Mechanical

Proposed Code Modifications

This document created by the Florida Department of Community Affairs - 850-487-1824

TAC: Mechanical

Sub Code: Building

Total Mods for Mechanical: 11

M3853

Date Submitted	3/24/2010	**Section**	916	**Proponent**	Steven Bassett
Chapter	9	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Approved as Modified
Commission Action Pending Review

Related Modifications

Summary of Modification

Changes to Carbon Monoxide Protection

Rationale

It is the work of the Carbon Monoxide work group to clairify the language.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Clairifies language to make it easier to enforce.

Impact to building and property owners relative to cost of compliance with code

Will reduce cost to owners

Impact to industry relative to the cost of compliance with code

Make it easier since it is more understandable

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

It will improve the health, safety and welfare of the public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

It will strengthen the code because it will be more understandable

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

It opens the code to more products.

Does not degrade the effectiveness of the code

It improves the effectiveness of the code by making it easier to enforce

~~Addition. An extension or increase in floor area, number of stories or height of a building or structure.~~

916 Carbon monoxide protection

916.1 Carbon monoxide protection. Every separate building or an addition to an existing building for which a permit for new construction is issued and having a fossil-fuel-burning heater or appliance, a fireplace, ~~or~~ an attached garage, or other feature, fixture, or element that emits carbon monoxide as a byproduct of combustion shall have an operational carbon monoxide alarm installed within 10 feet of each room used for sleeping purposes in the new building or addition, or at such other locations as required by this Code..

916.1.1 Carbon monoxide alarm ~~Power Source.~~ ~~In new construction, alarms shall breceive their primary power from the building wiring when such wiring is served from the local power utility. Such alarms shall have battery back up.~~ The requirements of Section 916.1 shall be satisfied by providing for one of the following alarm installation:

(1) A hard-wired carbon monoxide alarm.

(2) A battery-powered carbon monoxide alarm.

(3) A hard-wired combination carbon monoxide and smoke alarm.

(4) A battery-powered combination carbon monoxide and smoke alarm.

916.1.2 Combination alarms. Combination smoke/carbon monoxide alarms shall be listed and ~~or~~ labeled by a Nationally Recognized Testing Laboratory.

Exceptions:

(1) An approved operational carbon monoxide detector shall be installed inside or directly outside of each room or area within a hospital, inpatient hospice facility or nursing home facility licensed by the Agency for Health Care Administration, or a new state correctional institution where a fossil-fuel burning heater, engine, or appliance is located. The carbon monoxide detector shall be connected to the fire-alarm system of the hospital, inpatient hospice facility, or nursing home facility as a supervisory signal.

(2) This section shall not apply to existing buildings that are undergoing alterations or repair unless the alteration is an addition as defined in Section 916.1.3.

916.1.3 Addition shall mean an extension or increase in floor area, number of stories or height of a building or structure.

2nd Comment Period 09/03/2010 - 10/18/2010

M3853-G2

Proponent	Thomas Allen	Submitted	10/18/2010	Attachments	No

Comment:

Support Mod 3853 Carbon Monoxide Detectors as Modified (the Electrical TAC modified the proposal and the Fire TAC and Mechanical TAC agreed on one modification, the BOAF representatives at the TAC meetings helped craft the modification)

1st Comment Period History 04/15/2010 - 06/01/2010

M3853-G1

Proponent	Jack Glenn	Submitted	6/1/2010	Attachments	No

Comment:

This change may conflict with the provisions of HB-663 if signed by the Governor.

916.1 Carbon monoxide protection. Every separate building or an addition to an existing building ~~for which a permit for new construction is issued~~ having a fossil-fuel-burning heater or appliance, a fireplace or an attached garage, or other feature, fixture, or element that emits carbon monoxide as a product as a byproduct of combustion shall have an operational carbon monoxide alarm installed within 10 feet (3048 mm) of each room used for sleeping purposes in the new building or addition, or at such other location as required by the Florida Building Code. The requirements for this subsection may be satisfied with a battery-powered carbon monoxide alarm or a battery-powered carbon monoxide and smoke alarm. This subsection does not apply to existing buildings that are undergoing alterations or repairs unless the alteration is an addition as defined in Section 202 Defination.

Addition. An extension or increase in floor area, number of stories or height of a building or structure.

916 Carbon monoxide protection

916.1 Carbon monoxide protection. Every separate building or an addition to an existing building for which a permit for new construction is issued and having a fossil-fuel-burning heater or appliance, a fireplace, ~~or~~ an attached garage, or other feature, fixture, or element that emits carbon monoxide as a byproduct of combustion shall have an operational carbon monoxide alarm installed within 10 feet of each room used for sleeping purposes in the new building or addition, or at such other locations as required by this Code..

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(2) This section shall not apply to existing buildings that are undergoing alterations or repair unless the alteration is an addition as defined in this Code.

Sub Code: Mechanical

M4036

Date Submitted	4/1/2010	**Section**	Referenced Standards	**Proponent**	Amanda Hickman
Chapter	15	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Approved as Modified
Commission Action Pending Review

Related Modifications

Add AMCA Standard 550 to Sections 401.5 & 501.2.2 - Mods 4035 & 4037

Summary of Modification

Add AMCA 550 to Referenced Standards

Rationale

see attached

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Approval of this modification will have no financial impact to local code enforcement authority.

Impact to building and property owners relative to cost of compliance with code

Approval of this modification will have no financial impact to local code enforcement authority.

Impact to industry relative to the cost of compliance with code

Industries that manufacture louvers will be affected by this modification because they will be required to test to the new standard for wind driven rain.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes. It improves the durability and weather resistance of the building envelope during high-wind/rain events.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes. It facilitates consistency in product performance and capability by requiring testing to a standard that was specifically developed for louvers and specific to the geographic and climatic conditions of Florida.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No.

Does not degrade the effectiveness of the code

It improves the effectiveness and usefulness of the code because the code did not reference a standard that addressed protecting the ventilation openings against wind-driven rain.

ANSI/AMCA 550-089 Test Method for High Velocity Wind Driven Rain Resistant Louvers

Alternate Language

2nd Comment Period 09/03/2010 - 10/18/2010

M4036-A1

Proponent Amanda Hickman **Submitted** 10/18/2010 **Attachments** Yes

Rationale

I neglected to include the organizations' information when adding the standard to chapter 15.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

na

Impact to building and property owners relative to cost of compliance with code

na

Impact to industry relative to the cost of compliance with code

na

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

na

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

na

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

na

Does not degrade the effectiveness of the code

na

AMCA 550-08 Test Method for High Velocity Wind Driven Rain Resistant Louvers

Please add the following text to Chapter 15:

AMCA - Air Movement and Control Association International, Inc.
30 West University Drive
Arlington Heights, IL 60004

AMCA Standard 550-08

Test Method for High Velocity Wind Driven Rain Resistant Louvers

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

The International Authority on Air System Components

AMCA Standard 550-08

Test Method for High Velocity Wind Driven Rain Resistant Louvers

Air Movement and Control Association International, Inc.
30 W. University Drive
Arlington Heights, Illinois
60004

AMCA Standards

Authority

AMCA Standard 550 was approved by the AMCA Membership on July 26, 2008.

Copyright

Objections

Air Movement and Control Association International, Inc. will consider and decide all written complaints regarding its standards, certification programs, or interpretations thereof. For information on procedures for submitting and handling complaints, write to:

Air Movement and Control Association International
30 West University Drive
Arlington Heights, IL 60004-1893 U.S.A.

AMCA International, Incorporated
c/o Federation of Environmental Trade Associations
2 Waltham Court, Milley Lane, Hare Hatch
Reading, Berkshire, United Kingdom
RG10 9TH

Disclaimer

AMCA uses its best efforts to produce standards for the benefit of the industry and the public in light of available information and accepted industry practices. However, AMCA does not guarantee, certify or assure the safety or performance of any products, components or systems tested, designed, installed or operated in accordance with AMCA standards or that any tests conducted under its standards will be non-hazardous or free from risk.

Related Publications

ANSI/AMCA Standard 500-L	*Laboratory Methods of Testing Louvers for Rating*
AMCA Publication 501	*Application Manual for Louvers*
AMCA Publication 511	*Certified Ratings Program - Product Rating Manual for Air Control Devices*
AMCA Publication 512	*AMCA Listing Label Program*
ANSI/AMCA Standard 540	*Test Method for Louvers Impacted by Wind Borne Debris*

Review Committee

Mike Watz	**Greenheck Fan Corporation**
Mike Astourian	Ruskin Company
Dane Carey	United Enertech
Randal Geedey	The Airolite Company
Eric Gohring	Louvers and Dampers, Inc.
Loren Rasmusson	Industrial Louvers, Inc.
Bob Van Becelaere	Ruskin Company
Bill Vincent	Construction Specialties, Inc.
Tim Orris	AMCA International

Contents

AMCA 550-08
Test Method for High Velocity Wind Driven Rain Resistant Louvers

1. Purpose

This standard establishes uniform laboratory test methods and minimum performance ratings for water rejection capabilities of louvers intended to be used in high velocity wind conditions.

2. Scope

Tests conducted in accordance with the requirements of this standard are intended to demonstrate the acceptability of the louver for installation in facilities (essential and non-essential) that will remain in operation during a high velocity wind condition and where water infiltration must be kept to manageable amounts.

3. Units of Measurement

3.1 System of units

SI units (The International System of Units, Le Systéme International d'Unités) [1] are the primary units employed in this standard, with I-P units (Inch-Pound) given as the secondary reference. SI units are based on the fundamental values of the International Bureau of Weights and Measures [1], and I-P values are based on the values of the National Institute of Standards and Technology which are, in turn, based on the values of the International Bureau.

3.2 Basic units

The unit of length is the meter (m) or millimeter (mm); I-P units are the foot (ft.) or the inch (in.). The unit of mass is the kilogram (kg); the I-P unit is the poundmass (lbm). The unit of time is either the minute (min) or the second (s). The unit of temperature is either the degree Celsius (°C) or kelvin (K). I-P units are either the degree Fahrenheit (°F) or the degree Rankine (°R). The unit of force is the newton (N); the I-P unit is the pound (lb).

3.3 Airflow rate and velocity

3.3.1 Airflow rate

The unit of volumetric airflow rate is the cubic meter per second (m^3/s); the I-P unit is the cubic foot per minute (cfm).

3.3.2 Airflow velocity

The unit of airflow velocity is the meter per second (m/s); the I-P unit is the foot per minute (fpm).

3.4 Water flow rate

The unit of liquid volume is the liter (L); the I-P unit is the gallon (gal). The unit of liquid flow rate is the liter per second (L/s); the I-P unit is the gallon per minute (gpm).

3.5 Dimensionless groups

Various dimensionless quantities appear in the text. Any consistent system of units may be employed to evaluate these quantities, unless a numerical factor is included, in which case, units must be as specified.

3.6 Physical constants

The value of standard gravitational acceleration shall be taken as 9.80665 m/s^2 (32.174 ft/s^2) at mean sea level at 45° latitude [2]. The density of distilled water at saturation pressure shall be taken as 998.278 kg/m^3 (62.3205 lbm/ft^3) at 20 °C (68°F) [3]. The density of mercury at saturation pressure shall be taken at 13595.1 kg/m^3 (848.714 lbm/ft^3) at 0 °C (32°F) [3]. The specific weights in kg/m^3 (lbm/ft^3) of these fluids under standard gravity in a vacuum are numerically equal to their densities at corresponding temperatures.

4. Definitions

4.1 Louver

A louver is a device comprised of multiple blades, which, when mounted in an opening, permits the flow of air, but inhibits the entrance of other elements.

4.2 Essential facilities

Buildings and other structures designated as essential facilities, including, but not limited to, hospitals; other health care facilities having emergency treatment facilities; jails and detention facilities; fire, rescue and police stations, and emergency vehicle garages; designated emergency shelters; communication centers and other facilities required for emergency response; power generating stations; other public utility facilities required in an emergency; and buildings and other structures having critical national defense functions.

4.3 Non-essential facilities

All buildings and structures not defined as essential facilities in Section 4.2.

4.4 Performance variables

4.4.1 Water infiltration
The amount of water passing through a louver during the test.

4.4.2 Rain fall simulation
As calculated in Section 7.2.3 and Section 7.2.5.

4.4.3 Wind stream velocity
The movement rate of air generated during the test.

5. Test Specimen

One 1220 mm x 1220 mm (48 in. x 48 in.) louver shall be submitted for this high velocity wind driven rain test. The same louver, or an identical louver, shall be tested in accordance with the Wind Driven Rain Test detailed in ANSI/AMCA Standard 500-L, run at 22 m/s (50 mph) and 202.4 mm/hr (8 in./hr) of rainfall.

All devices tested shall be products as built, unpainted, clean, degreased, and without additional factory applied coating on the product's surfaces which would enhance water shedding capability. All devices tested shall be in the full open position without a screen across the air passages of the louver.

