ORDINANCE NO._____

An ordinance amending Title 28 - Plumbing Code of the Los Angeles County Code by adopting portions of the 2013 California Plumbing Code, by reference, with certain changes and modifications, and making other revisions thereto.

The Board of Supervisors of the County of Los Angeles ordains as follows:

SECTION 1. Sections 119.1.2 through 119.1.14 of Chapter 1, Chapters 2 through 16A, and Appendices A, B, D**,** G, I, and K, which incorporate by reference and modify portions of the 2010 California Plumbing Code, are hereby repealed.

SECTION 2. Chapter 1 is hereby amended to read as follows:

CHAPTER 1

ADMINISTRATION

100 -- ADOPTION BY REFERENCE.

Except as hereinafter changed or modified, Sections 1.2 through 1.14 of Chapter 1 Division I of that certain Plumbing Code known and designated as the 2013 California Plumbing Code as published by the California Building Standards Commission, are adopted by reference and incorporated into this Title 28 of the Los Angeles County Code as if fully set forth below, and shall be known as Sections 119.1.2 through 119.1.14, respectively, of Chapter 1 of Title 28 of the Los Angeles County Code.

Except as hereinafter changed or modified, Chapters 2 through 17 and Appendices A, B, D, , H, I, and J of that certain Plumbing Code known and designated as the 2013 California Plumbing Code as published by the California Building Standards Commission, are adopted by reference and incorporated into this Title 28 of

the Los Angeles County Code as if fully set forth below, and shall be known as Chapters 2 through 17 and Appendices A, B, D, H, I, and J of Title 28 of the Los Angeles County Code.

A copy of the 2013 California Plumbing Code shall be at all times maintained by the Chief Plumbing Inspector for use and examination by the public.

. . .

101.3 Scope

The provisions of this Code shall apply to the construction, alteration, moving, removal, repair and use of any plumbing or drainage work, and the qualification and registration of certain persons performing such work on any premises within the unincorporated territory of the County of Los Angeles, and to such work or use by the County of Los Angeles in any incorporated city not exercising jurisdiction over such work or use.

. Where the requirements within the jurisdiction of this plumbing code conflict with the requirements of the mechanical code, this code shall prevail.

. .

101.5 Use of Terms

Whenever the term "Chief Plumbing Inspector" or "Plumbing Inspector" is used in this Code, other than in Section 101.4, such term shall be construed to mean the "Director of the Department of Public Works" of the County of Los Angeles or his or her authorized representative.

Whenever the term "Authority Having Jurisdiction" is used in this Code, such term shall be construed to mean the following:

1. For purposes of administering the requirements of Title 28, Appendix H relating to the plan approval of private sewage disposal systems or plan approval of any construction activity impacting a private sewage disposal system, the Authority Having Jurisdiction shall be the Health Officer;

. . .

SECTION 2. Chapter 3 is hereby amended as follows:

. . .

301.2 Alternate Materials and Methods of Construction ~~Equivalency~~ and Modifications.

301.2.1 **Alternate Materials and Methods of Construction**

Nothing in this code is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this code. Technical documentation shall be submitted to the Authority Having Jurisdiction to demonstrate equivalency. The Authority Having Jurisdiction shall have the authority to approve or disapprove the system, method, or device for the intended purpose. [HCD 1] (See Section 1.8.7).

• • •

301.2.2 **Modifications**

Whenever there are practical difficulties involved in carrying out the provisions of this code, the Authority Having Jurisdiction may grant minor modifications on a case by case basis, provided the Authority Having Jurisdiction shall first find that a special individual reason makes the strict letter of this code impractical and that the modification is in reasonable conformity with the spirit and purpose of this code and that such modification does not lessen any health, fire-protection, or other life-safety related requirements. The details of any action granting modifications shall be recorded and entered in the files of the code enforcement agency.

. . .

SECTION 3. Chapter 6 is hereby amended as follows:

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609.7 Nothing contained in this Code shall be construed to prohibit the use of all or part of an abutting or adjacent lot or lots to:

. . .

SECTION 4. Chapter 7 is hereby amended as follows:

. . .

713.1 Where Required. A building in which plumbing fixtures are installed and premises having drainage piping thereon shall have a connection to a public or private sewer, except as provided in Sections ~~101.8~~101.3.3, 713.2, and 713.4.

. . .

721.3 If the public sewer does not extend to a point from which

each building on a lot or parcel of land large enough to permit future subdivision can be independently served, the property owner shall construct a public sewer as required by the Los Angeles County Sanitary Sewer and Industrial Waste Ordinance to provide adequate sewerage for each such possible parcel.

Exception: When the Authority Having Jurisdiction finds that the character of a lot is such that no further subdivision can be reasonably anticipated, or the use is such as to preclude subdivision, or where the owner has executed a covenant stating that the

lot or parcel of land together with all improvements thereon will be maintained as a unit

and that before any subdivision is made or any portion of said lot is transferred to another owner, separate sewerage facilities as hereinbefore required in this Section will be installed, the drainage system of all buildings may be connected to a common building sewer or private sewage disposal system. The covenant shall be recorded, by the owner, in the office of the Department of Registrar-Recorder as part of the conditions of ownership of said property. Such agreement shall be binding on all heirs, successors, and assigns to said property.

This exception shall apply only while the whole of such lot remains in one undivided ownership. Upon the transfer of any portion of such lot other than the whole thereof, to another owner, whether such transfer is made before or after the operative date of the ordinance adding this provision, the exception shall cease and a person shall not use or maintain any building or structure except in compliance with the

provisions of this Code. As used in this Section, a sale, foreclosure, or contract to sell by the terms of which the purchaser is given the right of possession shall be deemed a transfer.

. . .

728.0 Building Sewer Connection Requirements.

728.1 Size. That portion of the building sewer extending from the public sewer to the property line shall be not less than four (4) inches (100 mm) in internal diameter.

728.2 Depth. When laid within the limits of any public thoroughfare when the public sewer is sufficiently deep, no building sewer shall be less than six (6) feet (1.8 m) below grade. Whenever practicable, the alignment and grade of each building sewer shall be straight from the public sewer to the property line.

728.3 Taps and saddles. Whenever it becomes necessary to connect a building sewer to a public sewer at a point where no branch fitting has been installed in the public sewer, such connection shall be made as required by the Los Angeles County Sanitary Sewer and Industrial Waste Ordinance.

728.4 Connection to trunks. Whenever required, an approved-type unvented running trap shall be installed in each building sewer which is connected directly to a trunk sewer by any means whatsoever. Each such running trap shall be installed in the building sewer between the house drain or drains and the connection to the trunk sewer. A T-type cleanout shall be installed in the building sewer immediately below the running trap. This cleanout need not be extended to grade. Every running trap and

cleanout shall be located on the lot served by the building sewer.

728.5 Street widening. Where a future street or road-widening area has been established by the master plan of highways or in any other manner, all work installed in such area shall conform to the requirements established in this or other related ordinances for work on public property.

728.6 Main line required. Building sewer construction shall conform to the requirements of main line sewers as set forth in the Los Angeles County Sanitary Sewer and Industrial Waste Ordinance when either of the following conditions exists:

1. Where the Authority Having Jurisdiction requires such construction because of the character or quantity of the sewage or industrial waste to be discharged.

2. Where the sewer is designed to be, or proposed to be, dedicated to the County of Los Angeles at the present or any future time.

