

Aquatherm Technical Bulletin

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Aquatherm Red Pipe and NFPA 24

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With regard to the use of Aquatherm red pipe at a location within the scope of NFPA 24, “Installation of Private Fire Service Mains and Their Appurtenances”, the standard allows for equivalency when a product is not explicitly noted in the table of piping materials (Sec. 1.4). This section allows the use of systems with equivalent or superior quality, strength, fire resistance, effectiveness, durability and safety when compared to products prescribed in the standard.

Chapter 10 of NFPA 24 – 2019¹ covers underground piping. Section 10.1.1 specifies that piping shall be listed for fire protection service or shall comply with one of the standards in Table 10.1.1. The Aquatherm red pipe is listed by Factory Mutual for fire suppression systems. FM does not yet have a listing program developed for underground fire protection systems, but there is a standard for polyethylene (PE) pipe for underground service. Table 1 provides a comparison of requirements.

**Table 1 – Comparison of Minimum Requirements for Listing¹
Underground PE vs. Fire Suppression PP-R**

Standard	Polyethylene Pipe	Polypropylene (PP-R) Pipe
Requirement	FM,1613 ² Underground PE	FM,1635 ² Fire Suppression PP-R
Minimum pressure rating	150 psi at 73°F	175 psi at 120°F
Potable water	PE resin NSF 61	PP resin NSF 61
Hydrostatic strength	4x WP for 5 min.	5.1-8.5 x WP depending on size
Pressure cycling	None	Piping and joints withstand 100,000 pressure cycles
Flattening/crush resistance	Max. deflection 5% to 8 ft. burial depth	200 lb. load, pipe/fitting, max. deflection 0.4% under H2O highway loading at 8 ft. depth
High Ambient Temperature Exposure	None	45 days, 200°F, <5% reduction in waterway
Ring-tensile strength	2500 psi min.	Not required, but can be calculated from burst test data, 2800-4665 psi
120°F sustained pressure	None	45 days
Temperature cycling test	None	-40°F to 120°F, 10 days, then pressure test
Vibration	None	18-37 Hz, and resonant frequencies

Standard	Polyethylene Pipe	Polypropylene (PP-R) Pipe
Head loss (Resistance to flow)	None	Verify mfr. claim for Hazen-Williams C-factor
Damage resistance	None	10% wall thickness damage, must still pass hydrostatic test
Bending moment resistance	None	Quick-burst test while at max bending per mfr. literature
Thermal expansion/contraction	None	Must withstand hydrostatic test while under max tensile stress from $\Delta T = 100^{\circ}\text{F}$

1-There are additional tests not shown in the table related to manufacturing and QC, such as elongation, bend-back, and impact. These were not included because there is not a direct means of comparison between the different materials (e.g. can't directly compare the PE bend-back test to the PP-R impact test).

As seen in Table 1, the Aquatherm red pipe would be considered to meet or exceed the requirements of one of the materials prescribed in the standard (PE). Additionally, with regard to fire exposure, the Aquatherm red pipe has met the UL requirements for fire exposure testing.

The NFPA 24 standard also has a provision for allowing "Special Listed Fittings" in Section 10.2.3. This section specifically references fittings which have been investigated for suitability in automatic sprinkler systems as being permitted under NFPA 24. The Aquatherm red pipe fittings and fusion-weld joining method are included in the FM listing for this application.

Revisions:

1. 8 December 2021 – Code updates
2. 21 December 2023 – Code numbers updated