STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

1. State Building Code to be Amended:

- ☐ International Building Code
- ☐ ICC ANSI A117.1 Accessibility Code
- ☐ International Existing Building Code
- ☐ International Residential Code
- ☐ International Fire Code
- ☐ Uniform Plumbing Code
- ☒ State Energy Code
- ☐ International Mechanical Code
- ☐ International Fuel Gas Code
- ☐ NFPA 54 National Fuel Gas Code
- ☐ NFPA 58 Liquefied Petroleum Gas Code
- ☐ Wildland Urban Interface Code

Section(s): Table C403.2.8
(e.g.: Section: R403.2)

Title: Minimum Pipe Insulation Thickness (thickness in inches)
(e.g: Footings for wood foundations)

2. Proponent Name (Specific local government, organization or individual):

Proponent: Larry Andrews
Title: President of Andrews Mechanical, Inc
Date: 2/26/14

3. Designated Contact Person:

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4. Proposed Code Amendment for C403.2.8

TABLE C403.2.8
MINIMUM PIPE INSULATION THICKNESS (thickness in inches)[a]

FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F)	INSULATION CONDUCTIVITY		NOMINAL PIPE OR TUBE SIZE (inches)				
	Conductivity Btu • in./(h • ft^2 • °F)[b]	Mean Rating Temperature, °F	~~<1~~ ≤1	~~1 to <1 1/2~~ ≥1 to ≤2	~~1 1/2 to <4~~ ≥2 to ≤4	~~4 to <8~~ ≥4 to ≤8	≥8
> 350	0.32 – 0.34	250	4.5	5.0	5.0	5.0	5.0
251 - 350	0.29 – 0.32	200	3.0	4.0	4.5	4.5	4.5
201 - 250	0.27 – 0.30	150	2.5	2.5	2.5	3.0	3.0
141 - 200	0.25 – 0.29	125	~~1.5~~ 1.0	~~1.5~~ 1.0	2.0	2.0	2.0
105 - 140	0.21 – 0.28	100	~~1.0~~ 0.5	1.0	1.5	1.5	1.5
40 – 60	0.21 – 0.27	75	0.5	0.5	1.0	1.0	1.0
<40	0.20 – 0.26	75	0.5	1.0	1.0	1.0	1.5

a. For piping smaller than 1 ½ inch (38 mm) and located in partitions within *conditioned spaces*, reduction of these thicknesses by 1 inch (25 mm) shall be permitted (before thickness adjustment required in footnote b) but not to a thickness less than 1 inch (25 mm).

b. For insulation outside the stated conductivity range, the minimum thickness (T) shall be determined as follows:
$T = r\{(1 + t/r)\ K/k - 1\}$
where:
T = minimum insulation thickness,
r = actual outside radius of pipe,
t = insulation thickness listed in the table for applicable fluid temperature and pipe size,
K = conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature (Btu x in/h x ft2 x °F) and
k = the upper value of the conductivity range listed in the table for the applicable fluid temperature.

c. For direct-buried heating and hot water system piping, reduction of these thicknesses by 1 ½ inches (38 mm) shall be permitted (before thickness adjustment required in footnote b but not to thicknesses less than 1 inch (25 mm).

d. Allow mechanical designer to be allowed to not insulate piping if required by the space to be heated for the design condition or if the area would require heating to prevent the space from freezing

4. **Proposed Code Amendment.** Reproduce the section to be amended by underlining all added language, striking through all deleted language. Insert new sections in the appropriate place in the code in order to continue the established numbering system of the code. If more than one section is proposed for amendment or more than one page is needed for reproducing the affected section of the code additional pages may be attached. (Examples on the SBCC website)

Code(s) State Energy Code **Section(s)** Table C403.2.8

Enforceable code language must be used; see an example by clicking here.
Amend section to read as follows:

(See Attached)

5. **Briefly explain your proposed amendment, including the purpose, benefits and problems addressed.** Specifically note any impacts or benefits to business, and specify construction types, industries and services that would be affected. Finally, please note any potential impact on enforcement such as special reporting requirements or additional inspections required. (See Included Letter)

6. **Specify what criteria this proposal meets.** You may select more than one.
   - ☐ The amendment is needed to address a critical life/safety need.
   - ☐ The amendment is needed to address a specific state policy or statute.
   - ☐ The amendment is needed for consistency with state or federal regulations.
   - ☒ The amendment is needed to address a unique character of the state.
   - ☐ The amendment corrects errors and omissions.

7. **Is there an economic impact:** ☒ Yes ☐ No
   Explain:

   If there is an economic impact, use the Table below to estimate the costs and savings of the proposal on construction practices, users and/or the public, the enforcement community, and operation and maintenance. If preferred, you may submit an alternate cost benefit analysis.