SECTION 5. Appendix H is hereby amended to read as follows:

. . .

TABLE H 1.7
LOCATION OF SEWAGE DISPOSAL SYSTEM

MINIMUM HORIZONTAL DISTANCE IN CLEAR REQUIRED FROM	BUILDING SEWER	SEPTIC TANK	DISPOSAL FIELD	SEEPAGE PIT OR CESSPOOL
Building or structures[1]	2 feet	5 feet	8 feet	8 feet
Property line adjoining private property	Clear[2]	5 feet	5 feet	8 feet
Water supply wells[9]	50 feet[3]	50 feet	100 feet	150 feet
Streams and other bodies of water[9]	50 feet	50 feet	100 feet[7]	150 feet[7]
Trees		10 feet		10 feet
Seepage pits or cesspools[8]		5 feet	5 feet	12 feet
Disposal field[8]		5 feet	4 feet[4]	5 feet
On-site domestic water service line	1 foot[5]	5 feet	5 feet	5 feet
Distribution box			5 feet	5 feet
Pressure public water main	10 feet[6]	10 feet	10 feet	10 feet

For SI units: 1
foot = 304.8
mm Notes:

1 Including porches and steps, whether covered or uncovered, breezeways, roofed porte cocheres, roofed patios, carports, covered walks, covered driveways, and similar structures or appurtenances.

2 See Section 312.3.

3 Drainage piping shall clear domestic water supply wells by not less than 50 feet (15 240 mm). This distance shall be permitted to be reduced to not less than 25 feet (7620 mm) where the drainage piping is constructed of materials approved for use within a building.

4 Plus 2 feet (610 mm) for each additional 1 foot (305 mm) of depth in excess of 1 foot (305 mm) below the bottom of the drain line. (See Section H 6.0)

5 See Section 720.0.

6 For parallel construction For crossings, approval by the Health Department shall be required.

7 These minimum clear horizontal distances shall also apply between disposal fields, seepage pits, and the mean high-tide line.

8 Where disposal fields, seepage pits, or both are installed in sloping ground, the minimum horizontal distance between any part of the leaching system and ground surface shall be 15 feet (4572 mm).

9.Where special hazards are involved, the distance required shall be increased as may be directed by the Authority Having jurisdiction.

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TABLE H 2.1
CAPACITY OF SEPTIC TANKS[1, 2, 3, 4]

SINGLE-FAMILY DWELLINGS * NUMBER OF BEDROOMS	MULTIPLE DWELLING UNITS OR APARTMENTS - ONE BEDROOM EACH	OTHER USES: MAXIMUM FIXTURE UNITS SERVED PER TABLE 702.1	MINIMUM SEPTIC TANK CAPACITY (gallons)
1 or 2	—	15	750
3	—	20	1000
4	2 units	25	1200
5 or 6	3	33	1500
—	4	45	2000
—	5	55	2250
—	6	60	2500
—	7	70	2750
—	8	80	3000
—	9	90	3250
—	10	100	3500

For SI Units: 1 gallon = 3.785 L

Notes:

1. Extra bedroom, 150 gallons (568 liters) each.
2. Extra dwelling units over 10,250 gallons (946 liters) each.
3. Extra fixture units over 100, 25 gallons (95 liters) per fixture unit.
4. Septic tank sizes in this table include sludge storage capacity and the connection of domestic food waste disposal units without further volume increase.

* Applies to mobile homes not installed in a mobile home park

TABLE H 2.1(1)
ESTIMATED WASTE SEWAGE FLOW RATES[1, 2, ~~3~~]

TYPE OF OCCUPANCY	GALLONS PER DAY
1. Airports	15 per employee 5 per passenger
2. Auto washers	Check with equipment manufacturer
3. Bowling alleys (snack bar only)	75 per lane
4. Camps:	
Campground with central comfort station	35 per person
Campground with flush toilets, no showers	25 per person
Day camps (no meals served)	15 per person
Summer and seasonal	50 per person
5. Churches (Sanctuary)	5 per seat
with kitchen waste	7 per seat
6. Dance halls	5 per person
7. Factories	
no showers	25 per employee
with showers	35 per employee
Cafeteria, add	5 per employee
8. Hospitals	250 per bed
kitchen waste only	25 per bed
laundry waste only	40 per bed
9. Hotels (no kitchen waste)	60 per bed (2 person)
10. Institutions (Resident)	75 per person
Nursing home	125 per person
Rest home	125 per person
11. Laundries, self-service	
(minimum 10 hours per day)	300 per machine
Commercial	Per manufacturer's specifications
12. Motel	50 per bed space

with kitchen.....60 per bed space
13. Offices .....20 per employee
14. Parks,.....
Picnic parks (toilets only).....20 per parking space
Recreational vehicles
without water hook-up.....75 per space
with water and sewer hook-up.....100 per space
15. Restaurants – cafeterias ..... 50 per seat
16. Schools – Staff and office .....20 per person
Elementary students .....15 per person
Intermediate and high.....20 per student
with gym and showers, add .....5 per student
with cafeteria, add.....3 per student
Boarding, total waste .....100 per person
17. Service station, toilets .....1000 for 1st bay
500 for each additional bay
18. Stores .....20 per employee
Public restrooms, add .....1 per 10 square feet of floor space
19. Swimming pools, public .....10 per person
20. Theaters, auditoriums.....5 per seat
Drive-in.....10 per space

For SI units: 1 square foot = 0.0929 m^2, 1 gallon per day 3.785 L/day

Notes:

1

1See Section H 2.1.

2Because of the many variables encountered, it is not possible to set absolute values for waste/sewage flow rates for all situations. The designer should evaluate each situation and, where figures in this table need modification, they should be made with the concurrence of the Authority Having Jurisdiction.

Table H 2.1(2)
DESIGN CRITERIA OF SIX TYPICAL SOILS

TYPE OF SOIL	REQUIRED SQUARE FEET OF LEACHING AREA PER 100 GALLONS	MAXIMUM ABSORPTION CAPACITY IN GALLONS PER SQUARE FEET OF LEACHING AREA FOR A 24 HOUR
Coarse sand or gravel	20	5.0
Fine sand	25	4.0
Sandy loam ~~or sandy clay~~	40	2.5
Sandy clay	60	1.66
Clay with considerable sand or gravel	90	1.1
Clay with small amount of sand or gravel	120	0.8

For SI units: 1 square foot = 0.0929 m^2, 1 gallon = 3.785 L, 1 gallon per square foot = 40.7 L/m^2

Table H 2.1(3)LEACHING AREA SIZE BASED ON SEPTIC TANK CAPACITY

REQUIRED SQUARE FEET OF LEACHING AREA PER 100 GALLONS SEPTIC TANK CAPACITY (square feet per 100 gallons)	MAXIMUM SEPTIC TANK SIZE ALLOWABLE (gallons)
20-25	7500
40	5000
60	3500
90	3000
120	2500

For SI units: 1 square foot per 100 gallons = 0.000245 m^2/L, 1 gallon = 3.785 L

. . .

H3.0 Area of Disposal Fields and Seepage Pits.

. . .

(3) No excavation for a leach line or leach bed shall be located within ten (10) feet (3048 mm) of ~~the~~ ground water nor to a depth where sewage is capable of contaminating the underground water stratum.

Exception: When approved by the Authority Having Jurisdiction, this distance may be reduced to five (5) feet (1.5 m) from ocean water. The applicant shall supply evidence of groundwater depth to the satisfaction of the Authority Having Jurisdictions.

