

# CARICOM REGIONAL STANDARD

## CARICOM Application Document for the ICC Solar Thermal System Standard

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FDCRS/ICC 900/SRCC 300- 2020

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## Committee representation

This CARICOM Regional Standard was developed under the supervision of the Regional Project Team for **Solar Water Heaters**, hosted by the CARICOM Member State Saint Lucia, which was at the time comprised of the following members:

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## Regional Foreword

This CARICOM Regional Standard FDCRS/ICC 900/SRCC 300- 2020 CARICOM Application Document for the ICC Solar Thermal System Standard has been developed under the authority of the CARICOM Regional Organisation for Standards and Quality (CROSQ). This document represents the modifications to the ICC 900 CARICOM Application Document for the ICC Solar Thermal System Standard that are applicable to the CARICOM region when using the ICC Solar Thermal System Standard. This document was approved as a CARICOM Regional Standard by the CARICOM Council for Trade and Economic Development (COTED) at its <<xx [Meeting in MMM YYYY.>>](#)

This standard is intended to provide the minimum criteria for the design and installation of solar thermal systems. Furthermore, it describes the requirements and methodology for standardized solar thermal system design evaluation, including the analytical evaluation of its components.

The resulting document provides appropriate protections for health, safety and welfare while avoiding unnecessary restrictions on the use of new materials, technologies or designs.

This document is to be read in conjunction with the ICC 900/SRCC 300- 2020 Solar Thermal System Standard substituting the relevant clauses of the CAD in the ICC as applicable.

### **Applicable Version of the ICC 900**

This Application Document is based on the 2020 version of the International Conservation Code ICC Solar Thermal System Standard. It shall be read in conjunction with this version of the ICC 900.

Subsequent versions of the ICC 900 may require subsequent versions of this Application Document.

### **Use and Structure**

Users wishing to apply the ICC 900 in CARICOM must first consult this Application Document to get guidance on what applies, alternate compliance paths, additional data and information that applies only to CARICOM.

The structure of this CARICOM application document references only the sections of the ICC 900 which have been amended. The numbering system of the chapters is also maintained as far as is practicable.

Section and sub-section titles and numbering system are maintained according to the following:

1. Where there are regional requirements, the section and/or sub-section number and title along with the appropriate clause are included in this Application Document.
2. The number and title of sections and sub-sections follow the numbering sequence of the ICC 900;

This CAD does not follow the usual style and format of CARICOM standards and produces only changed text from ICC 900.

Additional requirements are represented by underline text in part of ICC clause with sub clause identified.

**EXAMPLE:**

**“301.6.3 Wiring identification.**

Control circuit wiring and terminals shall be identified in accordance with the electrical code approved by the authority having jurisdiction.“

Requirements which are not applicable to the CARICOM version are shown with the use of strikethrough text and should not be used to determine compliance with the CARICOM version of the ICC 900.

**EXAMPLE:**

**“~~302.1.5 Freeze protection~~**

~~Protection from freezing temperatures shall be provided for all system components subject to damage. The supplier shall specify a freeze tolerance limit for each system. Solar thermal systems shall comply with Section 302.1.5.1 through 302.1.5.3.~~“

Text that is in plain text give instructions for application document or are directly reproduced as from the ICC 900 to provide context for the insertion or deletion of text accordingly.

**EXAMPLE:**

“All sections of Chapter 1 of ICC 900/SRCC 300- 2020 shall apply.”

“All clauses of **SECTION 301** of ICC 900/SRCC 300- 2020 shall apply except the following which have been identified for change:“



## CHAPTER 1 APPLICATION AND ADMINISTRATION

All sections of **Chapter 1** of ICC 900/SRCC 300- 2020 shall apply.

## CHAPTER 2 DEFINITIONS

### SECTION 201 GENERAL

All clauses of **SECTION 201** of ICC 900/SRCC 300- 2020 shall apply.

### SECTION 202 DEFINED TERMS

All definitions in **SECTION 202** of ICC 900/SRCC 300- 2020 shall apply **except**:

#### **FREEZE TOLERANCE LIMIT**

Definition to be deleted because it is not relevant to Caribbean region.

## CHAPTER 3 SYSTEM REQUIREMENTS

### SECTION 301 SYSTEM DESIGN

All clauses of **SECTION 301** of ICC 900/SRCC 300- 2020 shall apply **except** the following which have been identified for change:

#### **301.3.1 General**

Water heating equipment shall comply with the plumbing code and mechanical code approved by the authority having jurisdiction, or in the absence of such code, the International Plumbing Code and International Mechanical Code.