6. Apparatus

6.1 Test frame

6.1.1
The test frame shall be constructed of CMU blocks with a minimum size of 2.45 m x 2.45 m (8 ft x 8 ft) and a hole as shown in Figure 1 to allow the insertion of the louver.

A catch basin shall be constructed behind the louver, as shown in Figure 1, to catch the water that penetrates the louver.

6.1.2
The test frame shall be painted to prevent water from penetrating the test apparatus.

6.1.3
The test frame shall be rigidly supported during the test period.

6.2 Wind generator

6.2.1
The wind generator shall provide a constant wind profile over the entire face of the louver for the specified time period to a maximum wind stream velocity of 49 m/s (110 mph).

6.2.2
If the wind generator is unable to provide the required constant profile as determined by wind stream calibration (Section 7.1), air flow from the wind generator shall be directed and smoothed by suitably shaped baffles (see Figure 2).

6.3 Water supply

6.3.1
Water shall be supplied to the wind stream using a sprinkle pipe system mounted on a movable frame capable of simulating a uniform 223.5 mm/hr (8.8 in./hr) of rainfall over the test specimen. The simulated rainfall and flow meters shall be calibrated, and the water distribution shall be checked as noted in Section 7.2.

6.4 Instruments

Calibrations of instruments used in this test shall be maintained in accordance with the manufacturer's definitions.

7. Calibration

7.1 Wind stream calibration

7.1.1
The wind stream velocity shall be measured on a vertical plane grid having dimensions of 2.44 m wide x 1.22 m high (8 ft wide x 4 ft high) and grid dimensions of 610 mm x 610 mm (24 in. x 24 in.), located 610 mm (24 in.) in front of the test frame with the lower 2.44 m (8 ft) dimension in line with the bottom edge of the test frame opening (See Figure 3).

7.1.2
The measured wind stream velocity within each grid square shall be within ± 10% of the required axial velocity for each wind speed.

7.1.3
Upon completion of the wind stream calibration, the distance from the test frame to the outlet of the wind generator and any necessary baffle configurations shall be noted and maintained while conducting the test as described in Section 8.

7.2 Rainfall simulation and flow meter calibration

A maximum of six months prior to conducting the test, the flow meter(s) shall be calibrated using the method described in Section 7.2.1 through Section 7.2.6.

7.2.1
Prepare an apparatus to capture any water which would enter the wind stream during an actual test.

7.2.2
Commence water insertion for a period of one (1) minute

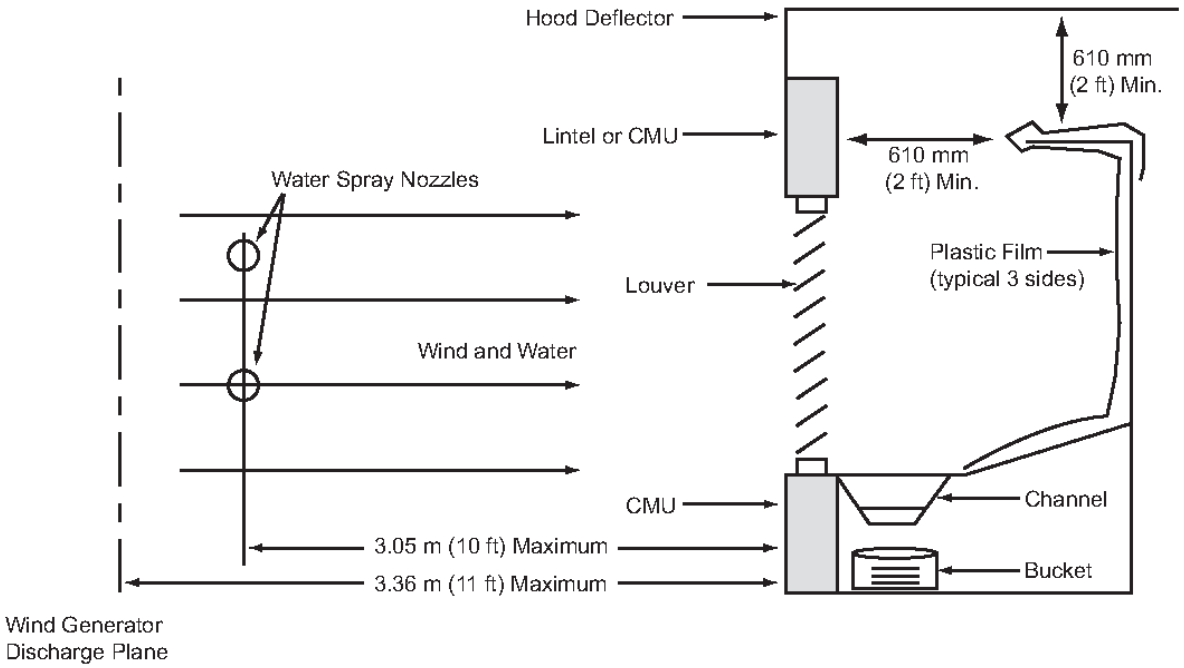


Figure 1 - High Velocity Wind Driven Rain Test Setup

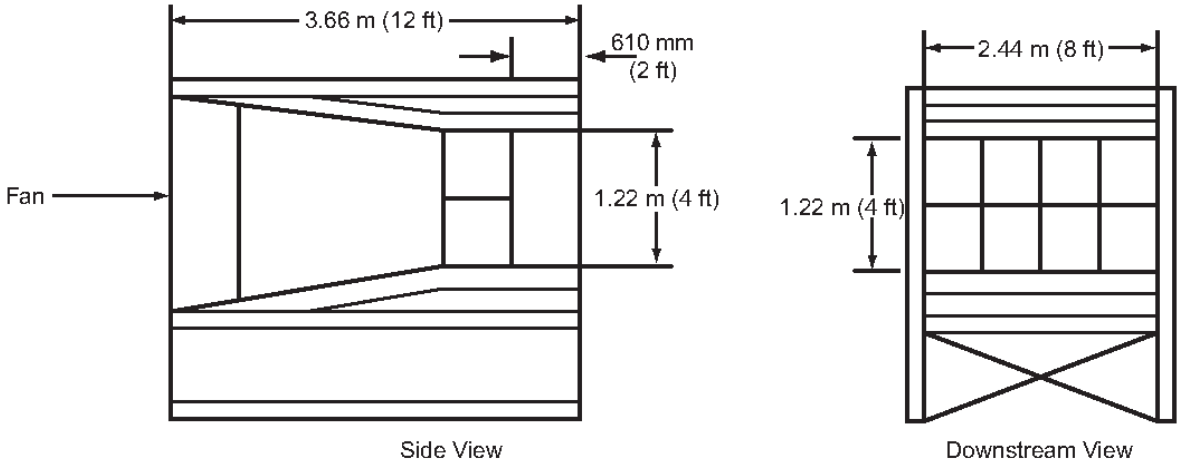


Figure 2 - Wind Tunnel with Baffles

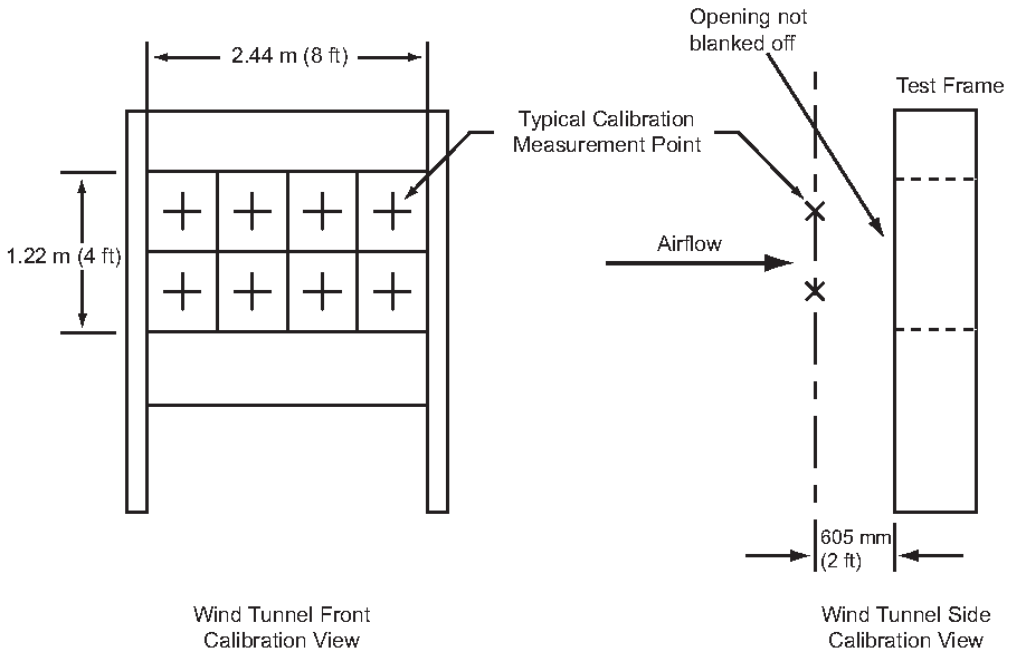


Figure 3 - Wind Stream Calibration Setup

and capture the water. Record the flow meter reading (gallons/min) during this process.

7.2.3
Convert the flow meter reading to rainfall simulation using the following formula:

$$\left[\frac{\left(\frac{\text{L}}{\text{min}}\right)\times\left(\frac{60\text{ min}}{1\text{ hour}}\right)\times\left(\frac{1{,}000{,}000\text{ mm}^3}{\text{L}}\right)}{4{,}459{,}346\text{ mm}^2}\right]=x\left(\frac{\text{mm}}{\text{hour}}\right)$$

Eqn 7.2.3 SI

$$\left[\frac{\left(\frac{\text{gallons}}{\text{min.}}\right)\times\left(\frac{60\text{ min.}}{1\text{ hour}}\right)\times\left(\frac{231\text{ in.}^3}{1\text{ gallon}}\right)}{6{,}912\text{ in.}^2}\right]=x\left(\frac{\text{in.}}{\text{hour}}\right)$$

Eqn 7.2.3 I-P

Note: For Equation 7.2.3 SI and Equation 7.2.3 I-P, 4,459,346 mm^2 and 6,912 $in.^2$ refer to the expected projection area of the water that hits the wall, respectively.

7.2.4
The quantity of rainfall simulation determined in Section 7.2.3 shall be within ± 5% of the desired rainfall simulation of 223.5 mm/hr (8.8 in./hr).

7.2.5
Measure the volume of water (mm^3 [$in.^3$]) captured and convert this to rainfall simulation (mm/hr [in./hr]) using the following formula:

$$\left[\frac{\left(\frac{\text{mm}^3}{4{,}459{,}346\text{ mm}^2}\right)}{1\text{ min}}\right]\times\left(\frac{60\text{ min}}{1\text{ hour}}\right)=y\left(\frac{\text{mm}}{\text{hour}}\right)$$

Eqn 7.2.5 SI

$$\left[\frac{\left(\frac{\text{in.}^3}{6{,}912\text{ in.}^2}\right)}{1\text{ min.}}\right]\times\left(\frac{60\text{ min.}}{1\text{ hour}}\right)=y\left(\frac{\text{in.}}{\text{hour}}\right)$$

Eqn 7.2.5 I-P

Note: For Equation 7.2.5 SI and Equation 7.2.5 I-P, 4,459,346 mm^2 and 6,912 $in.^2$ refer to the expected projection area of the water that hits the wall, respectively.

7.2.6
The rainfall simulation determined in Section 7.2.3 (*x*) shall be within ± 5% of the rainfall simulation determined in Section 7.2.5 (*y*).

7.3 Water distribution check

The water distribution check over the (1.22 m x 2.44 m [4 ft x 8 ft]) wall surface shall be checked and calibrated every six months using the method outlined herein. The water distribution system must be adjusted so that the water introduced into the wind stream strikes the wall area.

7.3.1
Prepare eight 610 mm (24 in.) squares of the absorptive material (i.e. roofing felt) and weigh each sample. From this data, determine the average weight of the samples. As an alternative, depending on the consistency of the weight of the absorptive material, each square used for calibration may be weighed individually.

7.3.2
Lay out the eight numbered squares of absorptive material (i.e. roofing felt) as shown in Figure 4. Put the hold-down frame over the squares of absorptive material.

7.3.3
Set the wind speed to 15.65 m/s (35 mph) and add water to the windstream at a constant rate, as indicated on the flow meter, until the absorptive material is well wetted, but not so that it is saturated, at which time, the wind and water flow shall be terminated.

7.3.4
Remove the hold-down frame from the wall and rapidly weigh the squares of wet absorptive material. Determine the weight of water absorbed by each square sample at the particular wind speed and flow meter setting.

7.3.5
No one particular square sample shall exhibit rain fall simulation, measured in weight, greater than or less than 25% of the average weight of all eight squares.

7.3.6
Repeat the steps in Sections 7.3.2, 7.3.3, 7.3.4, and 7.3.5 at a wind speed of 31.3 m/s (70 mph).

7.3.7
No one particular square sample shall exhibit rain fall simulation, measured in weight, greater than or less than 25% of the average weight of all eight squares.