(4) The minimum effective absorption area in any seepage pit shall be calculated as the excavated sidewall area below the inlet exclusive of any hardpan, rock, clay, or other impervious formations. The minimum required area of porous formation shall be provided in one or more seepage pits. No excavation shall extend within 10 feet (3048 mm) of ground water nor to a depth where sewage is capable of contaminating under-ground water stratum.

Exception: When approved by the Authority Having Jurisdiction, this distance

may be reduced to five (5) feet (1.5 m) from ocean water.

The applicant shall supply evidence of groundwater depth to the satisfaction of the Authority Having Jurisdiction.

. . .

H 4.0 Percolation Test.

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H 4.3 Absorption Rates. Where a percolation test is required, the proposed system shall have the capability to absorb a quantity of clear water in a 24-hour period equal to at least five times the liquid capacity of the proposed septic tank. No private disposal system shall be permitted to serve a building where that test shows the absorption capacity of the soil is less than 0.83 gallons per square foot (gal/ft2) (33.8 L/m2) or more than 5.12 gal/ft2 (208.6 L/m2) of leaching area per 24 hours. Where the percolation test shows an absorption rate greater than 5.12 gal/ft2 (208.6 L/m2) per 24 hours, a private disposal system shall be permitted where the site does not overlie groundwaters protected for drinking water supplies, a minimum thickness of 2 feet (610 mm) of the native soil below the entire proposed system is replaced by loamy sand, and the system design is based on percolation tests made in the loamy sand.

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H 6.0 Disposal Fields.

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H 6.5 Distribution Boxes. Where two or more drain lines are installed, an

approved distribution box of sufficient size to receive lateral lines shall be installed at the head of each disposal field. The inverts of outlets shall be level, and the invert of the inlet shall be not less than 1 inch (25.4 mm) above the outlets. Distribution boxes shall be designed to ensure equal flow and shall be installed on a level concrete slab in natural or compacted soil. Distribution boxes shall be coated on the inside with a bituminous coating or other approved method acceptable to the Authority Having Jurisdiction.

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H 6.8 Dosing Tanks. Automatic syphon or dosing tanks shall be installed when required or as permitted by the Authority Having Jurisdiction.

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H 7.0 Seepage Pits.

. . .

H 7.2 Multiple Installations. Multiple seepage pit installations shall be served through an approved distribution box or be connected in series . When connected in series, the effluent shall leave each pit through an approved vented leg fitting extending not less than 12 inches (305 mm) downward into such existing pit and having its outlet flow line at least six (6) inches below the inlet. All pipes between pits shall be laid with approved watertight joints.

. . .

H 10.0 Inspection and Testing.

H 10.1 Inspection. Inspection requirements shall comply with the following:

(1) Applicable provisions of Section 104.0 of this code and this appendix shall be required. Plans shall be required in accordance with Section 102.1 of this code.

(2) System components shall be properly identified as to manufacturer. Septic tanks or other primary systems shall have the rated capacity permanently marked on the unit.

(3) Septic tanks or other primary systems shall be installed on dry, level, well-compacted soil.

(4) Where design is predicated on soil tests, the system shall be installed at the same location and depth as the tested area.

(5) Disposal fields and seepage pits shall not be installed in uncompacted fill.

H 11.0 Abandoned Sewers and Sewage Disposal Facilities.

. . .

H11.6 Excavation. No excavation for an abandoned sewer or sewage facility shall be left unattended at any time unless the permittee shall have first provided a suitable and adequate barricade to assure public safety.

SECTION 6. Appendix M is hereby amended to read as follows:

•••

SECTION 7. Appendix S is hereby amended to read as follows:

APPENDIX S
SOLAR SYSTEMS

S-1 GENERAL. In addition to the requirements of this appendix, the provisions of this code shall be applicable to solar installations.

S-2 SCOPE. The provisions of this appendix shall apply to the erection, installation, alteration, repair, relocation, replacement, addition to, use, or maintenance of solar energy systems, including but not limited to equipment and appliances intended to utilize solar energy for water heating, and swimming pool heating.

S-3 DEFINITIONS.

Absorber. That part of the solar collector that receives the incident radiation energy.

Absorptance. The collecting of heat, measured as percent of total radiation available.

Ambient Temperature. Surrounding temperature.

Area, Absorber. The total projected heat transfer area from which the absorbed solar irradiation heats the transfer media.

Closed Loop System. A system where the fluid is enclosed in a piping system that is not vented to the atmosphere.

Collector. See Solar Collector.

Collector System. That section of the solar system that includes the collector and piping or ducts from the collector to the storage system.

Combustible Liquid. A liquid having a flash point at or above 100°F (38°C). Combustible liquids shall be divided into the following classifications:

(1) Class II liquids having a flash point above 100°F (38°C) and below 140°F

(60°C).

(2) Class IIIA liquids having a flash point at or above 140°F (60°C) and below 200°F (93°C).

(3) Class IIIB liquids having a flash point at or above 200°F (93°C).

The classifications of combustible liquids do not include compressed gases or cryogenic fluids.

Cover, Collector (Glazing). The material covering the aperture to provide thermal and environmental protection.

Design Pressure. The maximum allowable pressure for which a specific part of a system is designed.

Design Temperature. The maximum allowable continuous or intermittent temperature for which a specific part of a solar energy system is designed to operate safely and reliably.

Distribution System. That section of the solar system from the storage system to the point of use.

Drainback System. A closed loop system, which allows gravity draining of the heat transfer fluid into, lower portions or the solar loop under prescribed circumstances.

Draindown. An active solar energy system in which the fluid in the solar collector is drained from the solar energy system under prescribed circumstances.

Energy Collector Fluid. That fluid used to transfer energy from the collector to the storage system or point of use.

Energy Storage Fluid (or Media). That fluid (or media) used in the storage container for storing collected energy.

Energy Transfer Fluid. That fluid used within a closed system either from the collector to the storage system or from the storage system to the point of use.

Essentially Nontoxic Transfer Fluid. Fluid generally recognized as safe by the Food and Drug Administration (FDA) as food grade.

External Auxiliary Heating. Auxiliary heating device located outside the storage. The heat is transferred to the storage by direct or indirect charging via a charge loop.

Flammable Liquid. Any liquid that has a flash point below 100°F (38°C), and has a vapor pressure not exceeding 40 psi (276 kPa) at 100°F (38°C). Flammable liquids shall be known as Class I liquids and shall be divided into the following classifications:

(1) Class IA liquids having a flash point below 73°F (23°C) and a boiling point below 100°F (38°C).

(2) Class IB liquids having a flash point below 73°F (23°C) and a boiling point at or above 100°F (38°C).

(3) Class IC liquids having a flash point at or above 73°F (23°C) and below 100°F (38°C).

Flash Point. The minimum temperature corrected to a pressure of 14.7 psi (101 kPa) at which a test flame causes the vapors of a portion of the sample to ignite under the conditions specified by the test procedures and apparatus. The flash point of a liquid shall be determined in accordance with ASTM D 56, ASTM D 93, or ASTM D 3278.

Heat Exchanger. A device that transfers heat from one medium to another.

Heat Transfer Medium. The medium used to transfer energy from the solar collectors to the thermal storage or load.

Immersed Heat Exchanger. Heat exchanger, which is completely surrounded with the fluid in the storage tank.