##### **301.3.1.4 Electric water heater shutdown**

A means for disconnecting an electric hot water supply system from its energy supply shall be provided in accordance with the electrical code approved by the authority having jurisdiction. A separate valve shall comply with the mechanical code approved by the authority having jurisdiction, or in the absence of such code, the International Mechanical Code or the International Fuel Gas Code and shall be provided to shut off the fuel supply to all other types of hot water supply systems.

#### **301.4.1 General**

Storage tanks shall comply with the plumbing code and mechanical code approved by the authority having jurisdiction, or in the absence of such code, the International Plumbing Code and International Mechanical Code.

#### **301.5.1 Expansion tank sizing**

The required expansion tank volume shall demonstrate consideration of all of the following:

1. Total system volume shall be calculated for as-built conditions.
2. Calculation of total volume that can evaporate and turn to steam, including collectors and associated piping experiencing similar conditions for the heat transfer fluid contained therein.
3. Static pressure height calculated from the highest point in the collector loop to the location of the pressure relief device.
4. An additional 10-percent safety factor shall be used.
5. If the calculated size is greater than a readily available expansion tank, then the next greater size shall be specified.
6. Expansion tanks used in single-phase systems shall be sized in accordance with the mechanical code approved by the authority having jurisdiction, or in the absence of such code, the International Mechanical Code.

### **301.7.1 General**

Controller subsystems shall facilitate installation, startup, operation, shutdown and maintenance of the solar thermal system. The controller subsystem shall include provisions for bypass, adjustment and override as established in a design evaluation in accordance with the requirements of this standard. Safety controls shall not have provision for bypass or override. Operational controls and means of disconnect and their function shall be labeled and readily accessible in accordance with the electrical code approved by the authority having jurisdiction. Wires and connections, sensors, pneumatic lines, hydraulic lines or other means for transmitting sensor outputs to control devices shall be sufficiently protected from degradation or from introducing false signals as a result of environmental or system operating conditions.

### **301.9 Plumbing and piping design criteria.**

Plumbing and piping used as part of a solar water heating system shall comply with this section. Piping shall be installed in accordance with the plumbing code and mechanical code approved by the authority having jurisdiction or, in the absence of such code, the International Plumbing Code and International Mechanical Code.

## **SECTION 302 RELIABILITY AND DURABILITY**

All clauses of **SECTION 302** of ICC 900/SRCC 300- 2020 shall apply **except** the following:

Section 302.1.5 and subsections 302.1.5.1 to 302.1.5.2 to be deleted as references to freezing temperatures, freeze protection mechanism and freeze limit not applicable to the Caribbean Region.

### **302.1.5 Freeze protection**

~~Protection from freezing temperatures shall be provided for all system components subject to damage. The supplier shall specify a freeze tolerance limit for each system. Solar thermal systems shall comply with Section 302.1.5.1 through 302.1.5.3~~

#### **Exception**

~~Systems installed in a location that has no record of an ambient temperature below 5°C (41°F) shall be exempted from the requirements of this paragraph, except the specification of a freeze tolerance limit.~~

#### **302.1.5.1 Water exposed to freezing temperatures.**

~~For solar thermal systems where water is exposed to freezing temperatures, a minimum of two freeze protection mechanisms shall be provided on each system. Manual intervention in accordance with Section 302.5.2 shall be considered as one mechanism. Other acceptable mechanisms include but~~

are not limited to thermal mass (protection, but protection is limited to the thermal capacitance of the system), automatic draining, and closed-loop recirculation (with uninterruptible power supply).

#### **302.1.5.2 Manual intervention freeze protection.**

For solar thermal systems that rely on manual intervention for freeze protection, not less than one freeze protection mechanism shall be provided to protect components from freeze damage under all conditions, including in the event of power failure. Acceptable manual intervention actions include but are not limited to draining. A system in which components and/or piping are subject to damage by freezing shall have the proper fittings, pipe slope and collector design to allow for manual gravity draining and air filling of the affected components and piping. Pipe slope for gravity draining shall have a minimum 2 cm vertical drop for each meter of horizontal length (1/4 inch per foot). This also applies to any header pipes or absorber plate riser tubes internal to the collector.

