

State of Oregon
Building Codes Division
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Alternate Method Ruling No. OPSC 08-05
(ORS 455.060)

Issued November 6, 2008

Approval to allow single-wall heat exchangers as an alternate method for use in domestic solar hot water systems

Statewide Alternate Methods are approved by the division administrator in consultation with the appropriate advisory board. The advisory board's review includes technical and scientific facts of the proposed alternate method. In addition:

- *Building officials shall approve the use of any material, design or method of construction addressed in a statewide alternate method;*
- *The decision to use a statewide alternate method is at the discretion of the designer; and*
- *Statewide alternate methods do not limit the authority of the building official to consider other proposed alternate methods encompassing the same subject matter.*

Initiated By: The Building Codes Division at the request of the Energy Trust of Oregon

Applicable code sections: 506.4 Indirect-Fired Water Heaters & 603.4.4 Heat Exchangers.

Background:

Building Codes Division and the Energy Trust of Oregon request that single-wall heat exchangers be allowed for solar hot water installations which use a non-toxic heat transfer medium and have a higher operating pressure, as long as the operating pressure of the solar loop is below the potable water supply pressure in the building. New plumbing code provisions were adopted in the 2008 Oregon Plumbing Specialty code in sections 506.2(1) and 603.4.4.1, allowing single-wall heat exchangers under certain conditions. These code provisions apply to solar hot water systems and require a 30 psi relief valve to limit the solar heating loop pressure to no more than 30 psi when a single-wall heat exchanger is used. Solar hot water systems typically have an operating pressure of 20 to 30 psi. However, pressure flux occurs when the systems are in a stagnant state and the transfer medium is pumped to the panels causing a temporary steam generation in the solar loop. Because of this, the solar panels may reach high temperatures and cause a brief temporary pressure rise. During these periods the lower pressure relief valves discharge and lose the heat transfer medium in the system. This requires a system recharge making the system ineffective and costly to operate. Allowing higher pressure relief valves solves this problem.

The statewide alternate method addresses solar systems using single-wall heat exchangers when the heat transfer fluids are nontoxic and the working pressure in the solar loop is below the building's potable water supply pressure.

Procedural history:

Building Codes Division and the Energy Trust of Oregon initiated this alternate method ruling as a means of addressing solar hot water installations, which operate over 30psi and utilize single-wall heat exchangers. The division developed this alternate method to address solar hot water systems, which use nontoxic heat transfer mediums and single-wall heat exchangers and may operate over 30psi as an alternate method to the one addressed in the Oregon Plumbing Specialty Code.

Technical discussion:

Under Oregon law, when the division considers making an alternate method ruling on a method of construction, it must consider "standards and interpretations published by the body that promulgates any nationally recognized model code adopted as a specialty code of this state." ORS 455.060. Many states allow single-wall heat exchangers for solar hot water systems including: Utah, Colorado, Idaho, Florida, North Carolina, Michigan, Alabama, Georgia, New York and Minnesota.

The International Code Council (ICC) through the text of the International Plumbing Code (IPC), section 608.16.3, recognizes single-wall heat exchangers utilizing an essentially nontoxic transfer fluid for solar hot water systems. The provisions of the 2006 Uniform Plumbing Specialty Code (UPC) published by the International Association of Plumbing and Mechanical Officials (IAPMO), which promulgates the model plumbing code currently adopted by Oregon, recognizes that single-wall heat exchangers may be used when the heat transfer medium is nontoxic. However, the pressure limitation of 30psi is not consistent with solar industry standards.

Facts:

As approved by the Oregon State Plumbing Board and the Residential Structures Board, the following technical and scientific facts apply to solar hot water systems as an alternate method:

- The use of nontoxic heat transfer fluids or distilled water provide adequate protection of the potable water with a single-wall heat exchanger.
- Maintaining the operating pressure within the heat exchanger below the normal minimum operating pressure of the potable water system in the building provides an additional level of protection of the potable water system.
- Pressure relief valves used for solar hot water systems using single-wall heat exchangers and containing nontoxic heat transfer fluids or distilled water may be set above 30psi.
- Many states allow single-wall heat exchangers for solar hot water systems including: Utah, Colorado, Idaho, Florida, North Carolina, Michigan, Alabama, Georgia, New York and Minnesota.

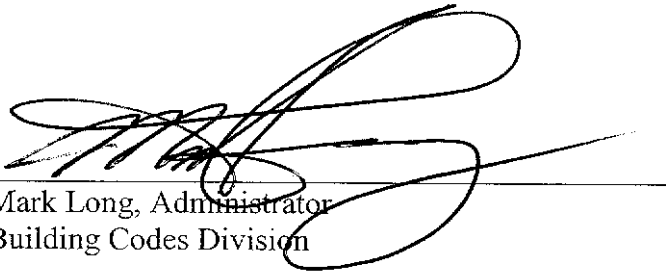
Scope of ruling:

This ruling addresses domestic solar hot water systems, which utilize a single-wall heat exchanger, use nontoxic heat transfer fluids or distilled water and operate above 30psi. The acceptability of alternate method of construction is contingent on construction meeting the following conditions:

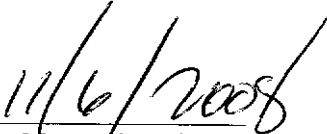
1. The solar heating loop shall use nontoxic heat transfer fluids or distilled water and be permanently labeled stating any fluid replacement be only nontoxic heat transfer fluids or distilled water.
2. The operating pressure within the single-wall heat exchanger shall be below the normal minimum operating pressure of the potable water system in the building.
3. Pressure relief valves used for solar hot water systems using single-wall heat exchangers and containing nontoxic heat transfer fluids or distilled water may be set above 30psi but at not more than 150psi.
4. Except for the provisions of 506.4 Indirect-Fired Water Heaters and 603.4.4 Heat Exchangers, the installation shall be made in accordance with the 2008 Oregon Plumbing Specialty Code.

Conclusion:

After considering the technical and scientific approval by the Oregon State Plumbing Board and the Residential Structures Board, the division rules that domestic solar hot water systems with single-wall heat exchangers are acceptable as a construction method, subject to stated limitations, and Alternate Method Ruling No. OPSC 08-05 is approved.



Mark Long, Administrator
Building Codes Division


Date November 6, 2008