Instantaneous Efficiency. The amount of energy removed by the transfer fluid per gross collector area. During the specified time period, divided by the total solar radiation

incident on the collector per unit area during the same test period, under steady state or quasi-steady state.

Langelier Saturation Index. A formula used to measure water balance or mineral saturation control of pool, spa, or hot tub water. Total alkalinity, calcium hardness, pH, water temperature, and total dissolved solids are measured, given a factor, and calculated to determine whether water has a tendency to be corrosive or scale forming.

Open Loop System. A system where the fluid is enclosed in a piping system that is vented to the atmosphere.

Out-Gassing. As applied to thermal energy, the thermal process by which materials expel gas.

Passive Solar Systems. As used in these requirements, are solar systems that utilize elements of a building, without augmentation by mechanical components such as blowers or pumps, to provide for the collections, storage, or distribution of solar energy for heating, cooling, or both.

Rock Storage. A bin, basement, or other container filled with rock to act as an energy reservoir for a solar system.

Solar Collector. A device used to absorb energy from the sun.

Solar Energy System. A configuration of equipment and components to collect, convey, store, and convert the sun's energy for a purpose.

Solar Energy System Components. Any appliance, assembly, device, equipment, or piping used in the conversion of solar energy into thermal energy for service water heating, pool water heating, space heating and cooling, and electrical service.

Solar Thermal System. A complete assembly of subsystems which convert solar energy into thermal energy and utilize this energy for service water heating, pool water heating, space

heating and cooling purposes.

Storage Temperature. Temperature of the storage medium.

Thermosiphon. The natural circulation of fluids due to temperature differential.

Total Alkalinity. The sum of all alkaline minerals in the water that is primarily in bicarbonate form, but also as sodium, calcium, magnesium, potassium carbonates, and hydroxides. It is a measure of the water's ability to resist changes in pH.

S-4 PERMITS.

S-4.1 Permits Required. It shall be unlawful for a person, firm, or corporation to make an installation, alteration, repair, replacement, or remodel a solar energy system regulated by this code or cause the same to be done without first obtaining a separate permit for each separate building, structure, or interconnected set of systems. In addition, Section 103 of this code shall apply.

S-5 PLANS AND SPECIFICATIONS.

S-5.1 Plans, engineering calculations, diagrams, and other data shall be submitted in one or more sets with each application for a permit. The Authority Having Jurisdiction shall be permitted to require plans, computations, and specifications to be prepared by, and the solar energy system designed by, an engineer, an architect, or both who shall be licensed by the state to practice as such.

Exception: The Authority Having Jurisdiction shall be permitted to waive the submission of plans, calculations, or other data where the Authority Having Jurisdiction finds that the nature of the work applied for is such that reviewing of plans is not necessary to obtain compliance within the code.

S-6 INSPECTION AND TESTING.

S-6.1 General. Solar energy systems for which a permit is required by this code shall be inspected by the Authority Having Jurisdiction. No solar energy system or portion thereof shall

be covered, concealed, or put into use until it first has been tested, inspected, and approved as prescribed in this code. Neither the Authority Having Jurisdiction nor the jurisdiction shall be liable for expense entailed in the removal or replacement of material required to permit inspection. Solar energy systems regulated by this code shall not be connected to the water, the energy fuel supply, or the sewer system until authorized by the Authority Having Jurisdiction. Installation of solar energy system shall comply with other parts of this code including section 104.0

S-6.2 Required Inspection. New solar energy system work and such portions of existing systems as affected by new work, or changes, shall be inspected by the Authority Having Jurisdiction to ensure compliance with the requirements of this code and to ensure that the installation and construction of the solar energy system is in accordance with approved plans. The Authority Having Jurisdiction shall make the following inspections and other such inspections as necessary. The permittee or the permittee's authorized agent shall be responsible for the scheduling of such inspections as follows:

(1) Underground inspection shall be made after trenches or ditches are excavated and bedded, piping installed, and before backfill is put in place.

(2) Rough-in inspection shall be made prior to the installation of wall or ceiling membranes.

(3) Final inspection shall be made upon completion of the installation.

S-6.3 Testing. Solar energy systems shall be tested and approved as required by this code or the Authority Having Jurisdiction.

S-6.3.1 Piping. The piping of the solar thermal system shall be tested with water, air, heat transfer liquid, or as recommended by the manufacturer's instructions, except that plastic pipe shall not be tested with air. The Authority Having Jurisdiction shall be permitted to require the removal of plugs, etc., to ascertain where the pressure has reached all parts of the system.

In cases where it would be impractical to provide the required water or air tests, or for minor installations and repairs, the Authority Having Jurisdiction shall be permitted to make such inspection as deemed advisable in order to be assured that the work has been performed in accordance with the intent of this code. Joints and connections in the solar energy system shall be gastight and watertight for the pressures required by test.

S-6.3.2 System Requirements. Upon completion, the system, including piping, collectors, heat exchangers, and other related equipment, shall be tested and proved airtight.

S-6.3.2.1 Open Loop Systems. Open loop systems directly connected to the potable water system shall be tested under a water pressure not less than the maximum working pressure under which it is to be used. The water used for tests shall be obtained from a potable source of supply. A 50 pound-force per square inch (psi) (345 kPa) air pressure test shall be permitted to be substituted for the water test.

S-6.3.2.2 Other Open Loop Systems. Systems operating at atmospheric pressure shall be tested under actual operating conditions.

S-6.3.2.3 Closed Loop Systems. Closed loop or other type pressure systems shall be tested at one-and-one-half times maximum designed operating pressure.

Systems shall withstand the test without leaking for a period of not less than 15 minutes.

S-6.3.3 Storage Tanks. Storage tanks shall be tested in accordance with Section S-6.3.3.1 and S-6.3.3.2.

S-6.3.3.1 Pressure Type. The test pressure for storage tanks that are subject to water pressure from utility mains (with or without a pressure reducing valve) shall be two times the working pressure but not less than 300 psi (2068 kPa).

S-6.3.3.2 Non-Pressure Type. Storage tanks shall be tested by filling it with water for a period of 24 hours prior to inspection and shall withstand the test without leaking. No tank or portion thereof shall be covered or concealed prior to approval.

S-6.3.4 Connection to Service Utilities. No person shall make connections from a source of energy or fuel to a solar energy system or equipment regulated by this code and for which a permit is required until approved by the Authority Having Jurisdiction. No person shall make connection from a water-supply line nor shall connect to a sewer system regulated by this code and for which a permit is required until approved by the Authority Having Jurisdiction. The Authority Having Jurisdiction shall be permitted to authorize temporary connection of the solar energy system equipment to the source of energy or fuel for the purpose of testing the equipment.

S-7 LOCATION.

S-7.1 System. Except as otherwise provided in this code, no solar energy system, or parts thereof shall be located in a lot other than the lot that is the site of the building, structure, or premises served by such facilities.

S-7.2 Ownership. No subdivision, sale, or transfer of ownership of existing property shall be made in such manner that the area, clearance, and access requirements of this code are decreased.

S-8 ABANDONMENT.

S-8.1 General. An abandoned solar thermal system or part thereof shall be disconnected from remaining systems, drained, plugged, and capped in an approved manner.

S-8.2 Storage Tank. An underground water storage tank that has been abandoned or discontinued otherwise from use in a solar thermal system shall be completely drained and filled with earth, sand, gravel, concrete, or other approved material or removed in a manner satisfactory to the Authority Having Jurisdiction.

