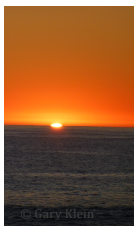
DOCKETED

Docket Number:	17-BSTD-02
Project Title:	2019 Title 24, Part 6, Building Energy Efficiency Standards Rulemaking
TN #:	222874
Document Title:	Gary Klein and Associates, Inc. Comments On Hot Water Topics in the 2019 BEES
Description:	N/A
Filer:	System
Organization:	Gary Klein and Associates, Inc.
Submitter Role:	Public
Submission Date:	3/5/2018 3:17:55 PM
Docketed Date:	3/5/2018

Comment Received From: Gary Klein and Associates, Inc.
Submitted On: 3/5/2018
Docket Number: 17-BSTD-02

On Hot Water Topics in the 2019 BEES

Additional submitted attachment is included below.



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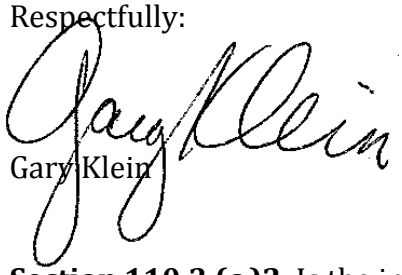
March 5, 2018

Docket No. 17-BSTD-02-Comments on Hot Water Topics in the 2019 BEES

Thank you for this opportunity to contribute to the code development process. In general, the sections that address domestic hot water or service water heating systems are in good shape. However, I found a few mistakes and several inconsistencies. My comments follow the section numbers.

Respectfully:



Gary Klein

Section 110.3 (c)2. Is the intent to exempt health care from only the controls requirement for hot water distribution systems? Should there be other exemptions?

Section 110.3 (c)3. This change to increase the temperature is good. However, what does the Energy Commission mean by public lavatories? Those lavatories used in transient-use situations or those in any non-residential building? Is there intent to exempt healthcare? My recommendation is to delete this section and let it be handled by the CPC, as this issue is primarily one of health and safety, not energy (particularly since the proposal is to raise the temperature). Please see Section 407.3 of the CPC.

Section 110.3(c)4. Why do we allow an R-12 external jacket and require combined internal and external insulation of R-16 for the same tank? A and B should be combined into one clause. For example: Insulation with an R-value of at least R-16. This insulation may be internal to the tank, external to the tank or a combination of both.

Section 120.3(a) This section is about pipe insulation, which is now required by the CPC for service hot water piping in all occupancies. Since it is required on all such piping, it would seem that some of the section is no longer needed. In addition, there seems to be a logic problem with what is connected to fluid distribution systems for

space heating or cooling. The elements that are not in series act as thermal wicks taking energy away or adding it to the fluid distribution system. They are no different than the cold water piping is to a hot water storage tank. If the fluid distribution piping is required to be insulated, so too should be the elements that are not in series.

(a) General Requirements. The piping conditions listed below for space-conditioning ~~and service water-heating~~ systems with fluid normal operating temperatures listed in TABLE 120.3-A, shall have at least the amount of insulation specified in Subsection (c):

1. Space Cooling Systems – keep

2. Space Heating Systems – keep

3. Service water heating systems.

A. I don't understand the entire clause. The piping is not "of the water heater." The only part that might be ambiguous in light of the CPC requirements is the return portion of a hot water circulation system.

B. The hot side is already required to be insulated, so the only part that might need to remain are the 8 feet of cold water piping. However, it should be insulated regardless of whether the storage system is circulating or not. By the way, the metric distance is missing for 8 feet.

C. What does this clause refer to in a water heating system?

D. Does this mean electrically heat traced hot water piping? If so, I would think this is already covered by the requirements of the CPC.

Suggested changes to this section:

3. Service water-heating systems.

~~A. Recirculating system piping, including the supply and return piping of the water heater.~~

~~B. The first 8 feet of hot and cold outlet piping for a nonrecirculating storage system.~~

~~C. The inlet pipe between the storage tank and a heat trap in a nonrecirculating storage system.~~

~~D. Pipes that are externally heated.~~

A. All piping in service water heating systems shall be insulated as specified in Section 609.11 of the California Plumbing Code.

B. The first 8 feet of ~~hot and~~ cold ~~outlet piping for a non recirculating~~ water pipes from the storage tank ~~system~~.

