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# IECC®: C404.4, C404.4.1 (New), TABLE C404.4.1 (New)

**Proponents:**

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**2021 International Energy Conservation Code**

# Revise as follows:

C404.4 ~~Insulation of piping~~ Service water heating system piping insulation.

~~Piping from a water heater to the termination of the heated water fixture supply pipe shall be insulated in accordance with Table~~ ~~C403.12.3. On both the inlet and outlet piping of a storage water heater or heated water storage tank, the piping to a heat trap or the~~ ~~first 8 feet (2438 mm) of piping, whichever is less, shall be insulated. Piping that is heat traced shall be insulated in accordance with~~ ~~Table C403.12.3 or the heat trace manufacturer's instructions. Tubular pipe insulation shall be installed in accordance with the~~ ~~insulation manufacturer's instructions. Pipe insulation shall be continuous except where the piping passes through a framing member.~~ ~~The minimum insulation thickness requirements of this section shall not supersede any greater insulation thickness requirements~~ ~~necessary for the protection of piping from freezing temperatures or the protection of personnel against external surface temperatures~~ ~~on the insulation.~~

Service water heating system piping shall be surrounded by uncompressed insulation. The wall thickness of the insulation shall be greater than or equal to the thickness shown in Table C404.4.1. Where the insulation thermal conductivity is not within the range in the table, the following equation shall be used to calculate the minimum insulation thickness:

talt = r·[(1 + ttable/r)kalt/kupper - 1]

Where:

talt = minimum insulation thickness of the alternate material (in.) (mm)

r = actual outside radius of pipe (in.) (mm)

ttable = insulation thickness listed in this table for applicable fluid temperature and pipesize

kalt = thermal conductivity

of the alternate material at mean rating temperature indicated for the applicable fluid temperature [Btu·in/h·ft2·°F] [W (m·°C)]

kupper = the upper value of the thermal conductivity range listed in this table for the applicable fluid temperature [Btu·in/h·ft2·°F] [W (m·°C)]

For nonmetallic piping thicker than Schedule 80 and having thermal resistance greater than that of steel pipe, reduced insulation thicknesses are permitted if documentation is provided showing that the pipe with the proposed insulation has no more heat transfer per foot (meter) than a steel pipe of the same size with the insulation thickness shown in the table.

**Exception:** Tubular pipe insulation shall not be required on the following:

1. ~~The tubing from the connection at the termination of the fixture supply piping to a plumbing fixture or plumbing appliance.~~ Factory-installed piping within water heaters and hot water storage tanks
2. Valves, pumps, and strainers ~~and threaded unions~~ in piping that is 1 inch (25 mm) or less in nominal diameter. ~~Piping that conveys hot water that has not been heated through the use of fossil fuels or electricity~~
3. Piping that conveys hot water that has not been heated through the use of fossil fuels or electricity
4. Piping from user-controlled shower and bath mixing valves to the water outlets~~.~~ ~~For piping 1 in. (25 mm) or less, insulation is not required for valves or strainers.~~
5. Cold-water piping of a demand recirculation water system. ~~Piping in existing buildings where alterations are made to existing service water heating systems where there is insufficient space or access to meet the requirements.~~
6. Piping in existing buildings where alterations are made to existing service water heating systems where there is insufficient space or access to meet the requirements.
7. Piping at locations where a vertical support of the piping is installed.
8. Insulation is not required at the point where piping passes through a framing member if it requires increasing the size of the framing member

~~Tubing from a hot drinking-water heating unit to the water outlet.~~

~~Piping surrounded by building insulation with a thermal resistance (R-value) of not less than R-3.~~

# Add new text as follows:

C404.4.1 Installation Requirements.

The following piping shall be insulated per the requirements of this section:

1. Recirculating system piping, including the supply and return piping.
2. The first 8 ft (2.4m) of outlet piping from:
   1. Storage water heaters
   2. Hot water storage tanks
   3. Any water heater and hot water supply boiler containing 10 or more gallons (37.9 L) of water heated by a direct heat source, an indirect heat source, or both a direct heat source and an indirect heat source.
3. The first 8 ft (2.4m) of branch piping connecting to recirculated, heat traced, or impedance heated piping.
4. The make-up water inlet piping between heat traps and the storage water heaters and the storage tanks they are serving,
5. Nonrecirculating service water heating storage-system.
6. Hot water piping between multiple water heaters, between multiple hot water storage tanks, and between water heaters and hot water storage tanks.
7. Piping that is externally heated (such as heat trace or impedance heating).
8. For direct-buried service water heating system piping, reduction of these thicknesses by 1.5 in (38.1 mm) shall be permitted (before thickness adjustment required in ~~Table~~ C404.4~~.~~1 ~~(footnote a)~~) but not to thicknesses less than 1 in (25.4 mm).

TABLE C404.4.1 MINIMUM PIPING INSULATION THICKNESS FOR SERVICE WATER HEAING SYSTEMSa

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Service Hot-Water Temperature Range** | **Insulation Thermal Conductivity** | | **Nominal Pipe or Tube Size, in.** | | | | | | | | | |
| **Conductivity, Btu in h ft2** ° | **Mean Rating Temperature, ⁰F** | **<1** | | **1 to <1- 1 2** | | **1-1 2 to**  **<4** | | **4 to**  **<8** | | **:> 8** | | |
| **Insulation Thickness, in.** | | | | | | | | | |
| 105°F to 140°F | 0.22 to 0.28 | 100 | 1.0 | 1.0 | | 1.5 | | 1.5 | | 1.5 | |
| >140°F to 200°F | 0.25 to 0.29 | 125 | 1.0 | 1.0 | | 2.0 | | 2.0 | | 2.0 | |
| >200°F | 0.27 to 0.30 | 150 | 1.5 | 1.5 | | 2.5 | | 3.0 | | 3.0 | |

1. These thicknesses are based on energy efficiency considerations only. Additional insulation may be necessary for safety.

# Reason Statement:

This proposal has been submitted to create a placeholder for the IECC to incorporate changes that are being considered for inclusion in the 2022 update to ASHRAE Standard 90.1.

The existing pipe insulation thickness requirements for service water heating piping come from Table C403.12.3, which was developed primarily for space heating. The major change in this proposal is to include a pipe insulation wall thickness table in the service water heating section of the IECC. Having a separate table will allow requirements for service water heating piping insulation to be based on typical service water heating operation and operating temperatures, which may be very different from those for mechanical systems.

# Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction. The revisions proposed to this section will not change construction costs.

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