S-9 TANKS.

S-9.1 Storage Tanks

S-9.1.1 Plans. Plans for tanks shall be submitted to the Authority Having Jurisdiction for

approval, unless listed by an approved listing agency. Such plans shall show dimensions, reinforcing, structural calculations, and such other pertinent data as required.

S-9.1.2 Gravity Tanks. Gravity tanks shall be installed with an overflow opening of not less than 2 inches (50 mm) Internal Pipe Size (IPS). The openings shall be aboveground and installed with a screened return bend.

S-9.1.3 Prefabricated Tanks. Prefabricated tanks shall be listed and labeled.

S-9.1.4 Pressure-Type Storage Tanks. Pressure-type water storage tanks shall be installed with a listed combination temperature and pressure relief valve. The temperature setting shall not exceed 210°F (99°C). The pressure setting shall not exceed 150 percent of the maximum designed operating pressure of the solar thermal system, or 150 percent of the established normal operating pressure of the piping materials, or the labeled maximum operating pressure of a pressure-type storage tank, whichever is less. The relief valve setting shall not exceed the recommendations of the equipment manufacturer.

All storage tanks and bottom fed tanks connected to a water heater shall be provided with a vacuum relief valve at the top of the tank that will operate up to a water pressure not exceeding 200 psi (1379 kPa) and up to a temperature not exceeding 250°F (121°C) to prevent siphoning of any water heater or storage tank. The size of such vacuum relief valves shall have a minimum rated capacity for the equipment served. This section shall not apply to pressurized captive air diaphragm/bladder tanks.

Valves shall not be located on either side of a relief valve connection. The relief valve discharge pipe shall be of approved material that is rated for the temperature of the system. The discharge pipe shall be the same diameter as the relief valve outlet, discharge by gravity through an air gap into the drainage system or outside of the building with the end of the pipe not exceeding 2 feet (610 mm) nor less than 6 inches (152 mm) above the ground and pointing downward.

S-9.1.5 Separate Storage Tanks. For installations with separate storage tanks, a pressure relief valve and temperature relief valve or combination thereof shall be installed on both the water heater and storage tank. There shall not be a check valve or shutoff valve between a relief valve and the heater or tank served.

The relief valve discharge pipe shall be of approved material that is rated for the temperature of the system. The discharge pipe shall be the same diameter as the relief valve outlet, discharge by gravity through an air gap into the drainage system or outside of the building with the end of the pipe not exceeding 2 feet (610 mm) nor less than 6 inches (152 mm) above the ground and pointing downward. Discharges from such valves on systems utilizing other than potable water heat transfer mediums shall be approved by the Authority Having Jurisdiction.

S-9.1.6 Underground Tanks. Tanks shall be permitted to be buried underground where designed and constructed for such installation.

S-9.1.7 Pressure Vessels. Pressure vessels, and the installation thereof, shall comply with minimum requirements for safety from structural failure, mechanical failure, and excessive pressures in accordance with the Authority Having Jurisdiction and nationally recognized standards.

S-9.1.8 Devices. Devices attached to or within a tank shall be accessible for repair and replacement.

S-9.1.9 Tank Covers. Tank covers shall be structurally designed to withstand anticipated loads and pressures in accordance with the manufacturer’s instructions.

S-9.1.10 Watertight Pan. Where a storage tank is installed in an attic, attic-ceiling assembly, floor-ceiling assembly, or floor subfloor assembly where damage results from a leaking storage tank, a watertight pan of corrosion-resistant materials shall be installed beneath the storage tank with not less than 3/4 of an inch (20 mm) diameter drain to an approved

location.

S-9.1.11. Materials.

S-9.1.11.1 General. Tanks shall be constructed in accordance with Section S-9.1.11.1.1 through Section 9.1.11.1.7.

S-9.1.11.1.1 Construction. Tanks shall be constructed of durable materials not subject to excessive corrosion or decay and shall be watertight. Each such tank shall be structurally designed to withstand anticipated loads and pressures and shall be installed level and on a solid bed.

S-9.1.11.1.2 Standards. Tanks shall be constructed in accordance with nationally recognized standards and the Authority Having Jurisdiction.

S-9.1.11.1.3 Concrete. The walls and floor of each poured-in-place, concrete tank shall be monolithic. The exterior walls shall be double-formed so as to provide exposure of the exterior walls during the required water test. The compressive strength of a concrete tank wall, top and covers, or floor shall be not less than 2500 pounds per square inch (lb/in^2) (1.7577 E+06 kg/m^2). Where required by the Authority Having Jurisdiction, the concrete shall be sulfate resistant (Type V Portland Cement).

S-9.1.11.1.4 Metal Tanks. Metal tanks shall be welded, riveted and caulked, brazed, bolted, or constructed by use of a combination of these methods.

S-9.1.11.1.5 Filler Metal. Filler metal used in brazing shall be non-ferrous metal or an alloy having a melting point above 1000°F (538°C) and below that of the metal joined.

S-9.1.11.1.6 Non-Fiberglass Storage Tanks. Non-fiberglass storage tanks shall be constructed in accordance with ASME Boiler and Pressure Vessel Code, Section VIII or other approved standards.

S-9.1.11.1.7 Fiber-Reinforced Storage Tanks. Fiber-reinforced storage tanks shall be constructed in accordance with ASME Boiler and Pressure Vessel Code, Section X or other

approved standards.

S-9.2 Expansion Tanks.

S-9.2.1 Where Required. An expansion tank shall be installed in a solar thermal system where a pressure reducing valve, backflow prevention device, check valve or other device is installed on a water supply system utilizing storage or tankless water heating equipment as a means for controlling increased pressure caused by thermal expansion. Expansion tanks shall be of the closed or open type and securely fastened to the structure. Tanks shall be rated for the pressure of the system. Supports shall be capable of carrying twice the weight of the tank filled with water without placing strain on the connecting piping.

Solar thermal systems incorporating hot water tanks or fluid relief columns shall be installed to prevent freezing under normal operating conditions.

S-9.2.2 Systems with Open Type Expansion Tanks. Open type expansion tanks shall be located not less than 3 feet (914 mm) above the highest point of the system. Such tanks shall be sized based on the capacity of the system. An overflow with a diameter of not less than one-half the size of the water supply or not less than 1 inch (25 mm) in diameter shall be installed at the top of the tank. The overflow shall discharge through an air gap into the drainage system.

S-9.2.3 Closed-Type Systems. Closed-type systems shall have an airtight tank or other approved air cushion that will be consistent with the volume and capacity of the system, and shall be designed for a hydrostatic test pressure of two and one-half times the allowable working pressure of the system. Expansion tanks for systems designed to operate at or above 30 pounds-force per square inch (psi) (207 kPa) shall be constructed in accordance with nationally recognized standards and the Authority Having Jurisdiction. Provisions shall be made for draining the tank without emptying the system, except for pressurized tanks.

S-9.2.4 Minimum Capacity of Closed-Type Tank. The minimum capacity of a closed-

type expansion tank shall be in accordance with Table S-9.2.4(1) and Table S-9.2.4(2) or from the following formula:

$$Vt = \frac{(0.00041t - 0.0466)\ Vs}{\left(\frac{Pa}{Pf} - \frac{Pa}{Po}\right)}$$ (Equation S-9.2.4)

Where:

Vt = Minimum volume of expansion tank, gallons.
Vs = Volume of system, not including expansion tank, gallons.
t = Average operating temperature, °F.
Pa = Atmospheric pressure, feet H_2O absolute.
Pf = Fill pressure, feet H_2O absolute.
Po = Maximum operating pressure, feet H_2O absolute.