8. Test Procedures

8.1
The louver to be tested shall be mounted and sealed as recommended by the manufacturer in the test frame to prevent any ingress of water other than through the louver blades.

Table 1 - Wind Stream Velocity and Water Spray Intervals for Wind-Driven Rain Resistance Testing

Interval #	Wind Speed m/s (mph)	Time (min)	Water Spray
1	15.65 (35)	15	On
2	0 (0)	5	Off
3	31.3 (70)	15	On
4	0 (0)	5	Off
5	40.2 (90)	15	On
6	0	5	Off
7	49.2 (110)	5	On
8	0	5	Off

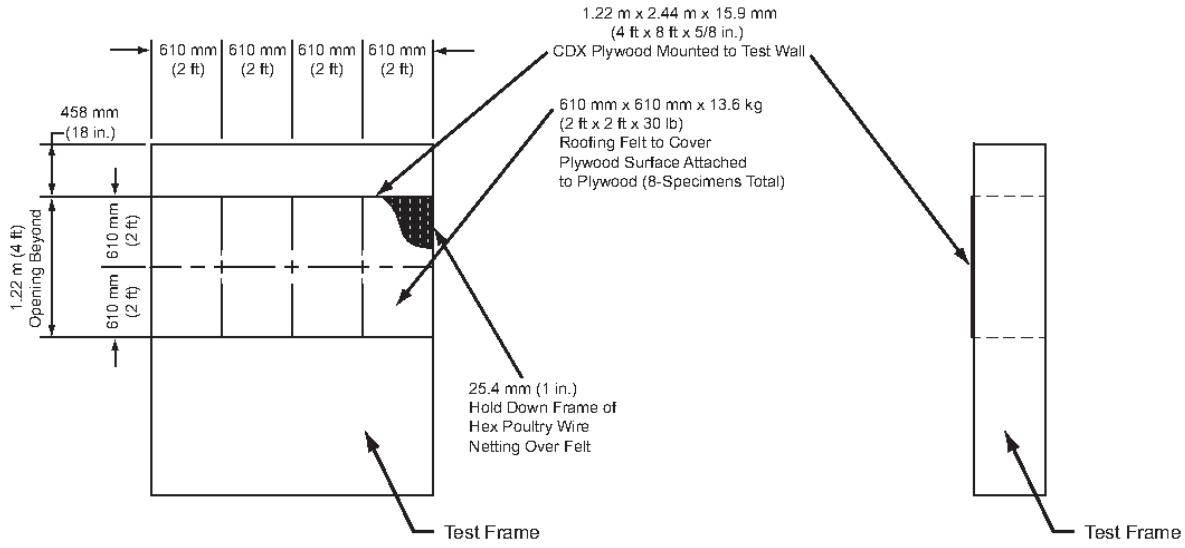


Figure 4 - Core Area and Rainfall Coverage

8.2
The wind stream velocity intervals shall be conducted as noted in Table 1.

8.3
Water shall be added to the wind stream upon commencement of the initial wind stream velocity in an even spray at a rate equal to 223.5 mm/hr (8.8 in./hr) of rainfall over the test specimen. The flow of water shall be measured with a calibrated flow meter during the test procedure to confirm water flow. Water flow shall be stopped and started in conjunction with the air flow intervals noted in Table 1.

8.4
The water penetrating the louver at each wind stream velocity shall be collected and measured.

9. Report and Results of Test

The test report shall be submitted in its entirety and shall include, at a minimum, the following:

1) The name, address, telephone number, and website address (optional) of the testing laboratory. Evidence of accreditation/certification to perform this test.

2) A unique identification number, with the identification number printed on each page.

3) Consecutive page numbers, with an indication of the total number of pages.

4) The date(s) when the test was performed and the date of the report.

5) The test standard number with the date of issue and an explanation detailing any derivation from the standard.

6) A signature, including titles, and date from both the Professional Engineer authorizing the test report and the lab technician.

7) A description of the louver, including:
   a) the model number
   b) any drawings and photographs of the louver
   c) a detailed report of the method of installation (including fasteners and caulk)

8) Test specimen construction documentation verifying the construction of the test sample.

9) Calibration data and calculations.

10) Detailed observations of any water infiltration and approximate times of water infiltration for each wind stream velocity tested. Observations should include the total volume of water which infiltrated the louver at each test speed.

11) The calculated percentage of water which infiltrated the louver based on the total amount of water sprayed at the test apparatus.

12) A determination of “pass” or “fail” based on whether or not the louver exhibits water infiltration in excess of 1% of the total water sprayed.

13) A video record of the test intervals (see Table 1), which must be made available upon request.

14) Photographs of the louver immediately prior to and subsequent to commencement and termination of the test.

Annex A
References (Informative)

[1] *The International System of Units (SI)*
Page, C. H. and Vigoureux, P.
National Bureau of Standards, NBS Special Publication 330, 1972.
(Now known as NIST.)

[2] ibid, p 19.

[3] *ASME Steam Tables*, p 283
American Society of Mechanical Engineers, 1967.

[4] *Checklist #0240 For The Approval of: Louvers (Includes Gable End Louvers)*
Miami-Dade County, Florida

[5] Florida Test Protocol TAS No. 100(A)-95
Test Procedure for Wind and Wind Driven Rain Resistance and /or Increased Windspeed Resistance of Soffit Ventilation Strip and Continuous or Intermittent Ventilation System Installed at the Ridge Area

[6] ANSI/AMCA Standard 500-L-07
Laboratory Methods of Testing Louvers for Rating

[7] ICC-ES AC85
Acceptance Criteria for Test Reports

[8] ICC-ES AC89
Accreditation Criteria for Testing Laboratories

Annex B
Reason for Two Louver Test Standards (Informative)

The requirement to test the louvers to two test criteria is based upon the need for the louver to perform at two conditions: during normal operation and during a hurricane.

A product could be designed for hurricane or high wind conditions but be unsuitable for normal day to day operation due to its high pressure drop and energy requirements.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.
30 West University Drive
Arlington Heights, IL 60004-1893 U.S.A.
Tel: (847) 394-0150 ▪ Fax: (847) 253-0088
E-Mail : info@amca.org ▪ Web: www.amca.org

The Air Movement and control Association International, Inc. is a not-for-profit international association of the world's manufacturers of related air system equipment primarily, but limited to: fans, louvers, dampers, air curtains, airflow measurement stations, acoustic attenuators, and other air system components for the industrial, commercial and residential markets.

Reason Statement for AMCA 550

The ICC Mechanical Technical Committee unanimously approved this exact code change last November at the ICC hearings in Baltimore. In fact, not a single person stood up to speak in opposition to this change. Additionally, no public comments were proposed to this code change in the ICC process, meaning that this change will be on the consent agenda at the ICC Final Action Hearing in May and will be included in the 2012 International Mechanical Code.

AMCA Standard 550-08 *Test Method for High Velocity Wind Driven Rain Resistant Louvers* standardizes uniform laboratory test methods and minimum performance ratings for water rejection capabilities of louvers intended to be used in high velocity wind conditions.

The tests conducted in accordance with the requirements of this standard are intended to demonstrate the acceptability of the louver for installation in facilities (essential and nonessential) that will remain in operation during a high velocity wind condition and where water infiltration must be kept to manageable amounts.

Sub Code: Mechanical

M3793

Date Submitted	3/23/2010	**Section**	1003.1	**Proponent**	J Glenn-BASF
Chapter	10	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Approved as Submitted
Commission Action Pending Review

Related Modifications

Summary of Modification

Retain base code (IMC) language.

Rationale

Base code provides the same level of protection.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Nnone

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

None

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

No change

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against anything.

Does not degrade the effectiveness of the code

Does not degrade the code.

2nd Comment Period 09/03/2010 - 10/18/2010

Proponent Kenneth Locke **Submitted** 9/24/2010 **Attachments** No

M3793-G1

Comment:

This is not a Florida specific issue. Language should be returned to base code (IMC) language.

~~**1003.1 General**. All pressure vessels shall bear the label of an approved agency and shall be installed in accordance with the manufacturer's installation instructions. Pressure vessels shall be designed and stamped per ASME Boiler and Pressure Vessel Code Section VIII Division 1, Division 2 or Division 3~~

1003.1 General. All pressure vessels shall be in accordance with the ASME Boiler and Pressure Vessel Code, shall bear the label of an approved agency and shall be installed in accordance with the manufacturer's installation instructions.

Sub Code: Building

M4391

Date Submitted	4/2/2010	**Section**	New appendix	**Proponent**	Doug Harvey
Chapter	2711	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation No Affirmative Recommendation with a Second
Commission Action Pending Review

Related Modifications

Add code reference to chapter 35 including the edition date.

Summary of Modification

Add a new Appendix “XX” (Designation to be assigned)

Rationale

Please see support document for rationale.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed change does not impact local enforcement, it merely provides an alternate path for design that adhere to the Florida Building Code

Impact to building and property owners relative to cost of compliance with code

No fiscal impact to the building owner is anticipated

Impact to industry relative to the cost of compliance with code

No fiscal impact to the industry is anticipated

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed change protects the health, safety and welfare by allowing the code compliant use of “green” ideas and technologies

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed change improves the code for design consistency

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed code change does not discriminate

Does not degrade the effectiveness of the code

This proposed change does not degrade the effectiveness of the code.

2nd Comment Period 09/03/2010 - 10/18/2010

M4391-G3

Proponent Arlene Stewart **Submitted** 10/18/2010 **Attachments** No

Comment:

TAC action should be reconsidered. Reason for disapproval was that the code was not yet final. However, the IGCC is available at http://www.iccsafe.org/cs/IGCC/Pages/default.aspx?r=IGCC. It is listed as the public version and not listed as a draft.

2nd Comment Period 09/03/2010 - 10/18/2010

M4391-G4

Proponent Thomas Allen **Submitted** 10/18/2010 **Attachments** No

Comment:

Support: IGCC to be included in the Florida Building Code in an appendix.
An appendix is adopted locally
This would provide an easily adopted green code that is designed to work with the building code

1st Comment Period History 04/15/2010 - 06/01/2010

M4391-G1

Proponent	Doug Harvey	Submitted	6/1/2010	Attachments	No

Comment:

BOAF has suggested the International Green Construction Code (IGCC) be included as an adoptable appendix. While many ideas for “green” and green construction are present in the marketplace today, no other document has been through the process the IgCC has. This document has been compared to the base codes for Building, Mechanical, Plumbing, Fuel Gas and Energy. The code has been scrutinized so as to prevent conflicts between building code requirements and green/sustainable requirements. The IgCC has been evaluated and endorsed by the USGBC and ASHRAE as well through the national consensus process. Many areas are in the process of trying to adopt “green” standards for their communities. This will provide a method for jurisdictions looking to mandate greener and more sustainable requirements. In addition, this document was created in conjunction with ASHRAE, ICC and others, including public meetings, to ensure compatibility with many of the existing requirements in existence today and with a forward looking approach. While this is a relatively new document, inclusion as an adoptable appendix will offer an option that will help with code compliance, not code violation or putting different standards at odds with each other.

1st Comment Period History 04/15/2010 - 06/01/2010

M4391-G2

Proponent	Jack Glenn	Submitted	6/1/2010	Attachments	No

Comment:

The new appendix is based on a proposed standard that is not yet approved.

APPENDIX 'XX' (Designation to be assigned)

International Green Construction Code (IGCC)

The provisions in this appendix are not mandatory unless specifically referenced in the adopting ordinance

SECTION (XX) 101

GENERAL

(XX) 101.1 Scope. The provisions of this appendix are applicable to all occupancies covered by the International Green Construction Code (IGCC).

(XX) 101.2 Intent. The intent of this appendix is to provide direction for communities having a desire to preserve natural resources, especially water, and lessen the impact of construction on the built environment. Adoption of this standard is to safeguard the environment, public health, safety and general welfare through the establishment of requirements to reduce the negative potential impacts and increase the potential positive impacts of the built environment and building occupants, by means of minimum requirements to: conservation of natural resources, materials and energy; the employment of renewable energy technologies, indoor and outdoor air quality; and building operations and maintenance.

(XX) 101.3 Requirements. The design of buildings shall be in accordance with the International Green Construction Code (IGCC).

Add the Following to Chapter 35 – references:

ICC

International Code Council, Inc.

