Designation: E683 – 91 (Reapproved2007)

Standard Practice for Installation and Service of Solar Space Heating Systems for One- and Two-Family Dwellings[1]

This standard is issued under the fixed designation E683; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers solar space heating systems for one- and two-family dwellings. It sets forth acceptable installation and service practices to help ensure adequate performance, safety, and consumer satisfaction.

1.2 This practice is intended to describe acceptable practices for space heating systems in new and existing dwellings and shall not be construed as the optimization of good practices.

1.3 This practice does not apply to Rankine cycle, heat pump, or high pressure vapor systems.

1.4 This practice is not intended to abridge safety or health requirements. All systems shall be installed in accordance with local codes and ordinances.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* (For specific safety precautions, see Section 6).

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E772 Terminology of Solar Energy Conversion

2.2 *ANSI Standards:*[3]

A58.1 Building Code Requirements for Minimum Design Loads in Buildings and Other Structures.

C1 National Electrical Code

Z97.1 Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings

2.3 *Other Standards:*

Installation Standards for One- and Two-Family Dwellings and Multi-Family Housing, Including Solar[4]

HUD Intermediate Minimum Property Standards Supplement—Solar Heating and Domestic Hot Water Systems[5]

3. Terminology

3.1 *Definitions:*

3.1.1 *air handling unit, n*—a device used for distributing conditioned air supply to a room, space, or area.

3.1.2 *building, n*—a structure erected and framed of component structural members designed for the housing, shelter, or support of persons, animals, or property.

3.1.3 *code, n*—a set of applicable regulations which a jurisdiction has lawfully adopted.

3.1.4 *collector, solar thermal, n*—a device designed to absorb solar irradiance and to transfer the energy to a fluid passing through it. **(E772)**

3.1.5 *collector subsystem, n*—that portion of the solar system which includes the solar collectors and related piping or ducts. **(E772)**

3.1.6 *distribution subsystem, n*—that portion of the solar system from the storage device to the point of ultimate use. **(E772)**

3.1.7 *energy (heat) transfer fluid, n*—the medium used to transfer energy from the solar collectors to the storage medium.

3.1.8 *potable water, n*—water that is satisfactory for drinking and culinary purposes, meeting the requirements of the health department having jurisdiction. **(E772)**

3.1.9 *pressure relief device, n*—a pressure-activated valve designed to automatically relieve excessive pressure.

3.1.10 *shall, vi—as used in this practice*, a term used to denote a mandatory requirement.

3.1.11 *should, vi—as used in this practice*, a term used to denote a recommendation.

[1] This practice is under the jurisdiction of ASTM Committee E44 on Solar, Geothermal and Other Alternative Energy Sources and is the direct responsibility of Subcommittee E44.05 on Solar Heating and Cooling Systems and Materials.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[4] Available from Sheet Metal and Air-Conditioning Contractors National Assn., 8224 Old Courthouse Rd., Vienna, VA 22180.

[5] Available from HUD USER, P.O. Box 6091, Rockville, MD 20850.

3.2 *solar system, n*—a configuration of equipment and components used to absorb, convey, store, convert, and distribute the energy from the sun.

4. Collector Subsystems

4.1 Collectors shall be installed in accordance with the instructions provided by the collector manufacturer and designer, in compliance with local codes and ordinances.

4.2 Structural supports shall be constructed to support the collector under all anticipated extremes of environmental conditions and to withstand local conditions and anticipated loads, such as wind, earthquake, rain, snow, ice, and freezing temperatures, so that the solar system does not impair the resistivity to damage of the building. Additional weight of collectors shall not exceed dead weight limitations of the building structure, foundation, or soil. Conversely, collector supports shall not impose undue stresses on the collectors.

4.3 Structural supports shall be constructed to maintain collector tilt and orientation within design conditions throughout the life of the solar system.

4.4 Structural supports shall be installed in a manner such that the integrity, weather resistance, and fire resistance of the building are not adversely affected. Joints between support structures and building shall be caulked or flashed, or both, to prevent water leakage. Access shall be provided to permit minor repairs to flashing and caulking without disturbing roof, collector supports, or collector panels.

4.5 Collectors shall be installed so as not to contribute to moisture buildup, rotting, or other accelerated deterioration of roofing materials.

4.6 Collectors and supports shall be installed in a manner such that water flowing off the collector surface will not accumulate on the roof surfaces, so as to form ice dams or cause water damage to the building, or both. Provisions shall be taken to minimize buildup of snow upon collectors, which may reduce their effectiveness.

4.7 Structural supports shall be selected and installed in a manner, such that thermal expansion of collector will not cause damage to the collector, structural frame, or building.

4.8 Pipe hangers, supports, expansion devices, and insulation shall be provided to compensate for thermal expansion effects and to minimize thermal losses. Care shall be exercised during their installation to prevent damage to connections on the collector or collector casing.

4.9 Interconnecting piping or ducting shall be installed to minimize flow restrictions and to provide balanced flow. Piping shall be installed to allow for filling and draining.

4.10 Safe access to components subject to deterioration or failure, such as rubber hoses, joint sealants, and cover plates shall be provided to allow for maintenance or repair. For roof-mounted collectors, the work space adjacent to collectors and provisions for safe placement of ladders shall be considered.

4.11 Safety protection shall be provided to prevent injury to personnel from contact with readily accessible hot surfaces.

4.12 Collectors mounted at ground level shall be provided with protective fencing, guard rails, and warning signs in compliance with local codes and ordinances.

4.13 Protection of collectors and components shall be provided during handling and installation to prevent damage from environmental exposure.

4.14 Glazings of collectors mounted at ground level shall meet the requirements specified in ANSI Z97.1.

4.15 Frames and braces used in collector construction shall be made of materials suitable for exterior location.

4.16 Collectors made of combustible materials shall not be located on or adjacent to construction required to be of noncombustible materials or in special fire zones.

4.17 Collectors should be mounted in a manner so as to take the best advantage of the sun's energy.

5. Thermal Storage Devices

5.1 Thermal storage devices shall be installed in accordance with the instructions provided by the manufacturer, in compliance with local codes and ordinances. Consideration shall be given to the type of service, temperature, storage media, design pressures, connections, flow, thermal storage capacity, mixing, and stratification, etc.

5.2 Liquid storage devices shall be leak-tested in accordance with recognized national standards.

5.3 Nonliquid storage devices need not be leak-tested unless a safety hazard or contamination could result from a storage device failure or if leakage could result in deterioration of the storage capacity.

5.4 Above ground storage devices shall be selected and installed to withstand all anticipated loads resulting from wind, hail, snow, and seismic conditions (where applicable). Protective coatings, casing materials, or enclosures shall be provided to prevent damage from continuous exposure to weather. Wood structural members shall be protected against deterioration from weathering, dry rot, ants, termites, and other adverse conditions. Footings and foundations shall support the storage device under all anticipated extremes of soil conditions.

5.5 Underground storage devices shall be selected and installed to withstand all anticipated loads resulting from soil, hydrostatic, and foundation. Such devices shall be anchored to prevent flotation resulting from flooding or high ground water levels (where applicable). Protective coatings, casing material, enclosures, or cathodic protection shall be provided to prevent damage from exposure to soil conditions and electrolytic action.

5.6 Underground storage devices subject to overhead vehicular traffic shall be designed and installed to withstand the additional load applied by this traffic.

5.7 Insulation shall be provided to minimize thermal losses from storage devices, related piping, and duct work. Insulation shall be suitable for the application, site, and occupancy conditions. Underground storage devices shall be given special consideration to prevent deterioration of insulating properties by compression, water penetration, or bacterial action.