For SI units: 1 gallon = 3.785 L, °C = (°F-32)/1.8, 1 foot of water = 2.989 kPa

TABLE S-9.2.4(1)
EXPANSION TANK CAPACITIES
FOR GRAVITY
HOT WATER SYSTEMS

INSTALLED EXPANSION DIRECT RADIATION* (square feet)	TANK CAPACITY (gallons)
Up to 350	18
Up to 450	21
Up to 650	24
Up to 900	30
Up to 1100	35
Up to 1400	40
Up to 1600	2 to 30
Up to 1800	2 to 30
Up to 2000	2 to 35
Up to 2400	2 to 40

For SI units: 1 gallon = 3.785 L, 1 square foot = 0.0929 m2

* For systems exceeding 2400 square feet (222.9 m2) of installed equivalent direct water radiation, the required capacity of the cushion tank shall be increased on the basis of 1 gallon (3.785 L) tank capacity per 33 square feet (3.1 m2) of additional equivalent direct radiation.

TABLE S-9.2.4(2)
EXPANSION TANK
CAPACITIES FOR FORCED
HOT WATER SYSTEMS

SYSTEM VOLUME* (gallons)	TANK CAPACITY (gallons)
100	15
200	30
300	45
400	60
500	75
1000	150
2000	300

For SI units: 1 gallon = 3.785 L

* Includes volume of water in boiler, radiation, and piping, not including expansion tank.

S-10 COLLECTORS.

S-10.1 Construction.

S-10.1.1 General. Frames and braces exposed to the weather shall be constructed of materials for exterior locations, and protected from corrosion or deterioration, in accordance with the Authority Having Jurisdiction.

S-10.1.2 Construction. Collectors shall be designed and constructed as to prevent interior condensation, out-gassing, or other processes that will reduce the transmission properties of the glazing, reduce the efficiency of the insulation, or otherwise adversely affect the performance of the collector.

S-10.1.3 Glass. Glass used in collector construction shall be tempered.

S-10.1.4 Plastic. Plastic used in collector construction shall be installed in accordance with the manufacturer's installation instructions.

S-10.1.5 Listing. Collectors that are manufactured as a complete component shall be listed or labeled by an approved listing agency in accordance with SRCC 100, UL 1279, or equivalent standard.

S-10.1.6 Air Collectors. Materials exposed within air collectors shall be noncombustible or shall have a flame spread index not to exceed 25 and a smoke developed index not to

exceed 50 where tested as a composite product in accordance with ASTM E 84 or UL 723.

S-10.1.6.1 Testing. Materials used within an air collector shall not smoke, smolder, glow, or flame where tested in accordance with ASTM C 411 at temperatures exposed to in service. In no case shall the test temperature be less than 250°F (121°C).

S-10.2 Collector Installation.

S-10.2.1 General. Solar collectors shall be anchored to roof structures or other surfaces in accordance with the manufacturer's installation instructions and the building code. Collectors shall be mounted as to minimize the accumulation of debris. Connecting pipes shall not be used to provide support for a solar collector.

S-10.2.2 Roof Installations. Anchors secured to and through a roofing material shall be made to maintain the water integrity of the roof covering. Roof drainage shall not be impaired by the installation of collectors. Solar collectors that are not an integral part of the roofing system shall be installed to preserve the integrity of the roof surface.

S-10.2.3 Ground Installations. Solar collectors installed at ground level shall be not less than 6 inches (152 mm) above the ground level.

S-11.2.4 Access. Access shall be provided to collectors and components in an approved manner. A work space adjacent to collectors for maintenance and repair shall be provided in accordance with the Authority Having Jurisdiction.

S-10.2.5 Stagnation Condition. The collector assembly shall be capable of withstanding stagnant conditions in accordance with the manufacturer's instructions where high solar flux and no flow occurs.

S-10.2.6 Waterproofing. Joints between structural supports and buildings or dwellings, including penetrations made by bolts or other means of fastening, shall be made watertight with approved material.

S-10.2.7 Fasteners. Mountings and fasteners shall be made of corrosion-resistant

materials.

S-10.2.7.1 Carbon Steel. Carbon steel mountings and fasteners shall be classified as noncorrosive in accordance with ASME SA194.

S-10.2.8 Combustible Materials. Collectors constructed of combustible materials shall not be located on or adjacent to construction required to be of noncombustible materials or in fire areas, unless approved by the Authority Having Jurisdiction.

S-10.2.9 Orientation. Collectors shall be located and oriented in accordance with the manufacturer's installation instructions.

S-10.2.10 Wall Mounted. Solar collectors that are mounted on a wall shall be secured and fastened in an approved manner in accordance with Section 314.0.

S-10.3 Fire Safety Requirements.

S-10.3.1 Building Components. Collectors that function as building components shall be in accordance with the building code.

S-10.3.2 Above or On the Roof. Collectors located above or on roofs, and functioning as building components, shall not reduce the required fire-resistance and fire-retardance classification of the roof covering materials.

Exceptions:

(1) Collectors located on buildings not exceeding three stories in height, a 9000 square feet (836.13 m^2) total floor area; or both providing:

(a) The collectors are noncombustible.

(b) Collectors with plastic covers have noncombustible sides and bottoms, and the total area covered and the collector shall not exceed the following:

1. Plastic CC1 – 33⅓ percent of the roof area.

2. Plastic CC2 – 25 percent of the roof area.

(c) Collectors with plastic film covers having a thickness of not more than 0.010 of an

inch (0.254 mm) shall have noncombustible sides and bottoms, and the total area covered by the collector shall not exceed 33⅓ percent of the roof area.

S-11 HEAT TRANSFER MEDIUM

S-11.1 Hazardous Heat-Transfer Mediums. Hazardous heat-transfer mediums shall comply with Section S-11.1.1 and Section S-11.1.2.

S-11.1.1 Approval. Heat-transfer mediums that are hazardous shall not be used in solar thermal systems, except with prior approval of the Authority Having Jurisdiction.

S-11.1.2 Flash Points. The flash point of a heat-transfer medium shall be:

(1) Not less than 50°F (10°C) above the design maximum nonoperating temperature and as high as the maximum stagnation temperature of the medium in the system.

(2) Not less than 50°F (10°C) above the design maximum operating temperature and exceeding the maximum stagnation temperature minus 200°F (93°C) of the medium in the system.

S-11.1.3 Discharge. The collector, collector manifold, and manifold relief valve shall not discharge directly or indirectly into the building or toward an open flame or other source of ignition.

S-12 HEAT EXCHANGERS

S-12.1 Heat exchangers used for heat transfer, heat recovery, or solar thermal systems shall protect the potable water system from being contaminated by the heat transfer medium. Single-wall heat exchangers shall meet the requirements of Section S-12.2. Double-wall heat exchangers shall separate the potable water from the heat transfer medium by providing a space between the two walls that is vented to the atmosphere.

S-12.2 Single-Wall Heat Exchangers. Solar thermal systems that incorporate a single-wall heat exchanger shall meet the following requirements:

(1) Heat transfer medium is either potable water or contains fluids recognized as safe by the Food and Drug Administration (FDA) as food grade.

(2) Bear a label with the word “Caution,” followed by the following statements:

(a) The heat transfer medium shall be water or other nontoxic fluid recognized as safe by the FDA.