500 New Jersey Avenue, NW

6th Floor

Washington, DC 20001

Standard Referenced: IGCC

Title: **International Green Construction Code (IGCC)**

Reference in code section number: Appendix L

Date Submitted	April 2, 2010
Mod Number	
Code Version	2010
Code Change Cycle	2010 Triennial Original Modifications 03/01/2010/-/04/02/2010
Sub-code	Building
Chapter Topic	Appendix, International Green Construction Code
Section	Appendix
Related Modification	Add code reference to chapter 35 including the edition date.
Affects HVHZ	No
Summary of modification	Add a new Appendix "XX" (Designation to be assigned)
Text of Modification	APPENDIX 'XX' (Designation to be assigned) International Green Construction Code (IGCC) The provisions in this appendix are not mandatory unless specifically referenced in the adopting ordinance SECTION (XX) 101 GENERAL (XX) 101.1 Scope. The provisions of this appendix are applicable to all occupancies covered by the International Green Construction Code (IGCC). (XX) 101.2 Intent. The intent of this appendix is to provide direction for communities having a desire to preserve natural resources, especially water, and lessen the impact of construction on the built environment. Adoption of this standard is to safeguard the environment, public health, safety and general welfare through the establishment of requirements to reduce the negative potential impacts and increase the potential positive impacts of the built environment and building occupants, by means of minimum requirements to: conservation of natural resources, materials and energy; the employment of renewable energy technologies, indoor and outdoor air quality; and building operations and maintenance. (XX) 101.3 Requirements. The design of buildings shall be in accordance with the International Green Construction Code (IGCC). Add the Following to Chapter 35 – references: ICC International Code Council, Inc.

	500 New Jersey Avenue, NW 6th Floor Washington, DC 20001 Standard Referenced: IGCC Title: International Green Construction Code (IGCC) Reference in code section number: Appendix L
Rational	1. The purpose of this proposed change is to add a new optional appendix to the FBC. 2. The proposed appendix will reference the International Green Construction Code (IGCC). This newly-developed, consensus-based standard may be used in conjunction with local code requirements specific to green buildings covered in the scope. 3. Green buildings are currently being designed and constructed nationwide using different programs guidelines, rating systems, and standards. The IGCC was developed under the direction of ICC, in conjunction with representatives from other nationally-recognized organizations with experience and expertise in this field, including ASHRAE members. In many cases, limited guidance is given as to the criteria to be used to determine if the building project meets the expectations. The IGCC provides a path using a publicly-reviewed resource for local jurisdictions to adopt and use in the administration of green residential building design.
Fiscal Impact statement	
Impact to Local Enforcement	This proposed change does not impact local enforcement, it merely provides an alternate path for design that adhere to the Florida Building Code
Impact to Building owner	No fiscal impact to the building owner is anticipated
Impact to Industry	No fiscal impact to the industry is anticipated
Requirements	
Has connection to health safety and Welfare	This proposed change protects the health, safety and welfare by allowing the code compliant use of “green” ideas and technologies
Strengths or improves Code	This proposed change improves the code for design consistency
Does not discriminate	This proposed change does not discriminate
Does not degrade effectiveness of code	This proposed change does not degrade the effectiveness of the code.

Sub Code: Mechanical

M3791

Date Submitted	3/23/2010	**Section**	606.4	**Proponent**	J Glenn-BASF
Chapter	6	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation with a Second
Commission Action Pending Review

Related Modifications

Summary of Modification

Retain base code (IMC) language

Rationale

Base code provides more clarity and the same or better level of protection

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

None

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

No change

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against anything.

Does not degrade the effectiveness of the code

Does not degrade the code.

2nd Comment Period 09/03/2010 - 10/18/2010

M3791-G1

Proponent	Kenneth Locke	**Submitted**	9/24/2010	**Attachments**	No

Comment:

Any changes to this section from the base code (IMC) are not Florida specific changes. To be consistent with the FBC directive to limit Florida modifications to only those items dealing with Energy, Wind or Legislative mandates, this item should be returned to the base code language as written in the IMC.

606.4 Controls operation. Upon activation, the smoke detectors shall shut down ~~all operational capabilities of~~ the air distribution system ~~in accordance with the listing and labeling of appliances used in the system.~~ Air distribution systems that are part of a smoke control system shall switch to the smoke control mode upon activation of a detector.

-

606.4 Controls operation. Upon activation, the smoke detectors shall shut down all operational capabilities of the air distribution system in accordance with the listing and labeling of appliances used in the system. Air distribution systems that are part of a smoke control system shall switch to the smoke control mode upon activation of a detector.

Date Submitted	3/18/2010	**Section**	1006.6	**Proponent**	Ben Bentley
Chapter	10	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation with a Second

Commission Action Pending Review

Related Modifications

3603, 3647, 3648

Summary of Modification

Add exception to this section of code for a solar system that can have multiple PRV's. Discharging a 1/2" relief valve device in the solar loop into thie T&P tank discharge should be acceptable.

Rationale

Maximum discharge flow through all the discharge piping can not be more than the maximum discharge of the largest relief device discharge size. Section M2301.2.8 requirment is the only reason a pressure relief device must be installed in the collector loop. If this relief device opens only a cup of water is discharged. Therefore, discharging a 1/2" relief device in the solar loop into the T&P tank discharge meets all discharge requirments.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None, easily recognized.

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Meets all requirments like the discharge from a T&P valve.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Provides equivalent products at a lower cost to the consumer.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No

Does not degrade the effectiveness of the code

No

2nd Comment Period 09/03/2010 - 10/18/2010

M3649-G1

Proponent Ben Bentley **Submitted** 10/8/2010 **Attachments** No

Comment:

Same water discharge whether one or both are open. PRV is redundant so no safety issue. No damage will be caused to any material, this should be a non issue.

2nd Comment Period 09/03/2010 - 10/18/2010

M3649-G2

Proponent Wayne Wallace **Submitted** 10/14/2010 **Attachments** No

Comment:

1) I agree with this Mod, such a small amount of water will discharge from the PRV that it means nothing about safety and damage to materials.
2) We have worked with inspectors for years over this, most get it, some do not. Please change code to clarify.
3) Mod is correct – No issues with safety, health or damage to materials.

1006.6 Safety and relief valve discharge. 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. High-pressure-steam safety valves shall be vented to the outside of the structure. Where a low-pressure safety valve or a relief valve discharges to the drainage system, the installation shall conform to the Florida Building Code, Plumbing.

Exception: direct solar water heating system relief valve(s) may discharge directly on the roof.

M3600

Date Submitted	3/18/2010	**Section**	1402.2	**Proponent**	Ben Bentley
Chapter	14	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation with a Second
Commission Action Pending Review

Related Modifications

Summary of Modification

Water heaters and/or solar storage tank-water heater combinations are considered to be solar equipment. An execption should be made for the solar water heater since no one expects it to be raised 6 feet off the finished floor.

Rationale

It is not reasonable to expect a water heater to be raised 6 feet above the finished floor.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

I see no impact to the local building department as it would be business as usual.

Impact to building and property owners relative to cost of compliance with code

Nothing that they don't already have with a standard water heater.

Impact to industry relative to the cost of compliance with code

Allows industry to go about business as usual without being conserned about elevating tanks that can weigh over 800 pounds.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The impact is no different than a standard water heater.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Helps the code to sound reasonable without trying to impose restrictions on solar only tanks.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No, it does not discriminate and allows solar water heaters to be installed like standard water heaters.

Does not degrade the effectiveness of the code

No, improves it by making it sound reasonable.

2nd Comment Period 09/03/2010 - 10/18/2010

M3600-G1

Proponent Ben Bentley **Submitted** 10/8/2010 **Attachments** No

Comment:

Regarding Mod#3600 voted down by the TAC stating “Should apply to all components of the system.”

Comment: You have to be kidding, change it or go to plumbing code and require all water heaters to be raised 6’ off the floor in that condition. 304.7 of the ’09 International Mechanical Code concerning lifting water heaters 6’ off the floor has been reserved/dismissed by the FL code; therefore, it should be reserved/dismissed under the FL solar code section, also. Reason to change is to promote code consistency.

2nd Comment Period 09/03/2010 - 10/18/2010

M3600-G2

Proponent Wayne Wallace **Submitted** 10/14/2010 **Attachments** No

Comment:

1) I agree with the proposed modification. I’ve been in business 26 years and have never been required to raise a tank 6’ off the floor.
2) I agree with the proposed modification. My company always places the plumbing on top of the tank to prevent incidental damage.
3) I agree with the proposed modification. I’ve been in business for 26 years and have never seen a heater installed 6’-0” off the floor in Florida.

1402.2 Protection of equipment. Solar equipment exposed to vehicular traffic shall be installed not less than 6 feet (1829 mm) above the finished floor.

Exception: This section shall not apply to the water heater or where other equipment is protected from motor vehicle impact. ~~where the equipment is protected from motor vehicle impact~~.

M3391

Date Submitted	1/7/2010	**Section**	1402.5.1	**Proponent**	Ben Bentley
Chapter	14	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation No Affirmative Recommendation with a Second
Commission Action Pending Review

Related Modifications

3389

Summary of Modification

FSEC clearly shows a PRV only for the solar loop in manuals and approved systems. FSEC is correct. Code needs to show T&P for tank and PRV for solar loop.

Rationale

FSEC (The Florida Solar Energy Center) clearly states that a PRV (pressure relief valve) not a P&T (pressure and temperature relief valve) can be installed to protect the component parts in an isolated solar loop. See attachment for further details.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

I see no impact to the local building departments. Local building departments are requiring P&T valves because they believe that the P&T is a stricter code requirement.

Impact to building and property owners relative to cost of compliance with code

Negative impact - none. Positive impact - the property owner will not be required to pay for service calls, labor and materials that would have otherwise been necessary if a P&T, rather that a PRV, had been installed due to premature valve failure.

Impact to industry relative to the cost of compliance with code

No impact to the solar industry since they have been installing PRV's on the solar loop for the past 20 years.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No trucks traveling to do service calls - saftey. No 140 degree water spilling off roof when it should be going back into the tank. No dripping of water off roof due to temperature portion of valve. No roof stains, no replacement parts.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Product is more than equivalent in all ways, provides a more service free system.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No, a PRV instead of a P&T .

Does not degrade the effectiveness of the code

No, it improves the efficiency and durablility of the solar system.

2nd Comment Period 09/03/2010 - 10/18/2010

M3391-G1

Proponent Ben Bentley **Submitted** 10/8/2010 **Attachments** No

Comment:

This same TAC committee just accepted and approved DCA10-DEC034 by Ben Bentley saying that it is allowed. Since the above is allowed, the code needs to reflect the same. This simply clarifies the code and makes it more understandable to building officials and contractors alike.

2nd Comment Period 09/03/2010 - 10/18/2010

M3391-G2

Proponent Ben Bentley **Submitted** 10/8/2010 **Attachments** No

Comment:

Note: This simple misunderstanding has resulted in “red tags” which has cost contractors tens of thousands of dollars. And it just promotes ill will between building departments and the solar trade. What is a no-brainer to the solar trade can be a huge issue to the building department which may be pulling information from another part of the code, thinking that this other part of the code is the dominant/ruling factor.

M3391-G3

Proponent	Wayne Wallace	Submitted	10/14/2010	Attachments	No

Comment:

1) I agree with the code change request. As a solar (SME) subject matter expert in solar, this question comes up often. FSEC, per DCA10-DEC-034 determined that using a T&P valve on the roof adversely affects the performance of the system and does not present a life safety risk.
2) I agree with the request to change the code. Having installed hundreds of systems with T&P's on the roof, hundreds of systems with PRV's only, on the roof, my experience dictates that, PRV's be installed – no service calls – no safety issues.
3) Please change the code. My local building department requires the T&P be installed, even after my manufacturers visit to try to explain why, only to be rejected. Please change the code to allow PRV, not T&P installation. There is no safety or health risk.

1402.5 Equipment. The solar energy system shall be equipped in accordance with the requirements of Sections 1402.5.1 through 1402.5.4.

1402.5.1 Pressure and temperature. Solar energy system components containing pressurized fluids shall be protected against pressures and temperatures exceeding design limitations with a pressure and/or temperature 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 valved off or otherwise isolated from a relief device. Relief valves shall comply with the requirements of Section 1006.4 and discharge in accordance with Section 1006.6.