#### **302.1.6 Protection from leaks**

Piping in a solar water heating system shall pass a leak test in accordance with the plumbing code approved by the authority having jurisdiction, or in the absence of such code, the International Plumbing Code, for direct systems; or the mechanical code approved by the authority having jurisdiction, or in the absence of such code, the International Mechanical Code, for indirect systems.

### **SECTION 303 SAFETY CRITERIA**

All clauses of **SECTION 303** of ICC 900/SRCC 300- 2020 shall apply **except** the following which have been identified for change:

#### **303.1.4 Protection of potable water from contamination**

Materials that come in direct contact with potable water shall not adversely affect the taste, odor or physical quality and appearance of the water and shall comply with drinking water quality standards approved by the authority having jurisdiction.

#### **303.1.5.2 Combustible and flammable fluids**

The storage, piping and handling of combustible and flammable fluids shall conform to the requirements of the fire code adopted by the authority having jurisdiction or in the absence of such a code, the International Fire Code.

#### **303.1.5.4 Toxicity**

The use of *toxic fluids* shall comply in accordance with the requirements of the authority having jurisdiction.

### **303.2 Electrical safety**

Solar thermal systems containing electrical components and wiring shall be designed and installed in accordance with the electrical code approved by the authority having jurisdiction. ~~as applicable.~~

#### **303.2.1 Protection of electrical components**

Overload and overcurrent protection of electrically operated components shall be consistent with the maximum current rating of the device and the electrical code approved by the authority having jurisdiction.

#### **303.2.2 Wiring and connections**

Electrical wiring shall be sized and installed in accordance with the electrical code approved by the authority having jurisdiction and manufacturer's instructions. Wiring shall be approved for the

temperature, voltage and applicable service conditions. Wiring subjected to direct sunlight shall be rated for the application or shall be protected by an approved method.

### 303.2.2.1 Wiring identification

Control circuit wiring and terminals shall be identified in accordance with the the electrical code approved by the authority having jurisdiction.

### 303.2.3 Component listings

Electrically powered components over 24 volts used within systems shall be listed and labeled in accordance with standards referenced by the electrical code approved by the authority having jurisdiction. Electrically powered components over 24 volts shall also be listed and labeled to one or more of the standards specified in Table 303.2.3, as applicable.

## SECTION 304 OPERATION AND SERVICING CRITERIA

All clauses of **SECTION 304** of ICC 900/SRCC 300- 2020 shall apply **except** the following which have been identified for change:

### 304.1.3 Waste disposal

Where fluid is automatically discharged in systems using a *toxic heat transfer fluid*, a means shall be provided for the catchment and removal of these fluids in accordance with the requirements of the authority having jurisdiction.

### 304.1.5 Maintenance and servicing

Access to individual components of the system that require periodic examination, adjustment, service or maintenance shall be provided in accordance with the plumbing code and mechanical code approved by the authority having jurisdiction, or in the absence of such code, the *International Plumbing Code* and *International Mechanical Code*.

## SECTION 305 INSTALLATION CRITERIA

All clauses of **SECTION 305** of ICC 900/SRCC 300- 2020 shall apply **except** the following which have been identified for change:

### 305.1.1 Penetrations of floor/ceiling assemblies and fire-resistance-rated assemblies

Penetrations of floor/ ceiling assemblies and assemblies required to have a fire-resistance rating shall be protected in accordance with building codes approved by the authority having jurisdiction.

### 305.1.5 Building penetrations

Penetrations of the building through which piping or wiring is passed shall not reduce or impair the function of the enclosure. Penetrations through walls or other surfaces shall not allow intrusion by insects and vermin. Required roof penetrations shall be made in accordance with building codes approved by the authority having jurisdiction.

**305.1.7.2 Discharge pipes.**

Safety and relief valve discharge pipes shall be of rigid pipe that is approved for the temperature of the system. The discharge pipe shall be the same diameter as the safety or relief valve outlet. Safety and relief valves shall not discharge so as to be a hazard, a potential cause of damage or otherwise a nuisance. Relief valves in partially filled collector loops capable of producing steam shall be discharged to the outside of the structure. Where a relief valve discharges inside a structure or to the drainage system, the installation shall conform to the plumbing code approved by the authority having jurisdiction or, in the absence of such code, the International Plumbing Code. Where a solar thermal system component requiring a relief valve is located outside the structure, the termination shall be not more than 6 inches (152 mm) above a splash block, a secured surface material or catchment method to prevent damage.

