

## SECTION 235613.19 - HEATING, SOLAR, VACUUM-TUBE COLLECTORS

**TIPS:**

To view non-printing **Editor's Notes** that provide guidance for editing, click on Masterworks/Single-File Formatting/Toggle/Editor's Notes.

To read **detailed research, technical information about products and materials, and coordination checklists**, click on Masterworks/Supporting Information.

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes liquid-type, heating, solar, vacuum-tube collectors.

## 1.3 DEFINITIONS

- A. FSEC: Florida Solar Energy Center.
- B. SRCC: Solar Rating and Certification Corporation.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for solar collectors.
  - 2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For solar collectors.
  - 1. Include plans, elevations, sections, and mounting and attachment details.
  - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Detail fabrication and assembly of heating, solar, vacuum-tube collectors.
  - 4. Include diagrams for control wiring.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of solar collector, certifying compliance with SRCC Standard 100.
- B. Sample Warranty: For manufacturer's special warranty.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Include **[two]** **<Insert number>** spare vacuum tubes for each panel.

## 1.7 QUALITY ASSURANCE

- A. Collector Certification: Certified by FSEC and SRCC.
- B. Manufacturer and collector model shall be listed in SRCC's "Directory of SRCC Certified Solar Collector Ratings."

## 1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace solar collectors that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: **[10]** **<Insert number>** years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Hail Resistance: Able to withstand **1-inch-** **(25-mm-)** diameter hail.

## 2.2 MANUFACTURERS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

## 2.3 COLLECTORS

- A. Enclosure: Extruded aluminum.
  - 1. Finish: **[Clear anodized]** **[Anodized bronze]** **[Powder coated]**.
- B. Header:

1. Tubing: Aluminum-covered copper.
  2. Header Assembly: Brazed with BAg45CuZn brazing material.
  3. Test Pressure: Each header factory tested to 145 psig (1000 kPa).
- C. Heat Pipes: Oxygen-free copper, with a minimum wall thickness of 0.027 inch (0.685 mm), Grade C10200.
- D. Vacuum Tubes: Twin tubes or double wall, tempered Borosilicate glass.
1. Outer Tube: Clear, with wall thickness not less than 0.07 inch (1.8 mm) and outside diameter of 2.28 inches (57.9 mm).
  2. Inside Wall Coating: Selective coating to act as the absorber.
  3. Interstitial Space: Evacuated and the bottom coated with silver barium.
  4. Seal: Vacuum tubes sealed to the header with UV-stabilized, high-temperature vulcanized (HTV), silicone rubber seals and rings.
- E. Flow Interruption: Panel design shall allow uninterrupted heated-fluid flow during damage and repair of absorber element.
- F. Absorber Coating: Minimum absorptance of 0.92 percent and maximum emissivity of 8 percent.
- G. Mounting Frame:
1. Fabricated to withstand wind loads of up to 130 mph (210 km/h) with no separation of the collector from the frame or the frame from the structure.
  2. Material: [Stainless steel] [Extruded aluminum].
  3. Profile: [Low angle, 11 to 13 degrees] [Medium angle, 21 to 28 degrees] [High angle, 27 to 62 degrees].
  4. Fasteners: Stainless steel.

## 2.4 CONTROLS

- A. Comply with requirements in Section 230993.11 "Sequence of Operations for HVAC DDC."

## 2.5 CAPACITIES AND CHARACTERISTICS

- A. Area:
1. Gross: <Insert sq. ft. (sq. m)>.
  2. Net Aperture: <Insert sq. ft. (sq. m)>.
- B. Dry Weight: <Insert lb (kg)>.
- C. Fluid Type: [Treated purified water] [Evaporative fluid] <Insert medium>.
- D. Fluid Capacity: <Insert gal. (L)>.
- E. Test Pressure: <Insert psig (Pa)>.
- F. Maximum Operating Temperature: <Insert deg F (deg C)>.

G. SRCC Certified Thermal Performance Rating:

1. Clear Day at 2000 Btu/sq. ft. (23 MJ/sq. m) per Day: <Insert rating value>.
2. Mildly Cloudy Day at 1500 Btu/sq. ft. (17 MJ/sq. m) per Day: <Insert rating value>.
3. Cloudy Day at 1000 Btu/sq. ft. (11 MJ/sq. m) per Day: <Insert rating value>.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine solar collectors for damage before installation.
- C. Examine roughing-in for solar collector piping to verify actual locations of piping connections before solar panel installation.
- D. Examine walls and roofs for suitable conditions where solar collector will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SOLAR COLLECTOR INSTALLATION

- A. Comply with manufacturer's written instructions for collector mounting and installation.
- B. Install the collector according to ASHRAE's "Active Solar Heating Systems Installation Manual."
- C. Install low-voltage wiring from the sensor to the energy-management panel.
- D. Mount the collector frame support feet to the structural support steel using stainless-steel bolts. Attach each pair of legs using two bolts for each.
- E. Place high-temperature-resistant covers over the header to prevent contaminants from entering the headers.
- F. Coat the controller's sensor with a layer of thermal paste and insert into the collector sensor port to full depth. Apply a silicone sealant around the entire perimeter of the sensor where it enters the collector. Completely cover the opening with insulation to prevent water ingress. Only use high-temperature-rated, minimum 395 deg F (202 deg C), sensors and cabling.
- G. After connecting the inlet and outlet of the collectors to the system, purge the system of all air.
- H. Install collectors with not less than minimum space for access and service as recommended by solar collector manufacturer.
- I. Once piping is installed and confirmed leak free and the air is purged, install the heat pipes and vacuum tubes.

### 3.3 CONNECTIONS

- A. Comply with requirements for piping specified in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to solar collectors, allow space for service and maintenance.
- C. Install flexible connections on piping between collectors installed in series.
- D. Install ball valve and union at inlet and outlet of solar collectors. Comply with requirements in Section 230523.12 "Ball Valves for HVAC Piping" for materials and installation requirements for ball valves and unions.
- E. Connect solar collectors to lightning protection system. Comply with requirements in Section 264113 "Lightning Protection for Structures."

### 3.4 STARTUP SERVICE

- A. **[Engage a factory-authorized service representative to perform] [Perform]** startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Verify tilt angle, mounting, fluid concentrations, and collector array arrangement.

### 3.5 ADJUSTING

- A. Adjust tilt angle per design requirement and adjust the collector balance valve to provide the design flow.

END OF SECTION 235613.19