Solar Codes
M2301.2.3 (P&T Relief)
1402.5.1
Direct Pumped Systems Fig. #1, Fig. #2
Indirect Pumped Systems Fig. #3, Fig. #4
FSEC Manuals

-M2301.2.3 Pressure and Temperature Relief
System components containing fluids shall be protected with pressure and temperature-relief valves. Relief devices shall be installed in sections of the system so that a section of a system cannot be valved off or isolated from a relief device.
Comments: Sentence #1 – Very poor wording (system components could be a pump or an air vent). The second sentence makes no sense and is probably an oversight or misprint. The statement found on pages 3-18 (FSEC Solar Manual) makes more sense "By code, a pressure relief valve is required in any portion of the system that can be isolated that contains a pressure producing fixture." So, I would suggest M2301.2.3 – 1) Pressure and Temperature Relief – Pressure Relief Protection
1. Pressure and temperature relief – A pressure and temperature relief device must/shall be installed on the solar storage tank/water heater combination because over temperature or over pressurization could pose a safety concern.
2. Pressure relief protection – pressure relief protection is required in any portion of the system that can be isolated that contains a pressure producing fixture (solar collector). Pressure relief protection within the solar loop for direct potable water systems can be installed on the roof, near the collectors, discharge port pointed down directly to roof, no more than 1'-0" off roof without discharge connection since relief will only discharge a cup of water since water loop is isolated. Indirect relief discharge shall be discharged ……. or into a suitable container.
Comments: 1) Pressure relief valves
2) FSEC's "Solar Thermal Manual" manuals state the proper usages of relief only verses P&T valves. See 2-23 & 24 and 3-18 (copies attached).
3) Note that the collector valves, installed properly, are rated above the temp setting of a P&V valve.
4) 13-612.1.ABC.3.4 Solar Water Heating Systems
Suggestion: Change the wording or make building officials aware of sentence, Collectors in installed solar water heating systems (add the word, generally) should meet the following criteria:
1.-
2.-
There are viable exceptions-
Good topic for CE.
5) 1402.5.1 a.) Pressure and temperature – my first note is that .1, .2, .3 and .4 are referring to indirect systems, but it never says such.

b.) temp/pressure, temp & pressure wording needs
to be straightened out. This section comes closer
to stating what M2301.2.3 should express.
Chapter 23: Solar Systems (2004 FBC, Residential, Commentary)
1) M2301.2.3 – P&T relief – suggest total wording revision and total wording revision on commentary – comment – pipes do not burst due to temp – plastic pipes melt, flat plates do not normally heat to 200 degrees on a freezing winter day. The entire explanation is worded poorly. Ex: A working solar flat plate system will generally cease to produce energy at about 170 degrees in the summer even with extended non usage (vacation). On a freezing winter day, 130 degree tank temperature from the sun is considered good.
Chapter 23: Direct Pumped Systems
Figure 1 – picture of direct system
Suggestion – Since that picture came from FSEC, the drawing, not the yellow wording, is correct. Notice that the tank P/T and the collector PRV. Note – pictures in Figure 2-6 on the following pages show exactly the same thing.
Alternative materials and methods application – how do we proceed? When one looks at the above information, there should be a strong and convincing argument that a roof PRV is superior in safety and durability. Why? Safety – valve opening will occur 20 times less. All other properly installed components are designed to take temperatures in excess of the P&T. PRV is most stringent in cost. FSEC's manuals always show and verbalize PRV's only within the collector loop. Temperature never pops the valve when the system is isolated, it is always pressure. CE video (7 hours) indicates this. The relaxed gel in the probe causes premature openings and coupled with spring tension weakening the roof valve, if P&T, will open at below 150 degrees, causing daily spillage on roof. PRV is the only way to go.

FLORIDA SOLAR ENERGY CENTER®

Creating Energy Independence

Resources - Solar Thermal Manual

This is the manual to be used in the State of Florida's Solar Contractor Test

Design and Installation & Repair and Maintenance

The intent of this manual is to equip the reader with the knowledge and skills needed to design, install, operate and maintain the most common types of solar water heating systems.

The manual presents an overview of solar thermal applications, provides basic information on the principles of solar energy, reviews solar thermal technologies, and provides detailed instruction on the safe, efficient installation of solar water heating and pool heating systems. The manual is divided into six sections, with each separated into individual modules.

The manual is broken down into various sections. For ease of downloading, these sections are provided below in PDF format. Go to Adobe© Acrobat© Reader™ to obtain a free version of the Reader™ that will enable you to open PDF files. These are large files, so be patient during the download.

Section 1: Solar Concepts provides an introduction, table of contents, and a basic understanding of solar thermal concepts.

Section 2: Solar Water Heating Systems focuses on what are commonly called solar domestic hot water systems, which heat water.

Section 3: System Installation covers the steps involved in installing a solar water heating system.

Section 4: Troubleshooting presents structured methods to follow in diagnosing and correcting solar water heating system problems.

Section 5: Solar Swimming Pool Heating Systems is devoted to solar systems that provide heat for swimming pools.

The Appendix includes the following

- Crome Dome Collector Siting Aid
- FSEC Simplified Sizing Procedures for Solar Domestic Hot Water Systems
- Electric Water Heater Circuitry
- Volt-Ohmmeter (VOM) or Multimeter Operation
- Solar System Flow Rates
- Tools for Service and Repair

Sec #2

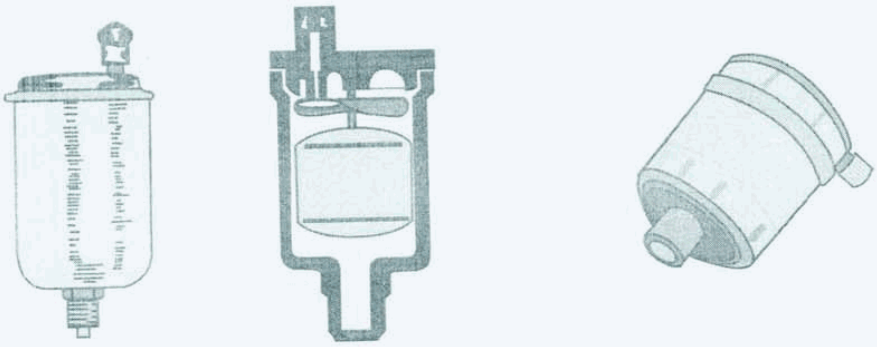


Figure 25 Air vent

TEMPERATURE-PRESSURE RELIEF VALVE

A temperature-pressure relief valve is also called a pressure-temperature relief valve or P&T valve or T&P valve. These names are used interchangeably in the industry. This valve (Figure 26) protects system components from excessive pressures and temperatures. A pressure-temperature relief valve is always plumbed to the solar storage (as well as auxiliary) tank. In thermosiphon and ICS systems, where the solar tanks are located on a roof, these tanks may also be equipped with a temperature-pressure relief valve since they are in some jurisdictions considered storage vessels. These valves are usually set by the manufacturer at 150 psi and 210° F. Since temperature pressure relief valves open at temperatures below typical collector loop operating conditions, they are not commonly installed in collector loops. (See pressure relief valves below.) Temperature-pressure relief valves located inside a building must drain to the outside. If uncertain, follow local code requirements.

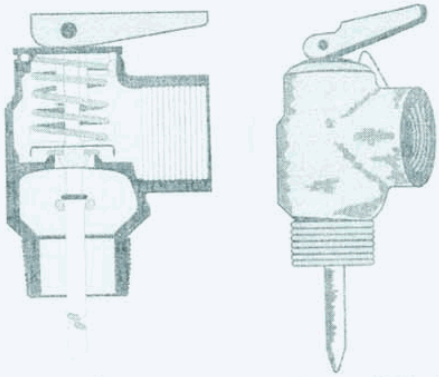


Figure 26 Pressure-temperature relief valve

SEC #2

PRESSURE RELIEF VALVE

A pressure relief valve (Figure 27) protects components from excessive pressures that may build up in system plumbing. In any system where the collector loop can be isolated from the storage tank, a pressure relief valve must be installed on the collector loop. The pressure rating of the valve (typically 125 psi) must be lower than the pressure rating of all other system components, which it is installed to protect.

The pressure relief valve is usually installed at the collector. Because it opens only with high pressure, it operates less frequently than does a temperature-pressure relief valve. For this reason, it offers a higher degree of reliability and is the valve of choice for protecting the solar collector. Indirect systems typically use pressure-relief valves with even lower psi settings. Pressure relief valves located inside a building should be piped to discharge to a safe location.

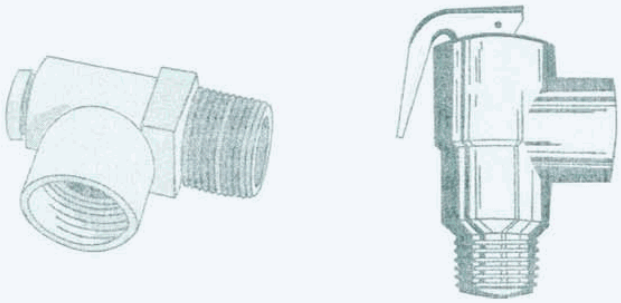


Figure 27 Pressure relief valve

PRESSURE GAUGE

A pressure gauge (Figure 28) is used in indirect systems to monitor pressure within the fluid loop. In both direct and indirect systems, such gauges can readily indicate if a leak has occurred in the system plumbing.

Figure 28 Pressure gauge

If multiple collector arrays are used, an air vent should be installed on each array. The system must be piped to prevent air traps and allow for gravity draining (Figure 24).

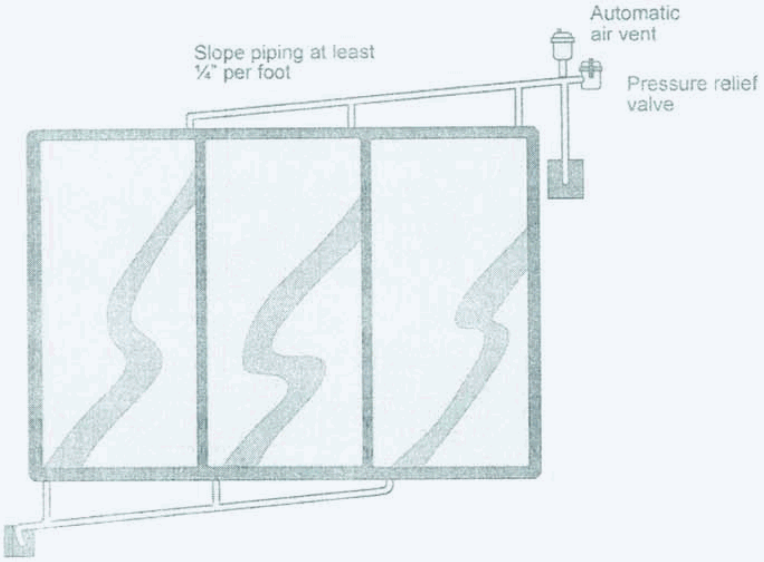


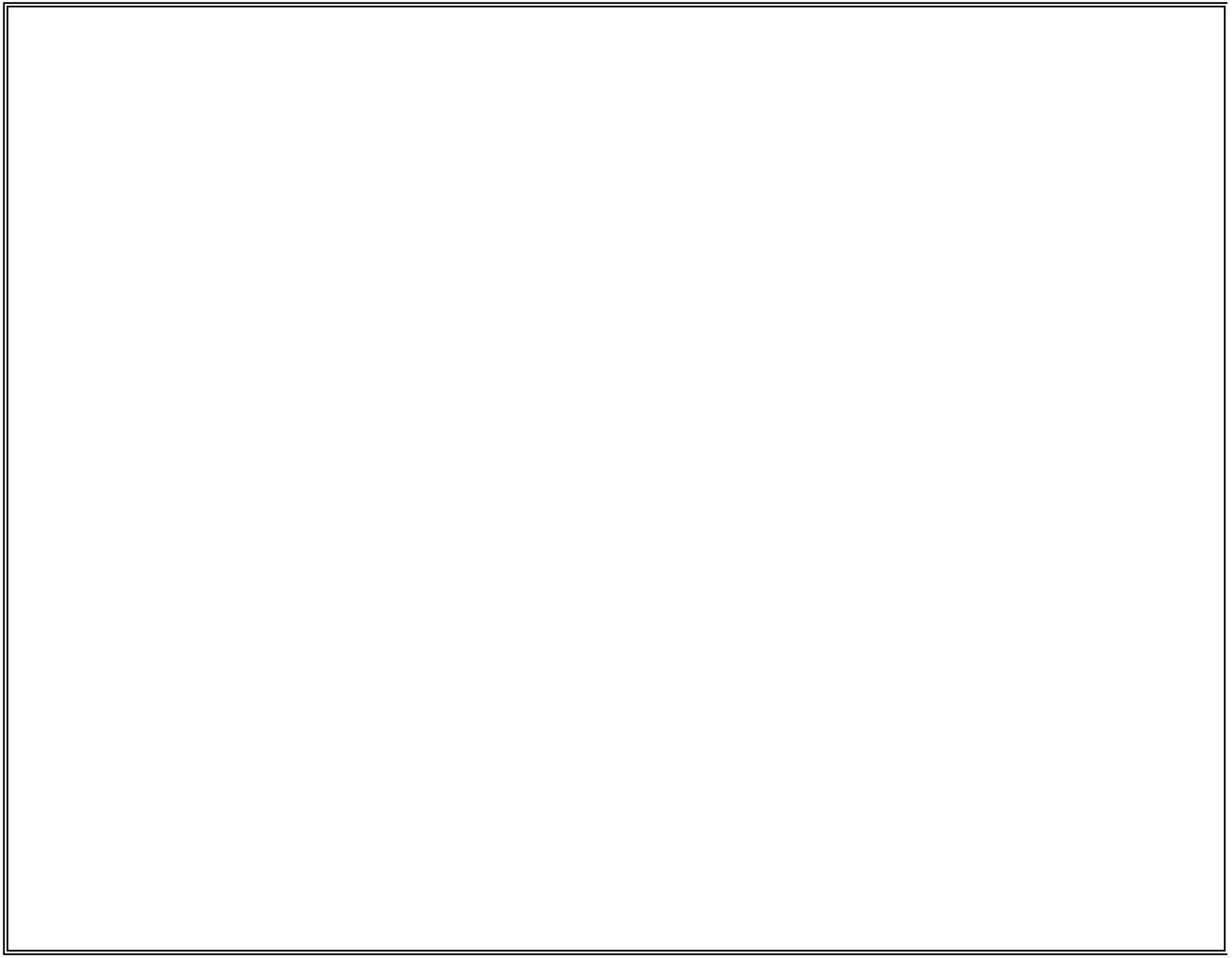
Figure 24 Piped and vented collector array