Insulation conductivity shall be determined in accordance with ASTM C335 at the mean temperature listed in TABLE 120.3-A, and shall be rounded to the nearest 1/100 Btu-inch per hour per square foot per °F. Fluid distribution systems include all elements that are in series with the fluid flow, such as pipes, pumps, valves, strainers, coil u-bends, and air separators, ~~but not including~~ and the elements that are not in series with the fluid flow, such as expansion tanks, fill lines, chemical feeders, and drains.

Section 120.3(b).2 What is meant by adhesive tape? What is meant by "provide this protection?" I suspect that there are some tapes that could adhere, seal the joint and retard condensate.

Section 120.3(c) Insulation Thickness What was the purpose of adding R-values to the table? There isn't any footnote to explain how this was calculated. That would help, but this doesn't seem very helpful.

What would be more helpful is for the Energy Commission to communicate with the major pipe insulation suppliers to explain the rules for California and ask them to stock the appropriate wall thicknesses. I am sure that the manufacturers, both individually and through their trade associations will support such an effort.

As far as hot water systems goes, there are two rows that are applicable. What if I pick the row with the lower values and then the system is operated in the higher temperature range? Okay, some insulation is better than none, but technically the building is operating out of compliance.

My recommendation is to take Service Hot Water out of the table entirely and defer to the insulation rules in the CPC. Delete the words twice in the title. ASHRAE really developed the table for use in space conditioning anyway, so let the table remain for space conditioning piping.

The energy code can assist the plumbing inspectors by still providing credit for insulation that has been inspected and verified by a HERS rater. Continue this inspection for at least two or three code cycles so that everyone learns what is meant by proper installation.

Exception 2 to Table 120.3: buildings are generally kept between 65 and 75F if they are being conditioned. So 5F less won't create much heat loss, but 30F above will. I recommend that 105F be changed to 80 or 85F.

Exception 3 to Table 120.3: Isn't this clause trying to say the same thing as Exception 2? If so, this can only happen if the delta-T is small, as my proposed change would be. Either combine these into one clause, or eliminate one of them.

Section 150.0(j)1. Why do we allow an R-12 jacket and require R-16 internal insulation for the same tank? Since most water heaters now have R-16 internal insulation my recommendation is to change the paragraph to read …"in installed thermal resistance of ~~R-12~~ R-16 or greater or have…

Section 150.0(j)2.A. Keep the first sentence referring to the CPC. Delete ii.-B. Keep the new B. I like how i. has eliminated the hot water piping from the clause. This is correct per the CPC. In fact, it would make sense to follow this same pattern for Section 120.3(a)3. Service water heating systems.

A. All domestic hot water piping shall be insulated as specified in Section 609.11 of the California Plumbing Code. ~~In addition, the following piping conditions shall have a minimum insulation wall thickness of 1 inch: All domestic hot water system piping conditions listed below, whether buried or unburied, must be insulated and the insulation thickness shall be selected based on the conductivity range in TABLE 120.3-A and the insulation level shall be selected from the fluid temperature range based on the thickness requirements in TABLE 120.3-A:~~

i. The first 5 feet (1.5 meters) of ~~hot and~~ cold water pipes from the storage tank.
~~ii. All hot water piping with a nominal diameter of between 3/4 inch (19 millimeter) or largerand 1 inch.~~
~~iii. All hot water piping less than 3/4 inch in diameter that is associated with a domestic hot water recirculation system regardless of the pipe diameter or leading to the kitchen fixtures.~~
~~iv. Piping from the heating source to storage tank or between tanks.~~
~~v. Piping buried below grade.~~
~~vi. All hot water pipes from the heating source to the kitchen fixtures.~~
~~B. In addition to insulation requirements, all domestic hot water pipes that are buried below grade must be~~
~~installed in a water-proof and non-crushable casing or sleeve.~~
B.~~C.~~ Pipinge for ~~cooling~~space conditioning systems lines, solar water-heating system collector loop, and ~~shall be insulated as specified in Subsection A. D~~ distribution piping for steam and hydronic heating systems, shall meet the requirements in of Section 120.3(c).~~TABLE 120.3-A~~.

Exceptions to Section 150.0(j)2. Shouldn't the exceptions in this section be essentially the same as those for Section 120.3(c)? If so, it would make sense to get the language right in 120.3 and then refer to it here as was done in new B. above. There are two exceptions here that are different than those in 120.3. Please note that the current wording of these exceptions does not match the wording in RA Appendices. Please note that RA3.5 isn't correct; hot water is in RA3.6. The wording in the appendices should be identical to that in the code or it should just refer to the correct section.