(b) The maximum operating pressure of the heat exchanger shall not exceed the maximum operating pressure of the potable water supply.

(3) The word “Caution” and the statements in letters shall have an uppercase height of not less than 0.120 of an inch (3.048 mm). The vertical spacing between lines of type shall be not less than 0.046 of an inch (1.168 mm). Lowercase letters shall be not less than compatible with the uppercase letter size specification.

S-13 VALVES

S-13.1 General. Valves shall be rated for the operating temperature and pressures of the system and shall be compatible with the type of heat transfer medium. Valves shall be approved for the installation with the piping materials to be installed.

S-13.2 Fullway Valves. A fullway valve shall be installed in the following locations:

(1) On the water supply to a solar thermal system.

(2) On the water supply pipe to a gravity or pressurized water tank.

(3) On the water supply pipe to a water heater.

S-13.3 Shutoff Valves. A shutoff valve shall be installed in the following locations:

(1) On the supply line to each appliance, equipment, or pressure vessel.

(2) On a nondiaphragm-type expansion tank.

S-13.4 Balancing Valves. Balancing valves shall be permitted to be used to obtain uniform flow distribution.

S-13.4.1 Location. Balancing valves shall be installed at the outlet of each group of

collectors.

S-13.4.2 Construction. Balancing valves shall be made of a bronze body with a brass ball, plastic, or other types compatible with the heat transfer medium.

S-13.4.3 Marking. Final settings shall be marked on each balancing valve in an approved manner.

S-13.5 Accessible. Required fullway or shutoff valves shall be accessible.

S-13.6 Control Valves. An approved three-way valve shall be permitted to be installed for manual control systems. An approved electric control valve shall be permitted to be installed for automatic control systems. The installation and operation of automatic control valves shall comply with the manufacturer's instructions.

S-13.7 Check Valves. An approved-type check valve shall be installed on liquid heat transfer piping where the system design is capable of allowing reverse thermosiphoning of heated liquids into the collector array.

S-13.8 Automatic Air Vents. Automatic air release vents shall be installed at high points of the solar thermal system in accordance with the system design requirements and manufacturer's installation instructions.

S-13.9 Closed Loop Systems. Closed loop systems, where hose bibbs or similar valves are used to charge or drain the system, shall be of loose key type; have valve outlets capped; or have handles removed where the system is operational.

S-14 PIPING AND CROSS CONNECTION CONTROL

S-14.1 Cross Connection Control

S-14.1.1 Prohibited Installation. No installation of solar thermal piping, or part thereof, shall be made in such a manner that it will be possible for used, unclean, polluted, or contaminated water, mixtures, or substances to enter a portion of the potable water system from a pipe, tank, receptor, or equipment by reason of backsiphonage, suction, or other cause,

either during normal use and operation thereof, or where such pipe, tank, receptor, or equipment is subject to pressure exceeding the operating pressure in the potable water system.

S-14.1.2 Cross-Contamination. No person shall make a connection or allow one to exist between pipes or conduits carrying potable water supplied by a public or private building supply system, and pipes or conduits containing or carrying water from other source or containing or carrying water that has been used for a purpose whatsoever, or piping carrying chemicals, liquids, gases, or substances whatsoever, unless there is provided a backflow prevention device approved for the potential hazard and maintained in accordance with this code.

S-14.1.3 Backflow Prevention. No device or construction shall be installed or maintained, or shall be connected to a potable water supply, where such installation or connection provides a possibility of polluting such water supply or cross-connection between a distributing system of water for drinking and domestic purposes and water that becomes contaminated by such device or construction unless there is provided a backflow prevention device approved for the potential hazard. In addition, Chapter 6 of this code shall apply.

S-14.1.4 Water Supply Inlets. Water supply inlets to tanks and other receptors shall be protected by one of the following means:

(1) An approved air gap.

(2) A listed vacuum breaker installed on the discharge side of the last valve with the critical level not less than 6 inches (152 mm) or in accordance with its listing.

(3) A backflow preventer suitable for the contamination or pollution, installed in accordance with the requirements for that type of device or assembly as set forth in this code.

S-14.2 Materials.

S-14.2.1 Piping Materials. Piping materials shall comply with the applicable standards referenced in this code and be acceptable for use based on the intended purpose. Materials

shall be rated for the operating temperature and pressures of the system and shall be compatible with the type of heat transfer medium and shall be approved for such use. Pipe fittings and valves shall be approved for the piping systems, and shall be compatible with, or shall be of the same material as the pipe or tubing. Exterior piping shall be protected from corrosion, degradation, and shall be resistant to UV radiation. Galvanized steel shall not be used in solar thermal systems where in contact with glycol heat transfer fluid.

S-14.2.2 Screwed Fittings. Screwed fittings shall be ABS, cast-iron, copper, copper alloy, malleable iron, PVC, steel, stainless steel or other approved materials. Threads shall be tapped out of solid metal or molded in solid ABS or PVC.

S-14.2.3 Storage Tank Connectors. Flexible metallic storage tank connectors or reinforced flexible storage tank connectors connecting a storage tank to the piping system shall be in accordance with the applicable standards (ASME A112.18.6-2009/CSA B 125.6-2009). Copper or stainless steel flexible connectors shall not exceed 24 inches (610 mm). PEX, PE-AL-PE, or PE-RT tubing shall not be installed within the first 18 inches (457 mm) of piping connected to a storage tank.

S-14.2.3.1 Flexible Connectors. Listed flexible connectors shall be installed in readily accessible locations, unless otherwise listed.

S-14.3 Safety Devices.

S-14.3.1 Pressure Relief Valves. Solar energy system components containing pressurized fluids shall be protected against pressures exceeding design limitations with a pressure relief valve. Each section of the system in which excessive pressures are capable of developing shall have a relief device located so that a section cannot be isolated from a relief device. Valves shall not be located on either side of a relief valve connection. The relief valve discharge pipe shall be of approved material that is rated for the temperature of the system. The discharge pipe shall be the same diameter as the relief valve outlet, discharge by gravity

through an air gap into the drainage system or outside of the building with the end of the pipe not exceeding 2 feet (610 mm) nor less than 6 inches (152 mm) above the ground and pointing downward.

S-14.3.2 Vacuum Relief Valves. The solar energy system components that are subjected to a vacuum while in operation or during shutdown shall be protected with vacuum relief valves. Where the piping configuration, equipment location, and valve outlets are located below the storage tank elevation the system shall be equipped with a vacuum relief valve at the highest point.

S-14.3.3 Space Heating. Where a combination potable water heating and space heating system requires water for space heating at temperatures higher than 140°F (60°C), a thermostatic mixing valve that is in accordance with ASSE 1017 shall be provided to limit the water supplied to the potable hot water distribution system to a temperature of 140°F (60°C) or less.

S-14.4 Protection of System Components.

S-14.4.1 Corrosion. Solar thermal systems and components subject to corrosion shall be protected in an approved manner. Metal parts exposed to atmospheric conditions shall be of corrosion-resistant material.

S-14.4.2 Mechanical Damage. Portions of a solar energy system installed where subjected to mechanical damage shall be guarded against such damage by being installed behind approved barriers or, where located within a garage, be elevated or located out of the normal path of a vehicle.