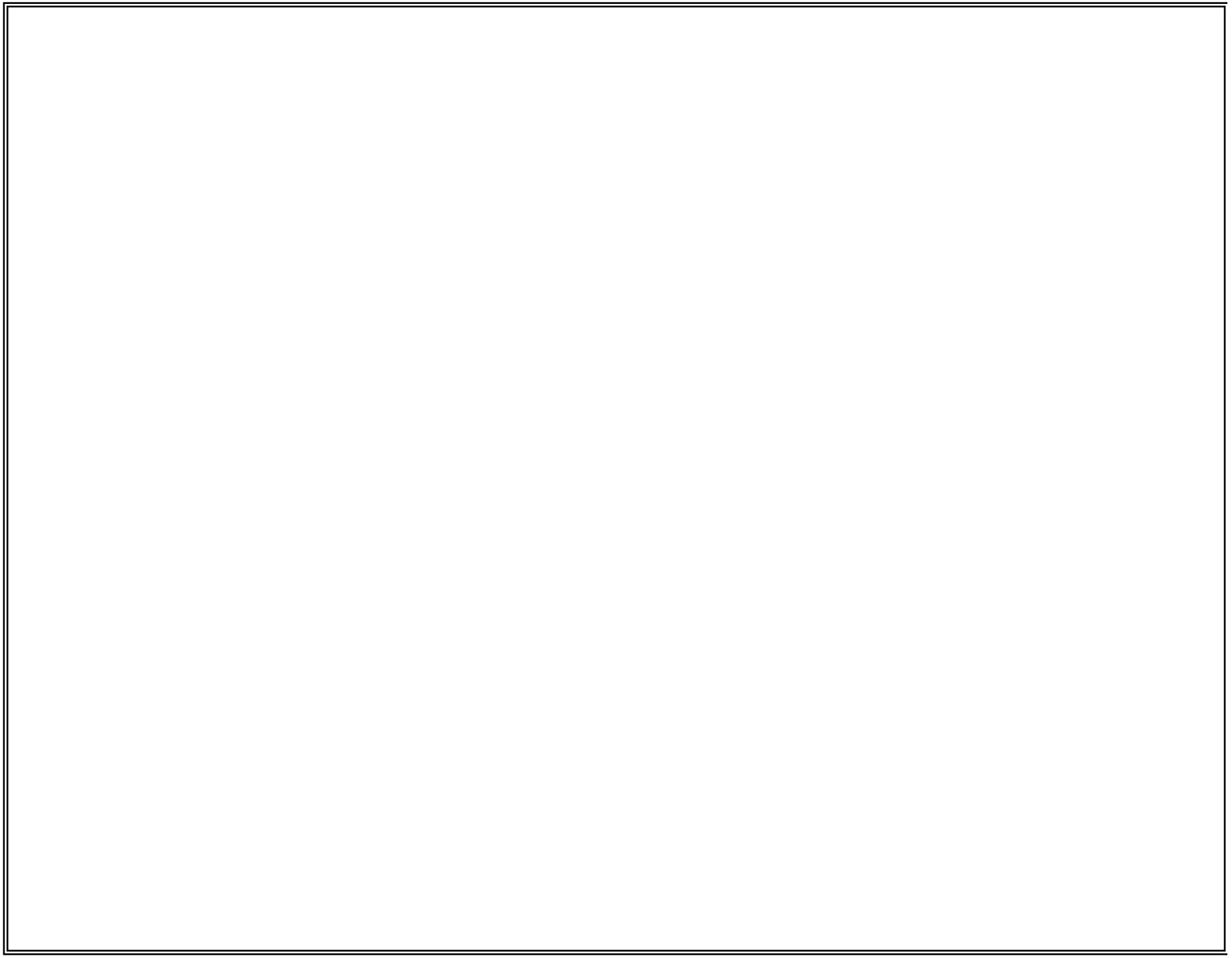
By code, a pressure relief valve is required in any portion of the system that can be isolated that contains a pressure producing fixture. For example, a circulating pump might have isolation valves so it can be removed for maintenance, but it is not considered a pressure producing fixture from the standpoint of the risk of bursting the system, so you don't need a pressure relief valve on this part of the system. However, the collector, or tanks with heater elements (connected or not), and even tankless water heaters are pressure producing fixtures, so if any can be isolated, there must be a pressure relief valve somewhere in that portion of the isolated loop that contain them. Most solar water heaters have the pressure relief valve for the collector loop installed at the collector. Special care should be taken to ensure the hot overflow from this valve does not come into contact with people or pets; some codes specify how this should be accomplished. The discharge pipe must be large enough to safely handle the overflow volume from indirect antifreeze systems, which usually operate at low pressure. Special low-pressure relief valves are often used on these systems.

Piping Collector Arrays

Cover all roof piping with insulation. Protect the insulation from degradation through exposure to ultra violet (UV) light by completely covering it with UV-resistant paint, or metallic or vinyl tape. Painted insulation will need to be repainted periodically, as the paint will deteriorate over time.

FSEC (The Florida Solar Energy Center) clearly states that a PRV (pressure relief valve) not a P&T (pressure and temperature relief valve) can be installed to protect the component parts in an isolated solar loop. See highlighted sections below on pages 3-18 (FSEC Solar Manual) makes more sense "By code, a pressure relief valve is required in any portion of the system that can be isolated that contains a pressure producing fixture." Local building departments are demanding that a P&T valve be installed. This requirement forces local contractors to install a device not recommended nor APPROVED by FSEC or the manufacturer of the system. See attached FSEC system approval sheet with isometric drawing indicating a pressure relief valve "ONLY" installed in the solar loop, (see component legend, item number 10, PRV, highlighted in yellow). The proposed code change above will allow the contractor to install per FSEC and manufacturers recommendations. FSEC is correct in that a PRV only should be installed in the loop. Installing a PRV meets all safety and durability requirements of the code and eliminates servicing the system which would be required if a P&T, not a PRV is installed in the solar loop.





FLORIDA SOLAR ENERGY CENTER

1679 Clearlake Road, Cocoa, FL 32922-5703 (321) 638-1000

Approved Solar Energy System

FSEC S1175 Sep-94

Revised Mar-10

DISTRIBUTOR	SYSTEM
Solar Hydronics Corp. 1423 Gunn Highway Odessa, FL 33556	0-80-40

The system listed below was evaluated by the Florida Solar Energy Center (FSEC) in accordance with the Florida Standards Program for Solar Domestic Water and Pool Heating Systems (FSEC-GP-80-7) and was found to meet the minimum standards established by FSEC.

Description

/ - designates various model suffixes

Collector	Model		Units	Total Rating
	1. Amer. Energy Tech.	AE-40	1	34,400 Btu
	2. Amer. Energy Tech.	MSC-40	1	33,900 Btu
	3. Solar Hydronics Corp.	SHC-40	1	34,400 Btu
	4. Amer. Energy Tech.	AE-21	2	35,200 Btu
	5. Amer. Energy Tech.	MSC-21	2	34,800 Btu
	6. Solar Hydronics Corp.	SHC-21	2	35,200 Btu

Tank	Model		Capacity
☑ Direct	1. American	SE-62/112-80H-045S	80 gal.
☐ Int. Heat Exch.			

Pump	Model		Power Draw	Rated Power
	1.Taco	003-BC4	51.75 WATTS	1/40 H.P.
	2. Solar Hydronics Corp.	003-BC4	51.75 WATTS	1/40 H.P.
	3. Solar Hydronics Corp.	003-VTBC4 Pump/cntrl	51.75 WATTS	1/40 H.P.

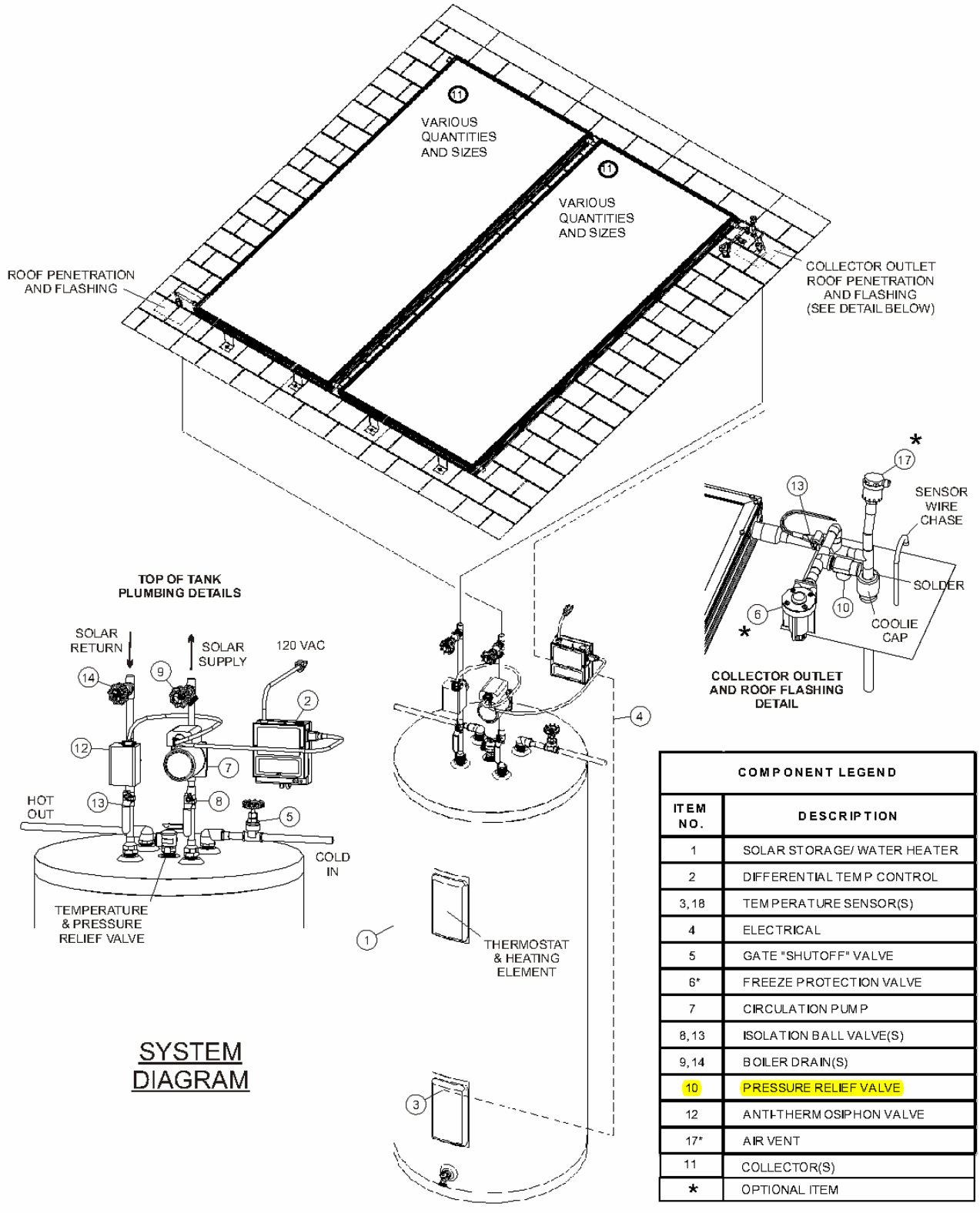
Controller	Model	
☑ Differential Temperature	1.Independent Energy	CM-30/C-30/GL-30LC0
☐ Absolute Temperature	2. Solar Hyrdronics Corp.	SHC-30-LC0
☐ Thermosiphon	3. Stecca	TRO-301-1-B-00
☐ Other _____	4. IMC	SOLR-2ELC-10
	5. Resol	DeltaSol BS/1

Freeze Protection by: manual drain, freeze protection valve, and/or automatic recirculation.

Other	
Major Components in addition to above.	1. Eaton FP-45 Freeze Protection Valve* (optional)
	2. Motorized Check Valve: Honeywell

If further information is required you may contact the Florida Solar Energy Center at the above address.

