

EC114-09/10 Part I & Part II

EECC Requested Final Action: Approved as Modified by the Public Comment

EECC Reason Statement:

EC114 should be approved as modified by this public comment.

EC114, as modified in this public comment, will bring substantial savings through increased efficiency in hot water heating systems. Although the original EC114 proposed a variety of equipment alternatives that, if selected, would have saved additional energy, the concern was raised at the Committee Hearings that these provisions may risk legal challenges on the basis of federal preemption. Although we do not necessarily believe the original proposal to be preempted, we do not want to risk subjecting the 2010 IECC and IRC to lengthy delays due to litigation.

The modification above removes the alternatives to insulation and pipe length and adds the industry term of “total developed pipe length” to set the requirements for increasing the energy efficiency of the hot water distribution system. The modification also increases the maximum length of total developed pipe length to be served by a single system in an effort to ease the requirement somewhat based on comments at the Development Committee hearing.

This proposal, as modified, will save more energy than other proposals because it requires both a minimum level of R-value insulation for all service hot water piping, as well as placing limits on pipe length (shorter pipes mean less hot water sitting in pipes to get cold). Equally important, this proposal is straightforward and will not be difficult to apply or to enforce, since it does not create exceptions for various types of piping and/or vary the insulation level depending on pipe length. As a result, this proposal will decrease the cost of construction by encouraging improved designs of hot water distribution systems while saving energy and water over the lifetime of the home.

EECC Proposed Modification to Original Proposal:

Part I – IECC

403.4 Service water heating (Mandatory). Service hot water piping shall be installed in accordance with Sections 403.4.1 through 403.4.3.

403.4.1 Pipe length and Insulation. Service hot water piping shall be no more than a total of 120 ~~60~~-linear feet of total developed pipe length to all fixtures being served by one service water heating unit. All service hot water piping shall be insulated to at least R-3 for pipes sized 1 inch in diameter or less and R-4 for pipes larger than 1 inch in diameter for the distance between the service water heating equipment to within 5 feet of each fixture connected to the hot water pipe. In addition, the first 5 feet of hot and cold water pipes from the storage tank for non-recirculating service water heating systems shall be insulated to at least R-3 for pipes sized 1 inch in diameter or less and R-4 for pipes larger than 1 inch in diameter.

Exception: ~~Hot water distribution systems that supply hot water from one of the following sources (this exception does not apply to portions of hot water distribution systems located below ground or in a mass floor or mass wall in contact with the ground):~~

- ~~1. Condensing gas service water heating equipment,~~
- ~~2. Solar thermal water heating equipment that is designed to provide more than 50 percent of annual hot water requirements from solar heated water,~~
- ~~3. Heat pump electric service water heating equipment,~~

- ~~4. Tankless demand service gas water heating equipment, or~~
- ~~5. Tankless demand service electric heating equipment, where either:~~
 - ~~_____ 5.1 Heated water is provided through piping that is insulated to R-3 or~~
 - ~~_____ 5.2 There is no more than a total of 15 linear feet of pipe length to all fixtures being served by each unit.~~

403.4.2 Circulating hot water systems. All circulating service hot water piping shall be insulated to at least R-3 for pipes sized 1 inch in diameter or less and R-4 for pipes larger than 1 inch in diameter. Circulating hot water systems shall include an automatic or readily accessible manual switch that can turn off the hot water circulating pump when the system is not in use.

403.4.3 Heat Traps. Water heating equipment not supplied with integral heat traps and serving non-circulating systems shall be provided with heat traps on the supply and discharge piping associated with the equipment.

Part II – IRC

N1103.4 Service water heating. Service hot water piping shall be installed in accordance with Sections ~~403.4.1~~ N1103.4.1 through ~~403.4.3~~ N1103.4.3.

N1103.4.1 Pipe length and Insulation. Service hot water piping shall be no more than a total of ~~120~~ 60 linear feet of total developed pipe length to all fixtures being served by one service water heating unit. All service hot water piping shall be insulated to at least R-3 for pipes sized 1 inch in diameter or less and R-4 for pipes larger than 1 inch in diameter for the distance between the service water heating equipment to within 5 feet of each fixture connected to the hot water pipe. In addition, the first 5 feet of hot and cold water pipes from the storage tank for non-recirculating service water heating systems shall be insulated to at least R-3 for pipes sized 1 inch in diameter or less and R-4 for pipes larger than 1 inch in diameter.