**305.1.8 Structural supports**

Neither wind loading, including uplift, nor the additional weight of filled collectors and tanks shall exceed the live or dead load ratings of the building, roof, roof anchorage, foundation or soil. Collector supports shall not impose stresses on the collectors beyond design specifications. The design load shall be as specified by the codes in force at the installation site. ~~and shall include an additional load for snow accumulation for applicable locations.~~

**305.1.9 Penetration of structural members**

Where penetrations are required in structural members to accommodate passage of solar components, such modified structural members shall comply with the plumbing code and mechanical code approved by the authority having jurisdiction or, in the absence of such code, the International Plumbing Code and International Mechanical Code, as applicable.

**305.1.13 Pipe and component supports**

Piping shall be installed and supported in accordance with the plumbing code and mechanical code approved by the authority having jurisdiction or, in the absence of such code, the International Plumbing Code and International Mechanical Code. Hangers shall provide support and maintain slope of pipes. Hangers or supports for insulated pipes and components shall be designed to not compress or damage the insulation material. Hangers shall not cause galvanic corrosion of the hanger or the pipe.

**305.1.17 Rain ~~and snow~~ on collector**

The location, orientation, and position of collectors relative to nearby objects and surfaces shall be such that water run-off from the collector surface is not impeded. ~~and excessive build-up of snow on lower portions of the collector glazing is not permitted to occur.~~

**SECTION 306 PUMP STATIONS**

All clauses of **SECTION 306** of ICC 900/SRCC 300- 2020 shall apply **except** the following which have been identified for change:

**306.5 Pump station failure.**

The pump station shall comply with Section 303.1.2. The pump station shall remain in a secure state and keep the ~~freezing and~~ overheating protection mechanisms operable when tested in accordance with Sections 306.5.1 through 306.5.3.

### 306.21.2 Manuals and instructions

Pump stations' operation, maintenance and installation instruction manuals from the manufacturer shall be supplied or made available in the official language of the country. Manufacturer's contact information shall be included within these documents.

## CHAPTER 4 LABELING, MARKING AND DOCUMENTATION

### SECTION 401 GENERAL

All clauses of **SECTION 401** of ICC 900/SRCC 300- 2020 shall apply.

### SECTION 402 MARKING AND LABELING

All clauses of **SECTION 402** of ICC 900/SRCC 300- 2020 shall apply.

### SECTION 403 MANUALS

All clauses of **SECTION 403** of ICC 900/SRCC 300- 2020 shall apply except the following which have been identified for change:

#### 403.1.1 Provision for manuals

A manual or manuals shall be provided with each solar thermal system. The manual shall be written in the official language of the country and shall contain the name and address of the system supplier, the system model name or number and shall describe the operation of the system and its components and the procedures for installation, operation and maintenance in accordance with Sections 403.1.1.1 through Section 403.1.1.3.

##### 403.1.1.1 Installation instructions

The manuals shall include an explanation of the physical and functional requirements of the system and its components and the general procedures for their proper installation. The instructions shall describe the interconnection requirements of the various subsystems and components and their interface requirements with the building and the site. Installation instructions shall prescribe installation complying with the building code, plumbing code, mechanical code, and fire code approved by the authority having jurisdiction or, in the absence of such codes, with the International Building Code, International Plumbing Code, International Mechanical Code, and International Fire Code, and National Electrical Code (NFPA 70).

##### 403.1.1.2 Operation instructions.

Number 7 of clause to be deleted. Freeze limit references are irrelevant to Caribbean climate.

~~7. Indicate the *freeze tolerance limit* and freezing control measures and include the statement: "Freeze tolerance limits are based upon an assumed set of environmental conditions." Where the freezing point of the fluid in an exposed part of the system is above the freeze tolerance limit specified for the system, the following statement shall be provided: "Extended periods of cold weather, including ambient air temperatures above the specified limit, might cause freezing in exposed parts of the system. It is the owner's responsibility to protect the system~~

~~in accordance with the supplier's instructions if the air temperature is anticipated to approach the specified freeze tolerance limit~~

## CHAPTER 5 REFERENCED STANDARDS

ICC 900/SRCC 300- 2020 shall apply.

## APPENDIX A SOLAR UNIFORM ENERGY FACTOR PROCEDURE FOR SOLAR WATER HEATING SYSTEMS

All clauses of **APPENDIX A** of ICC 900/SRCC 300- 2020 shall apply.

**END OF DOCUMENT**