SOLAR WATER HEATING SYSTEM (AC)



SYSTEM DIAGRAM

COMPONENT LEGEND	
ITEM NO.	DESCRIPTION
1	SOLAR STORAGE/ WATER HEATER
2	DIFFERENTIAL TEMP CONTROL
3, 18	TEMPERATURE SENSOR(S)
4	ELECTRICAL
5	GATE "SHUTOFF" VALVE
6*	FREEZE PROTECTION VALVE
7	CIRCULATION PUMP
8, 13	ISOLATION BALL VALVE(S)
9, 14	BOILER DRAIN(S)
10	PRESSURE RELIEF VALVE
12	ANTI-THERMOSIPHON VALVE
17*	AIR VENT
11	COLLECTOR(S)
*	OPTIONAL ITEM

Collector Mounting

If multiple collector arrays are used, an air vent should be installed on each array. The system must be piped to prevent air traps and allow for gravity draining (Figure 24).

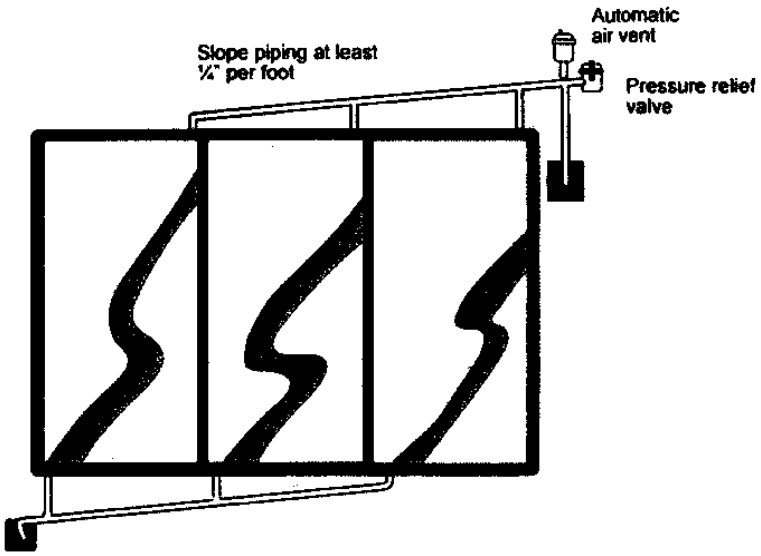


Figure 24 Piped and vented collector array

By code, a pressure relief valve is required in any portion of the system that can be isolated that contains a pressure producing fixture. For example, a circulating pump might have isolation valves so it can be removed for maintenance, but it is not considered a pressure producing fixture from the standpoint of the risk of bursting the system, so you don't need a pressure relief valve on this part of the system. However, the collector, or tanks with heater elements (connected or not), and even tankless water heaters are pressure producing fixtures, so if any can be isolated, there must be a pressure relief valve somewhere in that portion of the isolated loop that contain them. Most solar water heaters have the pressure relief valve for the collector loop installed at the collector. Special care should be taken to ensure the hot overflow from this valve does not come into contact with people or pets; some codes specify how this should be accomplished. The discharge pipe must be large enough to safely handle the overflow volume from indirect antifreeze systems, which usually operate at low pressure. Special low-pressure relief valves are often used on these systems.

Piping Collector Arrays

Cover all roof piping with insulation. Protect the insulation from degradation through exposure to ultra violet (UV) light by completely covering it with UV-resistant paint, or metallic or vinyl tape. Painted insulation will need to be repainted periodically, as the paint will deteriorate over time.

M3601

Date Submitted	3/18/2010	**Section**	1402.5.4	**Proponent**	Ben Bentley
Chapter	14	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation with a Second
Commission Action Pending Review

Related Modifications

Summary of Modification

For clarity to distinguish between potable and non potable liquid single phase solar energy systems.

Rationale

Where no mistake will be made, by interpertation, to put a direct potable water solar water heating system in the same category as a liquid single phase (non potable indirect) solar energy system.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None, it only clarifies and reduces confussion as to type of system.

Impact to building and property owners relative to cost of compliance with code

None, just for clarification of people who are trying to interpret the code.

Impact to industry relative to the cost of compliance with code

None, just clarity.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The is none, clarity purposes only.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strenghtens and improves the code by seperating the requirments for direct verses indirect solar systems.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

None

Does not degrade the effectiveness of the code

No, it strengthens the understanding of the code by seperation of different types of solar thermal systems.

2nd Comment Period 09/03/2010 - 10/18/2010

M3601-G1

Proponent Ben Bentley **Submitted** 10/8/2010 **Attachments** No

Comment:

Regarding Mod#3601 voted down by the TAC stating “Not FL specific.”

Comment: What does “not FL specific” mean? It is if systems are installed in FL, non potable systems, that is, and these non potable systems are installed everyday in FL. Unless this is clarified many building departments will read this as a requirement for all solar systems, and it clearly is not.

2nd Comment Period 09/03/2010 - 10/18/2010

M3601-G2

Proponent Wayne Wallace **Submitted** 10/14/2010 **Attachments** No

Comment:

1) The code needs to be changed because building department inspectors will read 1402.5.4, visit jobsites where no expansion tank is installed and ask questions like – is this a liquid system? Is it single-phase? The answer is yes. Is it a solar system? Again, yes. Therefore, he requires an expansion tank. Clearly, the plumbing code addresses this issue where it states that the condition (over temperature and pressurization) must be provided for where an expansion tank is only one of the, at least, three methods that are used daily in the field.
2) I agree with the code modification. Truthfully, building inspectors have trouble with understanding the differences between direct (potable) and indirect (non potable) solar. Leaving 1402.5.4 as is will only cause confusion in the future.
3) Mod is ok with me, it clarifies the difference where expansion tanks are required, (indirect systems) and where they may be used under certain conditions, (direct systems).

1402.5.4 Expansion tanks. Non potable liquid single-phase solar energy systems shall be equipped with expansion tanks sized in accordance with Section 1009.

Sub Code: Residential

M3602

Date Submitted	3/18/2010	**Section**	2301.2.9	**Proponent**	Ben Bentley
Chapter	23	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation with a Second
Commission Action Pending Review

Related Modifications

3389

Summary of Modification

If mod 3389 is accepted then the last sentence of this code 2301.2.9 needs to be changed.

Rationale

The rationale is to keep different sections of the code refering to the same item identical.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

None other than proposed by mod 3389.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes, it makes the different sections of the code say exactly the same thing.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No.

Does not degrade the effectiveness of the code

No.

2nd Comment Period 09/03/2010 - 10/18/2010

M3602-G1

Proponent	Ben Bentley	**Submitted**	10/8/2010	**Attachments**	No

Comment:

Regarding Mod#3602 voted down by the TAC stating “Weakens code.”

Comment: No, it does not weaken the code, our DCA for this was approved.

2nd Comment Period 09/03/2010 - 10/18/2010

M3602-G2

Proponent	Wayne Wallace	**Submitted**	10/14/2010	**Attachments**	No

Comment:

1) I agree with the code change request. As a solar (SME) subject matter expert in solar, this question comes up often. FSEC, per DCA10-DEC-034 determined that using a T&P valve on the roof adversely affects the performance of the system and does not present a life safety risk.
2) I agree with the request to change the code. Having installed hundreds of systems with T&P’s on the roof, hundreds of systems with PRV’s only, on the roof, my experience dictates that, PRV’s be installed – no service calls – no safety issues.
3) Please change the code. My local building department requires the T&P be installed, even after my manufacturers visit to try to explain why, only to be rejected. Please change the code to allow PRV, not T&P installation. There is no safety or health risk.

M2301.2.9 Maximum temperature limitation. Systems shall be equipped with means to limit the maximum water temperature of the system fluid entering or exchanging heat with any pressurized vessel inside the dwelling to 180°F (82°C). This protection is in addition to the required temperature- and/or pressure-relief valves required by Section M2301.2.3.

M3389

Date Submitted	3/18/2010	**Section**	M2301.2.3	**Proponent**	Ben Bentley
Chapter	23	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation No Affirmative Recommendation with a Second
Commission Action Pending Review

Related Modifications

3391

Summary of Modification

Solar P&T valve vs PRV only valve- local bldg depts are interpreting M2301.2.3 to mean a t&p valve only. FSEC clearly shows a PRV only for the solar loop. FSEC is correct. Code needs to show t&p for tank and PRV for solar loop.

Rationale

FSEC clearly states that a PRV (pressure relief valve) not a P&T can be installed to protect the component parts in an isolated solar loop. See attachment for furtuer details FSEC system approval #S1175 clearly shows a PRV, not T&P, is installed in the solar loop. See attachment for furtuer details

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

I see no impact to the local building departments. Local building departments are requiring P&T valves because they believe that the P&T is a strickter code requirement.

Impact to building and property owners relative to cost of compliance with code

Negative impact-none. Positive impact-the property owner will not be required to pay for service calls, labor or materials that would have otherwise been necessary if a T&P, rather than a PRV had been installed. T&P valve installation causes premature failure.

Impact to industry relative to the cost of compliance with code

No impact to the solar industry since they have been installing PRV's on the solar loop for the past 20 years.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No trucks traveling to do service calls - saftey. No 140 degree water spilling off roof when it should be going back into the tank. No dripping of water off roof due to temperature portion of valve. No roof stains, no replacement parts.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Product is more than equivalent in all ways, provides a more service free system.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

NO, a PRV instead of a P&T.

Does not degrade the effectiveness of the code

No, it improves the efficiency and durablility of the system.

2nd Comment Period 09/03/2010 - 10/18/2010

M3389-G1

Proponent Ben Bentley **Submitted** 10/8/2010 **Attachments** No

Comment:

Regarding Mod#3389 voted down by the TAC stating “Weakens the code.”

Comment: No it does not weaken the code. We have an approved Declaratory Statement approved that states such. Change code.

2nd Comment Period 09/03/2010 - 10/18/2010

M3389-G2

Proponent Wayne Wallace **Submitted** 10/14/2010 **Attachments** No

Comment:

1) I agree with the code change request. As a solar (SME) subject matter expert in solar, this question comes up often. FSEC, per DCA10-DEC-034 determined that using a T&P valve on the roof adversely affects the performance of the system and does not present a life safety risk.

2) I agree with the request to change the code. Having installed hundreds of systems with T&P’s on the roof, hundreds of systems with PRV’s only, on the roof, my experience dictates that, PRV’s be installed – no service calls – no safety issues.

3) Please change the code. My local building department requires the T&P be installed, even after my manufacturers visit to try to explain why, only to be rejected. Please change the code to allow PRV, not T&P installation. There is no safety or health risk.

SECTION M2301 SOLAR ENERGY SYSTEMS

M2301.2.3 Pressure and temperature relief. Solar energy system ~~System~~ components containing fluids shall be protected against pressures and temperatures exceeding design limitations with a pressure and/or temperature relief valve.~~with pressure- and temperature-relief valves~~. 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 valved off or otherwise isolated from a relief device.~~Relief devices shall be installed in sections of the system so that a section cannot be valved off or isolated from a relief device.~~

Solar Codes
M2301.2.3 (P&T Relief)
1402.5.1
Direct Pumped Systems Fig. #1, Fig. #2
Indirect Pumped Systems Fig. #3, Fig. #4
FSEC Manuals

-M2301.2.3 Pressure and Temperature Relief
System components containing fluids shall be protected with pressure and temperature-relief valves. Relief devices shall be installed in sections of the system so that a section of a system cannot be valved off or isolated from a relief device.
Comments: Sentence #1 – Very poor wording (system components could be a pump or an air vent). The second sentence makes no sense and is probably an oversight or misprint. The statement found on pages 3-18 (FSEC Solar Manual) makes more sense "By code, a pressure relief valve is required in any portion of the system that can be isolated that contains a pressure producing fixture." So, I would suggest M2301.2.3 – 1) Pressure and Temperature Relief – Pressure Relief Protection
1. Pressure and temperature relief – A pressure and temperature relief device must/shall be installed on the solar storage tank/water heater combination because over temperature or over pressurization could pose a safety concern.
2. Pressure relief protection – pressure relief protection is required in any portion of the system that can be isolated that contains a pressure producing fixture (solar collector). Pressure relief protection within the solar loop for direct potable water systems can be installed on the roof, near the collectors, discharge port pointed down directly to roof, no more than 1'-0" off roof without discharge connection since relief will only discharge a cup of water since water loop is isolated. Indirect relief discharge shall be discharged ……. or into a suitable container.
Comments: 1) Pressure relief valves
2) FSEC's "Solar Thermal Manual" manuals state the proper usages of relief only verses P&T valves. See 2-23 & 24 and 3-18 (copies attached).
3) Note that the collector valves, installed properly, are rated above the temp setting of a P&V valve.
4) 13-612.1.ABC.3.4 Solar Water Heating Systems
Suggestion: Change the wording or make building officials aware of sentence, Collectors in installed solar water heating systems (add the word, generally) should meet the following criteria:
1.-
2.-
There are viable exceptions-
Good topic for CE.
5) 1402.5.1 a.) Pressure and temperature – my first note is that .1, .2, .3 and .4 are referring to indirect systems, but it never says such.

b.) temp/pressure, temp & pressure wording needs
to be straightened out. This section comes closer
to stating what M2301.2.3 should express.
Chapter 23: Solar Systems (2004 FBC, Residential, Commentary)
1) M2301.2.3 – P&T relief – suggest total wording revision and total wording revision on commentary – comment – pipes do not burst due to temp – plastic pipes melt, flat plates do not normally heat to 200 degrees on a freezing winter day. The entire explanation is worded poorly. Ex: A working solar flat plate system will generally cease to produce energy at about 170 degrees in the summer even with extended non usage (vacation). On a freezing winter day, 130 degree tank temperature from the sun is considered good.
Chapter 23: Direct Pumped Systems
Figure 1 – picture of direct system
Suggestion – Since that picture came from FSEC, the drawing, not the yellow wording, is correct. Notice that the tank P/T and the collector PRV. Note – pictures in Figure 2-6 on the following pages show exactly the same thing.
Alternative materials and methods application – how do we proceed? When one looks at the above information, there should be a strong and convincing argument that a roof PRV is superior in safety and durability. Why? Safety – valve opening will occur 20 times less. All other properly installed components are designed to take temperatures in excess of the P&T. PRV is most stringent in cost. FSEC's manuals always show and verbalize PRV's only within the collector loop. Temperature never pops the valve when the system is isolated, it is always pressure. CE video (7 hours) indicates this. The relaxed gel in the probe causes premature openings and coupled with spring tension weakening the roof valve, if P&T, will open at below 150 degrees, causing daily spillage on roof. PRV is the only way to go.