Exception: ~~Hot water distribution systems that supply hot water from one of the following sources (this exception does not apply to portions of hot water distribution systems located below ground or in a mass floor or mass wall in contact with the ground):~~

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- ~~2. Solar thermal water heating equipment that is designed to provide more than 50 percent of annual hot water requirements from solar heated water,~~
- ~~3. Heat pump electric service water heating equipment,~~
- ~~4. Tankless demand service gas water heating equipment, or~~
- ~~5. Tankless demand service electric heating equipment, where either:~~
 - ~~_____ 5.1 Heated water is provided through piping that is insulated to R-3 or~~
 - ~~_____ 5.2 There is no more than a total of 15 linear feet of pipe length to all fixtures being served by each unit.~~

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N1103.4.3 Heat Traps. Water heating equipment not supplied with integral heat traps and serving non-circulating systems shall be provided with heat traps on the supply and discharge piping associated with the equipment.

Proposal History:

Committee Recommended Action on Original Proposal at Public Hearing:

Part I IECC – Disapproved

Part II IRC – Disapproved

Committee Reason(s) for Recommended Action:

Part I IECC – The issues in this proposal have already been dealt with in EC112 and EC13.

Part II IRC – This is an issue that should be dealt with in the plumbing section of the IRC.

Initial Recommendation of EECC: Approve

Initial Proposal for Reference:

EC114–09/10

403.4 (New), 403.4.1 (New), 403.4.2 (New), 403.4.3 (New); IRC N1103.4 (New), N1103.4.1 (New), N1103.4.2 (New), N1103.4.3 (New)

Proponent: Bill Prindle, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Garrett Stone, Brickfield, Burchette, Ritts & Stone; Steve Rosenstock, Edison Electric Institute; Brian Dean, ICF International

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC COMMITTEE. PART II WILL BE HEARD BY THE IRC BUILDING/ENERGY COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

PART I – IECC

1. Add new text as follows:

403.4 Service water heating (Mandatory). Service hot water piping shall be installed in accordance with Sections 403.4.1 through 403.4.3.

403.4.1 Pipe length and Insulation. Service hot water piping shall be no more than a total of 60 linear feet of pipe length to all fixtures being served by one service water heating unit. All service hot water piping shall be insulated to at least R-3 for pipes sized 1 inch in diameter or less and R-4 for pipes larger than 1 inch in diameter for the distance between the service water heating equipment to within 5 feet of each fixture connected to the hot water pipe. In addition, the first 5 feet of hot and cold water pipes from the storage tank for non-recirculating service water heating systems shall be insulated to at least R-3 for pipes sized 1 inch in diameter or less and R-4 for pipes larger than 1 inch in diameter.

Exception: Hot water distribution systems that supply hot water from one of the following sources (this exception does not apply to portions of hot water distribution systems located below ground or in a mass floor or mass wall in contact with the ground):

1. Condensing gas service water heating equipment.
2. Solar thermal water heating equipment that is designed to provide more than 50 percent of annual hot water requirements from solar heated water.
3. Heat pump electric service water heating equipment.
4. Tankless demand service gas water heating equipment, or
5. Tankless demand service electric heating equipment, where either:
 - 5.1. Heated water is provided through piping that is insulated to R-3 or
 - 5.2. There is no more than a total of 15 linear feet of pipe length to all fixtures being served by each unit.

2. Revise as follows:

403.4.2 ~~403-4~~ Circulating hot water systems (Mandatory). All circulating service hot water piping shall be insulated to at least R-~~32~~ R-3 for pipes sized 1 inch in diameter or less and R-4 for pipes larger than 1 inch in diameter. Circulating hot water systems shall include an automatic or readily accessible manual switch that can turn off the hot water circulating pump when the system is not in use.

3. Add new text as follows:

403.4.3 Heat traps. Water heating equipment not supplied with integral heat traps and serving non-circulating systems shall be provided with heat traps on the supply and discharge piping associated with the equipment.

PART II – IRC BUILDING/ENERGY

1. Add new text as follows:

N1103.4 Service water heating. Service hot water piping shall be installed in accordance with Sections 403.4.1 through 403.4.3.

N1103.4.1 Pipe length and Insulation. Service hot water piping shall be no more than a total of 60 linear feet of pipe length to all fixtures being served by one service water heating unit. All service hot water piping shall be insulated to at least R-3 for pipes sized 1 inch in diameter or less and R-4 for pipes larger than 1 inch in diameter for the distance between the service water heating equipment to within 5 feet of each fixture connected to the hot water pipe. In addition, the first 5 feet of hot and cold water pipes from the storage tank for non-recirculating service water heating systems shall be insulated to at least R-3 for pipes sized 1 inch in diameter or less and R-4 for pipes larger than 1 inch in diameter.

