**REPI-89-21  
IECC®: R403.5.2, TABLE C403.12.3, TABLE R405.2, TABLE R406.2**

**Proponents:** Gary Klein, representing on behalf of the California Statewide Utility Codes and Standards Team ([iecc-pipe-insulation@2050partners.com](mailto:iecc-pipe-insulation@2050partners.com)); Mark Lyles, representing New Buildings Institute ([markl@newbuildings.org](mailto:markl@newbuildings.org)); Kevin Rose, representing Northwest Energy Efficiency Alliance (NEEA) ([krose@neea.org](mailto:krose@neea.org))

**From the Monograph:**

**Revise as follows:**

**R403.5.2 Hot water pipe insulation.**

~~Insulation for e~~Service hot water piping ~~with a thermal resistance, R-value, of~~ ~~not less than R-3~~ shall be thermally insulated in accordance with Table R403.5.2 and be applied to the following:

1. Piping ¾ inch (19.1 mm) and larger in nominal diameter located inside the *conditioned space*.

~~2. Piping serving more than one dwelling units.~~

2~~3~~. Piping located outside the *conditioned space*.

3~~4~~. Piping from the water heater to a distribution manifold.

4~~5~~. Piping located under a floor slab.

5~~6~~. Buried piping.

6~~7~~. Supply and return piping in ~~circulation~~ ~~and recirculation systems~~ *circulating hot water systems* ~~other than cold water pipe return demand recirculation systems.~~

Exception: Cold water pipe returns in *demand recirculation water systems*.

TABLE R403.5.2 MINIMUM PIPE INSULATION THICKNESS (in inches)

|  |  |  |  |
| --- | --- | --- | --- |
| FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F) | INSULATION CONDUCTIVITY | | MINIMUM PIPE INSULATION THICKNESS |
|  | Conductivity  Btu x in./(h x ft2 x °F)a | Mean Rating Temperature, °F |  |
| 141-200 | 0.25 - 0.29 | 125 | 1 |
| 105-140 | 0.21 - 0.28 | 100 | 1 |

* 1. For insulation outside the stated conductivity range listed in Table R403.5.2, 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 requirement; 1 inch.

K = Conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature; [Btu x in/(h x ft2 x °F)].

k = The upper value of the conductivity range listed in Table R403.5.2 for the applicable fluid temperature; [Btu x in/(h x ft2 x °F)].

**TABLE R405.2 REQUIREMENTES FOR TOTAL BUILDING PERFORMANCE**

|  |  |
| --- | --- |
| **SECTION** | **TITLE** |
| **Mechanical** | |
| R403.5.1 | Heated water circulation and temperature maintenance systems |
| R403.5.2 | Hot water pipe insulation |
| R403.5.3 | Drain water heat recovery units |

**TABLE R406.2 REQUIREMENTES FOR ENERGY RATING INDEX**

|  |  |
| --- | --- |
| **SECTION** | **TITLE** |
| **Mechanical** | |
| R403.5.1 | Heated water circulation and temperature maintenance systems |
| R403.5.2 | Hot water pipe insulation |
| R403.5.3 | Drain water heat recovery units |

**As modified by the proponents:**

**R403.5.2 Hot water pipe insulation.**

Insulation for service hot water piping with a thermal resistance, R-value, of not less than R-3 shall be be applied to the following:

1. Piping ¾ inch (19.1 mm) and larger in nominal diameter located inside the *conditioned space*.

~~2. Piping serving more than one dwelling units.~~

2~~3~~. Piping located outside the *conditioned space*.

3~~4~~. Piping from the water heater to a distribution manifold.

4~~5~~. Piping located under a floor slab.

5~~6~~. Buried piping.

6~~7~~. Supply and return piping in ~~circulation~~ ~~and recirculation systems~~ *circulating hot water systems* ~~other than cold water pipe return demand recirculation systems.~~

Exception: Cold water pipe returns in *demand recirculation water systems*.

TABLE R405.2 REQUIREMENTES FOR TOTAL BUILDING PERFORMANCE

|  |  |
| --- | --- |
| **SECTION** | **TITLE** |
| **Mechanical** | |
| R403.5 | Service hot water systems |
| ~~R403.5.1~~ | ~~Heated water circulation and temperature maintenance systems~~ |
| ~~R403.5.3~~ | ~~Drain water heat recovery units~~ |

TABLE R406.2 REQUIREMENTES FOR ENERGY RATING INDEX

|  |  |
| --- | --- |
| **SECTION** | **TITLE** |
| **Mechanical** | |
| R403.5 | Service hot water systems |
| ~~R403.5.1~~ | ~~Heated water circulation and temperature maintenance systems~~ |
| ~~R403.5.3~~ | ~~Drain water heat recovery units~~ |

**Reasons:**

1. **First paragraph**. We are proposing to remove the change to wall thickness and k-value and retain the R-value designation in the existing section. We are also proposing to retain the R-value not less than R-3. While the supporting analysis done for the original proposal shows that a 1-inch wall thickness is economically justified, it is only true if the pipe insulation material is changed from foam to fiberglass or mineral wool. This results in an increase of R-1 over the current requirements, a very small change for a big change in common practice. Getting R-3 pipe insulation (1/2-inch foam) done well is more important than having 1-inch wall thickness installed poorly. **We recommend moving the proposal to increase pipe insulation R-value to Section R408 as part of an efficient SHW distribution system measure.**
2. **Piping serving multiple dwelling units.** Currently text in both IEEC sections R403.5.2 and R403.8 imply applicability for piping serving “more than one dwelling unit” (or “multiple dwelling units”). This apparent conflict raises concerns that two-dwelling unit buildings covered by the IRC will now be directed to the commercial sections. **We recommend deleting the confusing language from this section.**
3. **Supply and Return piping**. The language in the existing code is confusing. This modification uses the same changes as in the original proposal. This new language improves the clarity of the code by using defined terms and by creating an exception to this one clause which was previously part of a convoluted sentence. **We recommend accepting these proposed revisions.**
4. **Tables 405.2 and Table 406.2**. The original proposal added a line for hot water pipe insulation. This makes sense because pipe insulation should be required for the Total Building Performance and Energy Rating Index compliance paths. During discussions, it was pointed out that adding the line for pipe insulation meant that the entire section was now required. With that in mind, we are proposing to have only one line in each of the tables, instead of three. **We recommend accepting this modification to streamline the code, albeit by only one line in each table.**