FLORIDA SOLAR ENERGY CENTER®
Creating Energy Independence

Resources - Solar Thermal Manual

This is the manual to be used in the State of Florida's Solar Contractor Test

Design and Installation & Repair and Maintenance

The intent of this manual is to equip the reader with the knowledge and skills needed to design, install, operate and maintain the most common types of solar water heating systems.

The manual presents an overview of solar thermal applications, provides basic information on the principles of solar energy, reviews solar thermal technologies, and provides detailed instruction on the safe, efficient installation of solar water heating and pool heating systems. The manual is divided into six sections, with each separated into individual modules.

The manual is broken down into various sections. For ease of downloading, these sections are provided below in PDF format. Go to Adobe© Acrobat© Reader™ to obtain a free version of the Reader™ that will enable you to open PDF files. These are large files, so be patient during the download.

Section 1: Solar Concepts provides an introduction, table of contents, and a basic understanding of solar thermal concepts.

Section 2: Solar Water Heating Systems focuses on what are commonly called solar domestic hot water systems, which heat water.

Section 3: System Installation covers the steps involved in installing a solar water heating system.

Section 4: Troubleshooting presents structured methods to follow in diagnosing and correcting solar water heating system problems.

Section 5: Solar Swimming Pool Heating Systems is devoted to solar systems that provide heat for swimming pools.

The Appendix includes the following

- Crome Dome Collector Siting Aid
- FSEC Simplified Sizing Procedures for Solar Domestic Hot Water Systems
- Electric Water Heater Circuitry
- Volt-Ohmmeter (VOM) or Multimeter Operation
- Solar System Flow Rates
- Tools for Service and Repair

Sec #2

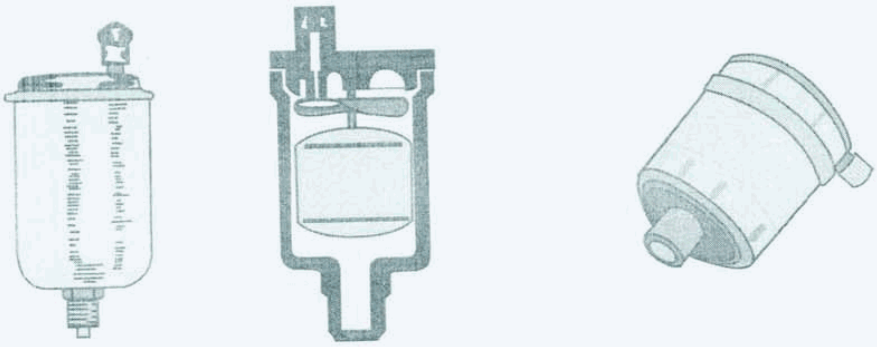


Figure 25 Air vent

TEMPERATURE-PRESSURE RELIEF VALVE

A temperature-pressure relief valve is also called a pressure-temperature relief valve or P&T valve or T&P valve. These names are used interchangeably in the industry. This valve (Figure 26) protects system components from excessive pressures and temperatures. A pressure-temperature relief valve is always plumbed to the solar storage (as well as auxiliary) tank. In thermosiphon and ICS systems, where the solar tanks are located on a roof, these tanks may also be equipped with a temperature-pressure relief valve since they are in some jurisdictions considered storage vessels. These valves are usually set by the manufacturer at 150 psi and 210° F. Since temperature pressure relief valves open at temperatures below typical collector loop operating conditions, they are not commonly installed in collector loops. (See pressure relief valves below.) Temperature-pressure relief valves located inside a building must drain to the outside. If uncertain, follow local code requirements.

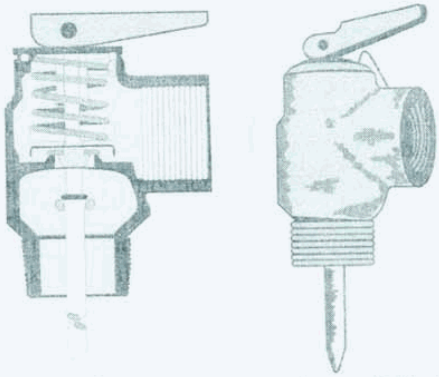


Figure 26 Pressure-temperature relief valve

SEC #2

PRESSURE RELIEF VALVE

A pressure relief valve (Figure 27) protects components from excessive pressures that may build up in system plumbing. In any system where the collector loop can be isolated from the storage tank, a pressure relief valve must be installed on the collector loop. The pressure rating of the valve (typically 125 psi) must be lower than the pressure rating of all other system components, which it is installed to protect.

The pressure relief valve is usually installed at the collector. Because it opens only with high pressure, it operates less frequently than does a temperature-pressure relief valve. For this reason, it offers a higher degree of reliability and is the valve of choice for protecting the solar collector. Indirect systems typically use pressure-relief valves with even lower psi settings. Pressure relief valves located inside a building should be piped to discharge to a safe location.

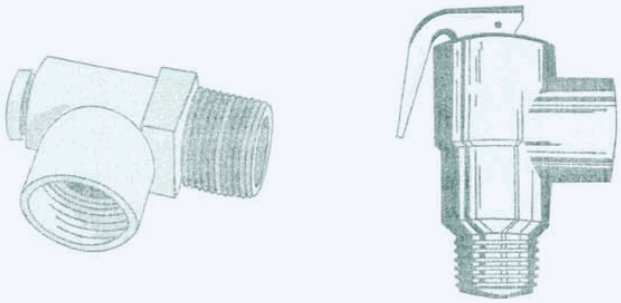


Figure 27 Pressure relief valve

PRESSURE GAUGE

A pressure gauge (Figure 28) is used in indirect systems to monitor pressure within the fluid loop. In both direct and indirect systems, such gauges can readily indicate if a leak has occurred in the system plumbing.

Figure 28 Pressure gauge

If multiple collector arrays are used, an air vent should be installed on each array. The system must be piped to prevent air traps and allow for gravity draining (Figure 24).

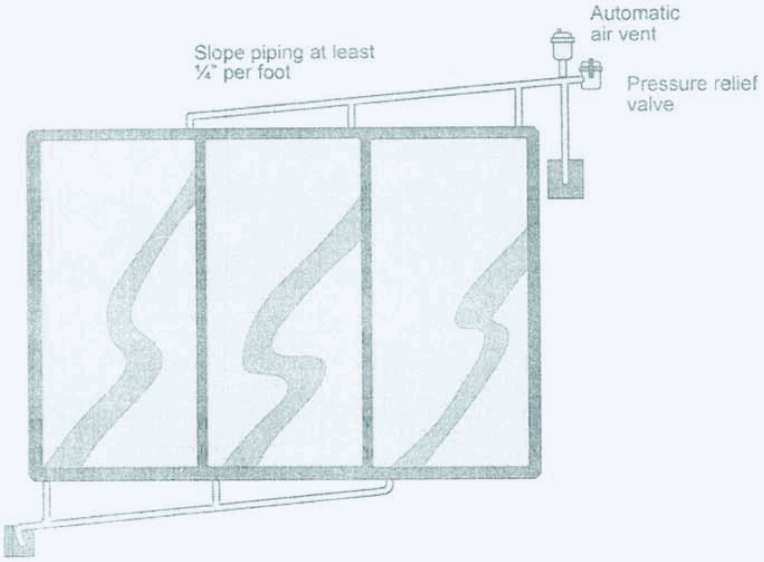


Figure 24 Piped and vented collector array

By code, a pressure relief valve is required in any portion of the system that can be isolated that contains a pressure producing fixture. For example, a circulating pump might have isolation valves so it can be removed for maintenance, but it is not considered a pressure producing fixture from the standpoint of the risk of bursting the system, so you don't need a pressure relief valve on this part of the system. However, the collector, or tanks with heater elements (connected or not), and even tankless water heaters are pressure producing fixtures, so if any can be isolated, there must be a pressure relief valve somewhere in that portion of the isolated loop that contain them. Most solar water heaters have the pressure relief valve for the collector loop installed at the collector. Special care should be taken to ensure the hot overflow from this valve does not come into contact with people or pets; some codes specify how this should be accomplished. The discharge pipe must be large enough to safely handle the overflow volume from indirect antifreeze systems, which usually operate at low pressure. Special low-pressure relief valves are often used on these systems.

Piping Collector Arrays

Cover all roof piping with insulation. Protect the insulation from degradation through exposure to ultra violet (UV) light by completely covering it with UV-resistant paint, or metallic or vinyl tape. Painted insulation will need to be repainted periodically, as the paint will deteriorate over time.

Building and property owners will see no increase or decrease in the total cost of the solar system due to it's insignificant cost, initially. However, the property owner will not be required to pay for service calls, labor and materials that would have otherwise been necessary if a P&T, rather that a PRV, had been installed.

FSEC (The Florida Solar Energy Center) clearly states that a PRV (pressure relief valve) not a P&T (pressure and temperature relief valve) can be installed to protect the component parts in an isolated solar loop. See highlighted sections below on pages 3-18 (FSEC Solar Manual) makes more sense "By code, a pressure relief valve is required in any portion of the system that can be isolated that contains a pressure producing fixture." Local building departments are demanding that a P&T valve be installed. This requirement forces local contractors to install a device not recommended by FSEC nor the manufacturer of the system. The proposed code change above will allow the contractor to install per FSEC and manufacturers recommendations. FSEC is correct in that a PRV only should be installed in the loop. Installing a PRV meets all safety and durability requirements of the code and eliminates servicing the system which would be required if a P&T, not a PRV is installed in the solar loop.

Collector Mounting

If multiple collector arrays are used, an air vent should be installed on each array. The system must be piped to prevent air traps and allow for gravity draining (Figure 24).

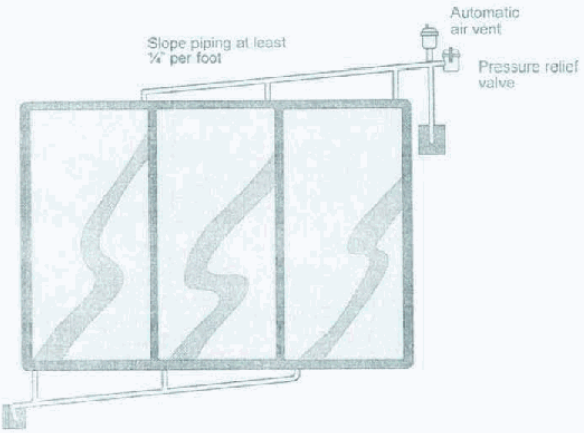


Figure 24 Piped and vented collector array

By code, a pressure relief valve is required in any portion of the system that can be isolated that contains a pressure producing fixture. For example, a circulating pump might have isolation valves so it can be removed for maintenance, but it is not considered a pressure producing fixture from the standpoint of the risk of bursting the system, so you don't need a pressure relief valve on this part of the system. However, the collector, or tanks with heater elements (connected or not), and even tankless water heaters are pressure producing fixtures, so if any can be isolated, there must be a pressure relief valve somewhere in that portion of the isolated loop that contain them. Most solar water heaters have the pressure relief valve for the collector loop installed at the collector. Special care should be taken to ensure the hot overflow from this valve does not come into contact with people or pets; some codes specify how this should be accomplished. The discharge pipe must be large enough to safely handle the overflow volume from indirect antifreeze systems, which usually operate at low pressure. Special low-pressure relief valves are often used on these systems.

Piping Collector Arrays

Cover all roof piping with insulation. Protect the insulation from degradation through exposure to ultra violet (UV) light by completely covering it with UV-resistant paint, or metallic or vinyl tape. Painted insulation will need to be repainted periodically, as the paint will deteriorate over time.