

# ProgressivTube<sup>®</sup> Passive Solar Water Heater

## Integral Collector Storage (ICS) Type

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### Engineering Specifications

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#### General Compliance for Quality Assurance:

The solar water heating system shall be of the integral collector storage (ICS) type, and shall require no pumps, electronic or mechanical controls, or parasitic energy consumption for normal operation. The ICS unit shall be a ProgressivTube<sup>®</sup> model number \_\_\_\_\_ manufactured by Thermal Conversion Technology, Inc. The ICS unit shall be fully tested and certified by the Florida Solar Energy Center (FSEC) to comply with the Florida Standards Program for Solar Domestic Water Heaters (FSEC GP-5-80, FSEC GP-6-80, FSEC GP-7-80). It shall also be certified by the Solar Ratings and Certification Corporation (SRCC) to comply with standard SRCC OG-300. The thermal testing shall be as established by the American Society of Heating, Refrigeration and Air Conditioning Engineers, Standard ASHRAE 95-81. The test results shall provide the daily energy output of the unit expressed as Net Energy Delivered ( $Q_{NET}$ ) by FSEC and Solar Energy Factor (SEF) by SRCC. The ICS unit shall also be listed for compliance by the International Association of Plumbing and Mechanical Officials (IAPMO) as meeting the requirements of the Uniform Solar Energy Code<sup>™</sup>. The ICS unit shall have successfully passed static wind load testing to 84 psf on its case, the equivalent of 180 m.p.h. (289 k.m.p.h.).

#### Case:

The dimensions of the ProgressivTube<sup>®</sup> ICS model number \_\_\_\_\_ shall be 97.4 inches in length, inches in width and 7.75 inches in height and be rated at a nominal fluid capacity of \_\_\_\_\_ U.S. gallons. The casing shall be made of an extruded aluminum alloy, 6061 T6 or 6063 T5, and shall be anodized or coated with a baked on acrylic finish for increased corrosion protection. The framewall shall be reinforced and connected together by four corner brackets made from 1" x 1" x 1/8 inch extruded aluminum architectural angle. The brackets shall be attached with six #64 aluminum rivets. The casing backsheet shall be aluminum sheet of not less than .025 inches in thickness.

#### Insulation:

Rigid foil faced polyisocyanurate closed cell foam board shall be used to maximize heat retention. The minimum thickness of the backing board shall be 2 inches with the stabilized R-value @ 75° F mean temperature being no less than R-16. The minimum thickness of the side and end boards shall be 1.5 inches with the stabilized R-value @ 75° F mean temperature being no less than R-12.

#### Glazings:

The outer glazing shall be tempered low-iron solar glass with a thickness of not less than 1/8 inch and have a minimum transmittance of 91%. The outer glazing shall be thermally isolated from the casing by a continuous EPDM synthetic rubber gasket that is compressed by the extruded aluminum glazing caps to seal out moisture and sand. The glazing caps shall be of the same material as the case and shall be attached to the case with black oxide stainless steel screws. The inner glazing shall be FEP 100A Teflon film with a thickness of 1 mill and have a transmittance of 96%.. The inner glazing shall be secured to

an aluminum roll formed frame with an EPDM synthetic rubber spline.

**Absorber/Storage Tank:**

The ICS design combines the collector absorber plate and the storage tank into one unit. This unit shall be constructed of 4.125 inch O.D. tubes manufactured entirely of copper alloy C-110 that shall meet ASTM specification B152. The copper tubes shall have a cap made of the same copper material fusion welded on to both ends of each tube. The thickness of the copper tubes and the copper caps is proprietary information.. The tubes shall be interconnected with 7/8 inch O.D. Type L copper manifold pipes to form a series flow pattern storage vessel. The storage vessel shall be pressure rated at 150 psig working pressure and 300 psig test pressure. All manifold pipes shall be connected to the tubes by brazed joints utilizing a copper phosphorous brazing alloy with no less than 5% silver content and conforming to AWS classification BCuP-5. Upon assembly completion, each absorber/storage tank shall be pressure tested at a minimum of 160 psig for a minimum of ten minutes.

**Fluid Connections:**

The inlet and outlet fluid connections of the absorber/storage tank shall be made of 7/8 inch O.D. Type L copper tubes that are joined to copper caps utilizing a copper phosphorous brazing alloy with no less than 5% silver content and conforming to AWS classification BCuP-5. These connections shall be sweat connected to the supply and return lines of the water heating system to provide leak free plumbing hook ups.

**Absorber Coating:**

The absorber coating shall be a moderately selective high temperature tolerant silicone based finish with a minimum absorptivity of 95% and a maximum emissivity of 42%.

Thermal Conversion Technology 101 Copeland Street - Jacksonville, Florida 32204 USA Ph: 904.358.3720      Fx: 904.358.3728
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