S-14.4.3 Freeze Protection. No solar thermal piping shall be installed or permitted outside of a building or in an exterior wall, unless, where necessary, adequate provision is made to protect such pipe from freezing. Freeze protection for solar thermal systems shall be provided in accordance with the following:

(1) Protection from freeze damage where the ambient temperature is less than 41°F (5°C) shall be provided for system components containing heat transfer liquids in an approved manner.

(2) The supplier of each system shall specify the limit ("Freeze Tolerance Limit") to the system's tolerance of freezing weather conditions.

(3) For systems that rely on manual intervention for freeze protection, the supplier shall specify the system's freeze tolerance limit based on exposure for 18 hours to a constant atmospheric temperature.

(4) For solar thermal systems where the collector fluid is potable water, not less than two freeze protection mechanisms shall be provided on each system. Manual intervention (e.g., draining, changing valve positions, etc.) shall be permitted as one mechanism. Not less than one freeze protection mechanism, in addition to manual intervention, shall be designed to protect components from freeze damage, in the event of power failure in an approved manner. Where approved, thermal mass of a system shall be permitted to be a form of freeze protection.

(5) Fittings, pipe slope, and collector shall be designed to allow for manual gravity draining and air filling of solar thermal system components and piping. Pipe slope for gravity draining shall be not less than ¼ inch per foot (20.8 mm/m) of horizontal length. This also applies to header pipes or absorber plate riser tubes internal to the collector. Where a means to drain the system is provided a drain valve shall be installed.

(6) At the time of installation, a label indicating the method of freeze protection for the system shall be attached to the system in a visible location. For systems which rely on manual intervention for freeze protection, such label shall indicate the minimum ambient temperature conditions (Freeze Tolerance Limit) below which owner action is recommended by the manufacturer's instructions.

S-14.4.4 Water Hammer Protection. Solar thermal systems where quick-acting valves

are installed shall be provided with water hammer arrester(s) to absorb high pressures resulting from the quick closing of these valves. Water hammer arrestors shall be approved mechanical devices in accordance with the applicable standard(s) referenced in in this code and shall be installed as close as possible to quick-acting valves.

S-14.4.5 Materials. Solar thermal system components in contact with heat-transfer mediums shall be approved for such use. Solar thermal system components, installed outdoors, shall be resistant to UV radiation.

S-14.4.6 Heat Transfer Medium. Solar thermal piping shall be identified with an orange background with black uppercase lettering, with the words "CAUTION: HEAT TRANSFER MEDIUM, DO NOT DRINK." Each solar thermal system shall be identified to designate the medium being conveyed. The minimum size of the letters and length of the color field shall comply with Table S-14.4.5.

Each outlet on the solar thermal piping system shall be posted with black uppercase lettering as follows:

"CAUTION: HEAT TRANSFER MEDIUM, DO NOT DRINK."

Table S-14.4.5
Minimum Length of Color Field and Size of Letters

Outside Diameter of Pipe or Covering (inches)	Minimum Length of Color Field (inches)	Minimum Size of Letters (inches)
1/2 to 1 1/4	8	1/2
1 1/2 to 2	8	3/4
2 1/2 to 6	12	1 1/4
8 to 10	24	2 1/2
Over 10	32	3 1/2

For SI units: 1 inch = 25.4 mm

S-15 SPECIFIC REQUIREMENTS

S-15.1 Electrical.

S-15.1.1 Wiring. Electrical connections, wiring, and devices shall be installed in accordance with the electrical code. Electrical equipment, appliances, and devices installed in areas that contain flammable vapors or dusts shall be of a type approved for such environment.

S-15.1.2 Controls. Required electrical, mechanical, safety, and operating controls shall be listed or labeled by a listing agency. Electrical controls shall be of such design and construction as to be suitable for installation in the environment in which they are located.

S-15.2 Flow Directions. Solar thermal systems shall have flow directions indicated on system components and piping or shall have flow directions indicated on a diagrammatic representation of the system as installed, and permanently affixed to the system hardware in a readily visible location.

S-15.3 Attic Installations. An attic space in which solar energy system components are installed shall comply with Section 508.4 of this code.

S-15.4 Connections to Drainage System Required. Receptors, drains, appurtenances, and appliances, used to receive or discharge liquid wastes, shall be connected to the drainage system of the building or premises in accordance with the requirements of this code.

S-15.5 Dry Storage Systems.

S-15.5.1 Waterproofing. The containment structure for dry thermal storage systems shall be constructed in an approved manner to prevent the infiltration of water or moisture.

S-15.5.2 Detecting Water Intrusion. The containment structure shall be capable of fully containing spillage or moisture accumulation that occurs. The structure shall have a means, such as a sight glass, to detect spillage or moisture accumulation, and shall be fitted with a drainage device to eliminate spillage.

S-15.5.3 Rock as Storage Material. Systems utilizing rock as the thermal storage material shall use clean, washed rock, and free of organic material.

S-15.5.4 Odor and Particulate Control. Thermal storage materials and containment structures, including an interior protective coating, shall not impart toxic elements, particulate matter, or odor to areas of human occupancy.

S-15.5.5 Combustibles Within Ducts or Plenums. Materials exposed within ducts or plenums shall be noncombustible or shall have a flame spread index not to exceed 25 and a smoke developed index not to exceed 50 where tested as a composite product in accordance with ASTM E 84 or UL 723.

S-16 SOLAR THERMAL SYSTEMS FOR SWIMMING POOL

S-16.1 Applicability. This chapter shall govern the installation and construction of solar thermal systems for swimming pools, spas, and hot tubs.

S-16.2 Water Chemistry. Where water from a swimming pool, spa or hot tub is heated by way of circulation through solar collectors, the chemistry of such water shall comply with the requirements of Section S-16.2.1, and shall be filtered in accordance with Section S-16.3 and Section S-16.3.1.

S-16.2.1 Parameters. Parameters for chemicals used within a swimming pool, spa, or hot tub shall be in accordance with Table S-16.2.1.

TABLE S-16.2.1
WATER CHEMISTRY

PARAMETER	ACCEPTABLE RANGE
Calcium hardness	200 – 400 parts per million (ppm)
Langelier Saturation Index	0 (+ or - 0.3 acceptable)
pH	7.2 – 7.8
TDS	< 1500 ppm
Total alkalinity	80 – 120 ppm

For SI Units: 1 part per million = 1 mg/L

S-16.3 Filter. A filter shall be provided to remove debris from the water entering the solar

loop.

Exception: A solar swimming pool, spa, or hot tub heating system with a heat exchanger.

S-16.3.1 Location. A filter shall be located upstream of a pump used to direct water to solar collectors.

S-16.4 Corrosion Resistant.

S-16.4.1.1 Copper. Glazed solar collectors made of copper shall not be used for solar pool, spa, or hot tub heating.

Exception: Where a heat exchanger is provided between the collector circuit and the swimming pool, spa, or hot tub water.

S 17 Certificate of Compliance

Upon completion of the solar system, the permittee shall sign a certificate of system installation compliance with this code.

The Certificate of Compliance shall also list the following information:

a) Type of freeze protection;

b) Mixing valve setting degrees Fahrenheit (º F);

c) Subsystem working pressure (if applicable) psi;

d) Subsystem test pressure (if applicable) psi;

e) Heat exchange make and model number (if applicable);

f) *Circulating pump over temperature protection shut-off setting degrees Fahrenheit (º F).

This certificate shall be posted in a conspicuous location at or near the water heater.

* Required only in one-tank systems where the water heater controls utilize fusible-link type over temperature protection.