts 2 to 4.

Subp. 2. **Voluntary termination.** The manufacturer of a certified product may voluntarily terminate certification by giving written notice to the department. The notice must state the effective termination date and reason for termination.

Subp. 3. **Revocation or suspension of certification.** The department may revoke or suspend certification of a solar collector in the event of:

- A. material misrepresentation in the application for certification;
- B. misrepresentation that a collector certification applies to other collector models that have not been certified;
- C. failure to notify the department of changes in materials or designs used in a certified collector;
- D. a sample of the collector failing the verification retest; or
- E. failure to comply with a condition of certification or labeling.

If certification is suspended, the department shall notify the manufacturer in writing, including the reasons for suspension and the necessary corrective action. If certification is revoked, a new application is required to recertify the collector.

Subp. 4. **Notification of suspension, termination, or revocation of certification.** The department shall notify appropriate state and local agencies and states cooperating with the Solar Rating and Certification Corporation certification program of collectors for which certification has been revoked, suspended, or terminated.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

#### **4280.3700 APPEAL PROCESS.**

An applicant aggrieved by a final decision may file a written request for review with the department. The request must be filed within 20 state business days after the date of the final decision. The department shall appoint an advisory review board made up of two representatives from the solar collector industry and one representative each from the Consumer Service Division of the Department of Commerce, a solar energy technical training institute, and a technical college or university to reconsider the evidence on file. The department shall affirm, modify, or reverse the initial decision based upon the recommendation of the advisory review board and shall inform the applicant of the board's recommendation and the department's action.

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*

**4280.3800 SOLAR COLLECTOR CERTIFICATE.**

Subpart 1. **In general.** The solar collector certificate issued under this chapter must be in the form in subpart 4

Subp. 2. **Certificate holder's rights.** The solar collector identified and described in the solar collector label information in subpart 4 is certified by the Minnesota Department of Energy and Economic Development as having met the testing, disclosure, and warranty requirements of the state of Minnesota for solar collector certification.

This certificate entitles the manufacturer or its agent to.

A. publicize this collector as certified by the state of Minnesota and eligible for the Minnesota residential energy tax credit; and

B. use the certification symbol and label information in advertising, catalogs, or sales promotion material, provided the symbol clearly refers only to certified collectors.

Subp. 3. **Revocation or suspension of certification.** In the application for collector certification the manufacturer agreed to comply with the rules for collector certification. Certification for this solar collector may be revoked or suspended in the event of:

A. material misrepresentation in the application for certification;

B. misrepresentation that a collector certification applies to other collector models which have not been certified;

C. failure to notify the department of changes in materials or designs used in a certified collector;

D. a sample of the collector failing in the verification retest; or

E. failure to comply with a condition of certification or labeling.

Subp. 4. **Solar collector label information.**

Manufactured by: Name \_\_\_\_\_  
Address \_\_\_\_\_

Model # \_\_\_\_\_ Serial # \_\_\_\_\_

Gross Collector Area \_\_\_\_\_ m<sup>2</sup>(ft<sup>2</sup>) Cover Plate \_\_\_\_\_

Collector Dimensions

length \_\_\_\_\_ m (ft)

width \_\_\_\_\_ m (ft)

Collector Weight \_\_\_\_\_ kg (lbs)

Fluid Types \_\_\_\_\_

Fluid Capacity \_\_\_\_\_ L (Gal)

Max. Flow Rate \_\_\_\_\_ Liquid mL/s (Gpm)

Air L/s (SCFM)

Max. Operating Pressure \_\_\_\_\_ kPa gauge (Psi)

Max. Operating Temperature \_\_\_\_\_ °C (°F)

Thermal Performance Efficiency (ASHRAE 93-77 or 96-80)

Slope \_\_\_\_\_ W/m<sup>2</sup>.°C (Btu/hr.ft<sup>2</sup>.°F)

Y Intercept \_\_\_\_\_

Incident Angle Modifier, Axis 1 \_\_\_\_\_

Incident Angle Modifier, Axis 2 \_\_\_\_\_

(Not required on all models)

Design Life \_\_\_\_\_ years

Full Warranty \_\_\_\_\_ years

Other Express Warranties \_\_\_\_\_ years

Performance Rating at irradiation of 17 MJ/m<sup>2</sup>.day  
(1500 Btu/ft<sup>2</sup>.day)

Delta t

Rating

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## CERTIFICATION OF SOLAR COLLECTORS 4280.3800

(inlet temp.-ambient temp.)

(Energy supplied per panel per day)

+ 5 °C ( + 9 °F)

\_\_\_\_\_MJ (thousand Btu)

+ 20 °C ( + 36 °F)

\_\_\_\_\_MJ (thousand Btu)

+ 50 °C ( + 90 °F)

\_\_\_\_\_MJ (thousand Btu)

Use Restrictions: \_\_\_\_\_

Minnesota Tax Credit Approval: The label shall contain the statement, "This collector is certified by the state of Minnesota for the Minnesota Residential Energy Credit."

As the duly authorized representative of the state of Minnesota, I hereby grant certification for the solar collector described in this document.

Signature\_\_\_\_\_

Name\_\_\_\_\_

Commissioner, Department of Energy and Economic Development

Date\_\_\_\_\_

**Statutory Authority:** *MS s 290.06 subd 14*

**History:** *8 SR 531*