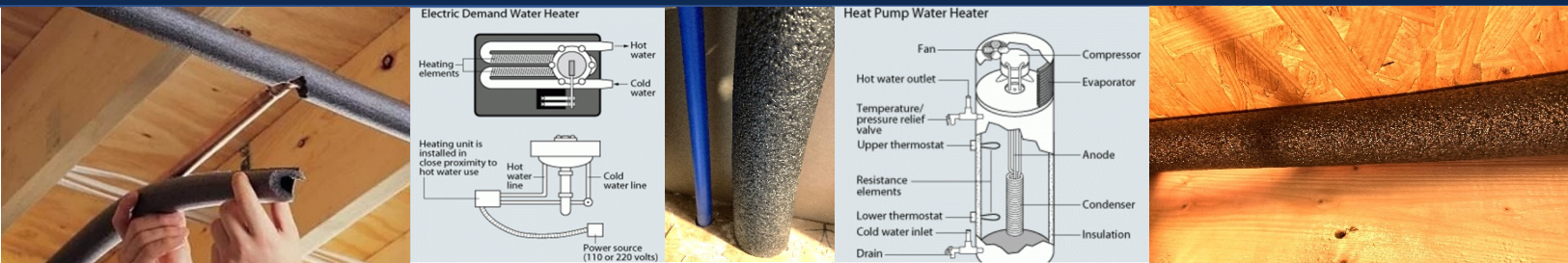


Hot Water Pipe Insulation

2018 VRC/VECC Code Guide



Hot Water Pipe Insulation:

Summary: While the plumbing code (P2603.5) has long required freeze protection of water pipes as needed, the 2012 edition of Virginia's residential energy code began requiring specific insulation performance on some domestic hot water pipes for homes following the prescriptive path. That language changed slightly from the 2012 to 2015 editions but did not between the 2015 and 2018 editions. Per N1103.5. 3 (R403.5.3), pipe insulation of not less than R-3 should be installed on:

1. piping $\frac{3}{4}$ inch and larger in nominal diameter (Virginia's 2012 edition of the building code only required piping larger than $\frac{3}{4}$ inch to be insulated)
2. piping serving more than one dwelling unit
3. piping located outside conditioned space
4. piping from the water heater to a distribution manifold
5. piping located under a floor slab
6. buried piping
7. supply and return piping in recirculation systems other than demand recirculation systems

Why: Uninsulated piping increases risk of pipe failure, increases water and water heating costs, and can contribute to resident dissatisfaction with wait times for hot water. Risk of pipes freezing is reduced when they are insulated. PEX, a commonly used material, can suffer from long-term performance problems when degraded by UV exposure. Insulation helps to minimize UV exposure. Insulated hot water piping maintains the temperature in the pipes for longer, reducing wait time at fixtures and minimizing water waste.

Best practices for effective installation:

- Insulating pipes is quick and easy with typical hand tools after leakage tests and inspections but prior to cover-up by cavity insulation, drywall, and/or other coverings.
- Cut insulation to fit tightly around corners and nearby building components.
- Secure insulation as needed with tape, wire, clips, etc.



- For storage water heaters, also insulate the first foot of incoming cold water pipe adjacent to the water heater. Heat migrates up that pipe during times of no draw.
- Foam sleeves – from R-3 to R-5 – designed for insulating pipes are widely available for less than \$.30 per linear foot (September 2022 pricing).
- Safety tip from the US Dept. of Energy: “On [atmospherically-vented] gas water heaters, insulation should be kept at least 6 inches from the flue. If pipes are within 8 inches of the flue, your safest choice is to use fiberglass pipe-wrap (at least 1-inch thick) without a facing. You can use either wire or aluminum foil tape to secure it to the pipe.”ⁱ

How much energy does it save?

As of September 2022, conservation programs managed by electric utilities in Virginia calculateⁱⁱ that pipe insulation reduces energy use by 17 kWh/year on ½” pipes and 26 kWh/year on ¾” pipe, per foot of pipe. In September 2022, much of Virginia is paying \$.14 per kWh (prices will vary by utility jurisdiction and for other fuel sources). The table below calculates the potential savings over 30 years as achieved by insulating pipes in a typical home – based on unchanging electricity rates.

Pipe diameter (inches)	Annual kWh savings per foot	kWh cost	Savings per foot per year	Sample # feet of pipe in home	Savings per year for home	Mortgage term in years	Total savings over mortgage term
0.5	17	\$ 0.14	\$ 2.38	30	\$ 71.40	30	\$ 2,142.00
0.75	26	\$ 0.14	\$ 3.64	20	\$ 72.80	30	\$ 2,184.00
				Annual savings	\$ 144.20	Lifetime savings	\$ 4,326.00

2018 VECC and VRC Pipe Insulation Code References:

Section R403.5.3/N1103.5.3 Hot Water Pipe Insulation (Prescriptive). Insulation for hot water piping with a thermal resistance, R-value, of not less than R-3 shall be applied to the following:

1. Piping ¾ inch (19 mm) and larger in nominal diameter.
2. Piping serving more than one dwelling unit.
3. Piping located outside the conditioned space.
4. Piping from the water heater to a distribution manifold.
5. Piping located under a floor slab.
6. Buried piping.
7. Supply and return piping in recirculation systems other than demand recirculation systems.

ⁱ <https://www.energy.gov/energysaver/do-it-yourself-savings-project-insulate-hot-water-pipes>.

Banner graphics from <https://www.energy.gov/energysaver/water-heating>; photos from Viridiant.

ⁱⁱ Energy savings calculations are presented in the Mid-Atlantic Technical Reference Manual (TRM) V9 at <https://neep.org/mid-atlantic-technical-reference-manual-trm-v9>