Exception: Hot water distribution systems that supply hot water from one of the following sources (this exception does not apply to portions of hot water distribution systems located below ground or in a mass floor or mass wall in contact with the ground):

1. Condensing gas service water heating equipment,
2. Solar thermal water heating equipment that is designed to provide more than 50 percent of annual hot water requirements from solar heated water,
3. Heat pump electric service water heating equipment,
4. Tankless demand service gas water heating equipment, or
5. Tankless demand service electric heating equipment, where either:
 - 5.1. Heated water is provided through piping that is insulated to R-3 or
 - 5.2. There is no more than a total of 15 linear feet of pipe length to all fixtures being served by each unit.

2. Revise as follows:

N1103.4.2 ~~N1103-4~~ Circulating hot water systems. All circulating service hot water piping shall be insulated to at least R-~~2~~ R-3 for pipes sized 1 inch in diameter or less and R-4 for pipes larger than 1 inch in diameter. Circulating hot water systems shall include an automatic or readily accessible manual switch that can turn off the hot water circulating pump when the system is not in use.

3. Add new text as follows:

N1103.4.3 Heat traps. Water heating equipment not supplied with integral heat traps and serving non-circulating systems shall be provided with heat traps on the supply and discharge piping associated with the equipment.

Reason: Water heating energy is becoming a large percentage of the overall energy use in homes due to significant improvements that have occurred to heating, cooling and lighting energy efficiency. This proposal is intended to improve hot water efficiency by requiring improvement of either the efficiency of the hot water distribution system or the water heating equipment (due to issues with federal NAECA preemption, the code cannot require an improved hot water heater, but can permit such an improvement as an exception to an alternative requirement not involving improved equipment).

The efficiency of the hot water distribution system is based on the pipe length, pipe diameter and pipe insulation. This proposal requires increased insulation as the pipe diameter increases in all homes. The proposal also requires system zoning if the distribution pipe from one system exceeds 60 linear feet. Assuming an average of 30 linear feet per 1000 SF of conditioned floor area for a typical hot water distribution system, this second requirement will promote more efficient distribution design in larger homes.

This proposal also allows high performance water heating equipment to be installed as an exception in lieu of improving the hot water distribution. The improvement in water heating equipment has a significant impact on the overall energy used for hot water in a home. The following table from ACEEE shows estimated annual energy use by equipment type, with the bold equipment selected for the exceptions.

Water Heater Type	Efficiency (EF)	Yearly Energy Cost
Conventional gas storage	0.60	\$350
High-efficiency gas storage	0.65	\$323
Condensing gas storage	0.80	\$262
Demand gas (no pilot)	0.82	\$228
Conventional oil-fired storage	0.55	\$654
Minimum Efficiency electric storage	0.90	\$463
High-eff. electric storage	0.95	\$439
Electric heat pump water heater	2.20	\$190
Solar with electric back-up	1.20	\$175

source: <http://www.aceee.org/consumerguide/waterheating.htm>

Electric tankless demand water heating, while not analyzed by ACEEE in the study above, is also included due to increased EF ratings compared to electric storage as an exception with an additional requirement for insulation or the length of pipe serviced by the equipment. This additional requirement is meant to limit the electric demand impact and also improve the distribution efficiency for improved system performance. Literature shows that electric tankless heaters have very high efficiency ratings (around 0.98 and 0.99) and have opportunity to save significant energy when coupled with reduced distribution losses.

The US DOE (http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=13060) states that "insulating your hot water pipes reduces heat loss and can raise water temperature 2°F–4°F hotter than uninsulated pipes can deliver, allowing for a lower water temperature setting". This is the main reason for having a strong focus on improving the hot water distribution which will allow for reduced energy use on the overall hot water system. The DOE also recommends insulation of all accessible hot water pipes, with the most important being within 3 feet of the water heater.

In addition to the insulation language, this proposal also adds language that requires a heat trap for systems that are not supplied with a heat trap. This language is exactly based on section 504.4 of the IECC and is being included to ensure that more energy is not lost from the hot water equipment to the piping based on the recommendation from the DOE:
http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=13100

Cost Impact: The code change proposal will increase the cost of construction.

PART I – IECC

Public Hearing: Committee: AS AM D
 Assembly: ASF AMF DF

PART II – IRC BUILDING/ENERGY

Public Hearing: Committee: AS AM D
 Assembly: ASF AMF DF

ICCFILENAME: PRINDLE-EC-24-403.4-N1103.4