	Construction[1]		Enforcement[2]		Operations & Maintenance[3]	
Building Type	Costs	Benefits[4]	Costs	Benefits[4]	Costs	Benefits[4]
Residential		$2.53/sq ft				
Single family		$2.53/sq ft				
Multi-family		$2.53/sq ft				
Commercial/Retail		$2.53/sq ft				
Industrial		$2.53/sq ft				
Institutional		$2.53/sq ft				

Please send your completed proposal to: sbcc@ga.wa.gov

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.

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[1] $ / square foot of floor area or other cost. Attach data. **Construction** costs are costs prior to occupancy, and include both design and direct construction costs that impact the total cost of the construction to the owner/consumer.

[2] Cost per project plan. Attach data. **Enforcement** costs include governmental review of plans, field inspection, and other action required for enforcement.

[3] Cost to building owner/tenants over the life of the project.

[4] Measurable benefit.

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Andrews Mechanical, Inc.

February 26, 2014

To the State Building Code Council

I and others in the piping industry are having real problem with the rating of pipe insulation in R factor. The piping industry is based on a K factor and this do to varying the temperature is inside the pipe.
We are having a real problem with the fact that warm air ducts inside the building are not required to be insulated yet Hydronics piping is require to have what I think is R-6 insulation. What is with this? We are involved in the radiant heating and cooling business which is 25% more efficient then force air with out insulation on our pipes. So why are we required to install all this insulation on our piping. Is it to slow the Radiant industries down so we are not able to compete against force air industry. I think this wrong and here is why. Insulation for the Hydronics industry should be base off what the out side jacket of the insulation in temperature space is putting into the space. In many cases in the colder areas of the State we use the pipe as a convector in our unfinished basement to provide the heat as needed so our pipes don't freeze in the cold winter condition that we have in the north eastern part of the state. Also in our crawl spaces that have insulated out side walls we allow non insulated Hydronics pipe in the crawl space to keep the plumbing pipes from freezing up. This is economical way getting the heat to the areas as needed. We are trying to target for Geo thermo side of the radiant industry's with a supply temperature of 110 degrees for heating and on the cooling side of things 48 degrees. By doing this we have to put in almost double the tubing that would be required with higher water temperatures as it is. Enclosed from a NAIMA insulation program is documentation of what ½ thick fiberglass insulation out side jacket temperature is with 110 degree water going down the pipe with room temperature of 72 degrees the jacket temperature is 78.3 degrees remember we are in heating mode. In cooling with 48 degree water temperature and 72 indoor temperature the jacket temperature with ½ " thick insulation is 68 degrees again I would point out that we are in a cooling mode to. It cost 270 % more on average to go from ½" to 1" thick insulation just for the insulation but some would say 270% more is not a lot. See enclosed quote from supplier. But you must remember we are having a hard enough time getting the ½" thick insulation in are buildings now with out requiring extra structural condition to cause larger joist, bigger beams wider wall and so on. Also the radiant manifolds are extremely hard to get ½" insulation around them let alone 1" thick insulation around them and then get them in a wall.

Here is what I purpose R403.3 drop this back to ½" thick insulation for homes also allow mechanical designer to be allowed not insulate piping if require by the space to be heated for the design condition or that area would require heating to prevent the space from freezing. Crawl spaces outside walls that this happens would require the outside walls to be insulated with the same requirement as above ground walls Note these requirements are piping inside a insulated building envelope.

R403.4.2.8 change to ½" insulation thick insulation or the R-3 value.

Table C403.2.8 would change to ≤ 1 from 105 - 140 to be ½" thick pipe insulation. Note make the break at pipe greater then one inch and larger pipe. This due to the fact that radiant circuits are ran up to 1" in diameter and there not much gain from 1 " insulation over ½", but cost of putting pipe insulation in 1" insulation is a lot more with out the gain. Also the table would be changed to 1 to <2" then 2 to <4 then 4 to <8 Note these requirements are piping inside a insulated building envelope.

Add a foot note d. Allow mechanical designer to be allowed not insulate piping if require by the space to be heated for the design condition or that area would require heating to prevent the space from freezing. Crawl spaces outside walls that this happens would require the outside walls to be insulated with the same requirement as above ground walls

In conclusion remember all these pipes are inside the building insulated envelope and all this energy is still going to stay with in the building envelope the only thing is now a comfort issue we are talking about. It would be real hard to prove any energy saving unless each room was totally insulated that means wall floor and ceiling and the door would have to be closed and a separate zone for each room. To prove any energy saving from even the insulation I recommend.