My proposal is to combine the two exceptions into one. It was incorrect to delete where the pipes must be located within the wall; they should be located closer to the conditioned space that to the unconditioned space. I have added floors because the pipe could be installed there too. I believe that this rewording is a better way to cover the four locations.

~~EXCEPTION 4~~ 3 to Section 150.0(j)2: ~~Piping installed in interior or exterior walls shall not be required to have pipe insulation if all of the requirements are met for~~

~~compliance with Quality Insulation Installation (QII) as specified in the Reference Residential Appendix RA3.5~~ RA3.6.~~.~~

EXCEPTION ~~5~~ 4 to Section 150.0(j)2: Piping installed completely surrounded with a minimum of 1 inch of ~~in~~ attic~~s~~, crawlspace, floor, or wall insulation ~~with a minimum of 4 inches (10 cm) of attic insulation on top of the piping~~ shall not be required to have pipe insulation. The piping shall be located closer to the conditioned space than to the unconditioned space. In addition, all of the requirements shall be met for compliance with Quality Insulation Installation (QII) as specified in the Reference Residential Appendix RA3.6.

Section 150.0(j)3. This referral to another section is an excellent idea. There are several other sections in which the same language was repeated, but without exactly the same wording, which will only cause confusion. Get it worded correctly once, then refer people to that section.
RA3.6 Field Verification of Water Heating Systems

RA3.6.2 HERS-Verified Pipe Insulation Requirements for all Hot Water Distribution Systems
This section should be written to reflect all of the changes made to the body of the code where the language is identical. Alternatively, it could simply refer to the relevant code sections. One way or the other additional language that describes how to meet the requirements of the code can also be included.

RA3.6.3 HERS-Verified Pipe Insulation Credit (PIC-H)
This section should be kept in place for at least 2 or 3 code cycles so that the industry can learn what is meant by proper installation of hot water pipe insulation. Please note that the remaining paragraph refers to section RA4.4.3 Pipe Insulation Credit, which is shown as being deleted.

RA3.6.4 HERS-Verified Central Parallel Piping (PP-H)

This clause no longer seems correct since all hot water piping must be insulated. In addition, it is not only parallel piping systems that can have long runs of hot and cold water piping running next to each other for long distances, so if we want to say this, we should say it for all domestic hot and cold water systems.

~~(b)1. The hot water distribution piping must be separated by at least two inches from any other hot water supply piping, and at least six inches from any cold water supply piping or the hot water supply piping must be insulated based on the conductivity range in TABLE 120.3-A and the insulation level shall be selected from the fluid temperature range based on the thickness requirements in TABLE 120.3-A.~~

RA3.6.9 HERS-Verified Drain Water Heat Recovery System (DWHR-H)
There is potential problem with the wording in (e). Being within 2 degrees of the

rated slope is a reasonable tolerance for vertical DWHR units. At the other extreme, a low slope (horizontal) drain is typically installed at a 2-degree slope with some exceptions that allow for a 1-degree slope. In addition, horizontal DWHR can slope in two directions – along their length and side to side. While this is probably covered in (f), given that this is a brand new component, I recommend that we make the tolerance both tighter and more clear here. The new wording is taken from IGC346.

The HERS inspector shall verify that:
(e) The DWHR unit(s) shall be installed within ~~2 degrees~~ 1 degree of the rated slope. Sloped DWHR shall have a minimum lengthwise slope of 1 degree. The lateral level tolerance shall be +/- 1 degree.
(f) The installation shall comply with any applicable California Plumbing Code requirements.

RA4.4.1 Proper Installation of Pipe Insulation
This section should be written to reflect all of the changes made to the body of the code where the language is identical. It also seems to need to be identical to Section RA3.6.2. Alternatively, it could simply refer to the relevant code sections or to RA3.6.2. One way or the other additional language that describes how to meet the requirements of the code can also be included.

Sections RA4.4.14-21 All of these sections are about verifying installation through a HERS inspection; they seem out of place. Appendix RA3 is about Residential Field Verification and Diagnostic Test Protocols. Appendix RA4 is about the Eligibility Criteria for Energy Efficiency Measures. It seems to me that the description of how to do the verification belongs in RA3 and the measure criteria belong in RA4. The text of each paired section should be similar but not identical. Also, the headings for each section should not be identical, which they are in several cases.