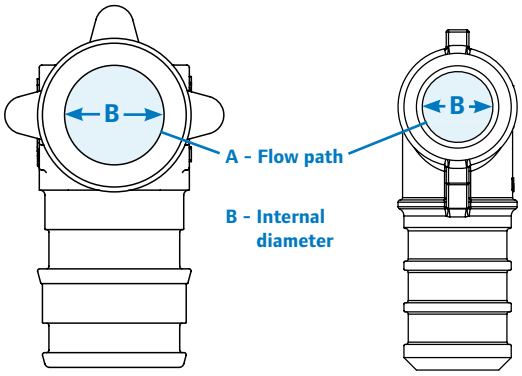
RESIDENTIAL FIRE SAFETY SYSTEMS

SPRINKLER FITTINGS

COMPARISON SHEET

Sprinkler Fittings Flow Comparison: Expansion vs. Insert

PEX-based multipurpose residential fire sprinkler systems use either expansion fittings or insert fittings. This comparison sheet shows the differences in flow rates between the two fittings, and the resulting impact on system design and cost.



ASTM F1960
ProPEX® Expansion Fitting

ASTM F1807
Insert Fitting

Differences in PEX

There are three different types of PEX: PEX-a, PEX-b and PEX-c. Uponor manufactures PEX-a tubing, which has a shape memory that allows expansion of the tubing to insert a larger-diameter fitting. The tubing then naturally and quickly shrinks back down around the fitting, forming a strong, reliable, high-flow connection.

PEX-b tubing does not have the same shape memory as PEX-a, so it requires insertion of a smaller-diameter fitting into the tubing. The tubing is then crimped or pressed onto the fitting.

The smaller-diameter fittings required with PEX-b tubing result in greater friction loss when performing water flow calculations. This increase in friction loss (measured in additional "feet of equivalent pipe") reduces the water pressure available to the sprinklers.

Compared to Uponor's expansion fitting system, a system using insert fittings will likely require one or more of the following.

1. A booster pump to provide acceptable system pressure
2. Additional tubing and fittings to provide an acceptable flow and pressure to each sprinkler
3. More sprinklers, spaced closer together, to reduce system pressure requirements

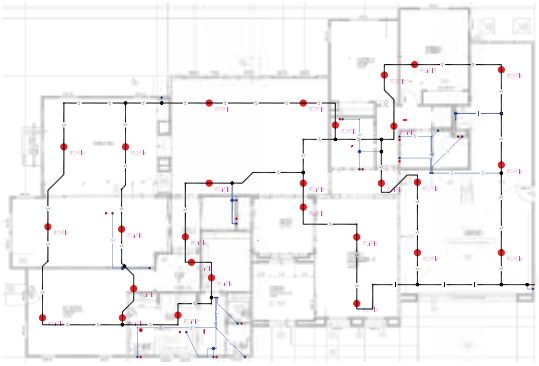
Performance Comparison: ProPEX Expansion vs. Insert

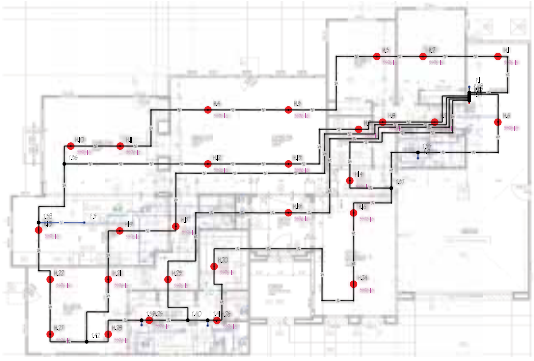
The table below shows the dimensional and performance differences between Uponor's ProPEX PEX-a expansion fittings and PEX-b insert fittings.

Criteria	Uponor ProPEX PEX-a Expansion	PEX-b Insert	Uponor Advantage
Flow Area (Dimension A, 1" fitting)	0.50 sq. in.	0.40 sq. in.	25% greater area
Internal Diameter (Dimension B, 1" fitting)	0.80"	0.71"	12% larger diameter
Flow Rate (at 8 ft./sec.)	12.4 gpm	9.9 gpm	25% greater flow
Equivalent Length (¾" branch tee)	3 feet	9 feet	Superior hydraulic performance
Equivalent Length (¾" elbow)	3 feet	8 feet	Superior hydraulic performance

Sprinkler Design Layouts: ProPEX Expansion vs. Insert

The following sprinkler designs illustrate the practical benefits of Uponor ProPEX PEX-a expansion fittings compared to PEX-b insert fittings for the same house.





ProPEX Expansion Design Layout

Because of the high-flow expansion fittings, Uponor's design uses only 391 feet of ¾" PEX-a tubing to generate 26 gallons of flow per minute to the sprinklers. Using Uponor large-diameter fittings in this design requires just 53.8 psi (using PEX-b lower-flow insert fittings would demand 83.2 psi, which would exceed safe working pressures for the system).

Insert Fitting Design Layout

To overcome the flow restrictions and friction losses from smaller-diameter insert fittings, this design requires 628 feet of ¾" tubing to create a system that is able to operate at an acceptable 46.6 psi. (Using Uponor's higher-flow expansion fittings on the same design would require only 37.5 psi.) Note that pressures in many jurisdictions are as low as 40 psi, so in this case, the system would require the installation of a booster pump.

Criteria	Uponor ProPEX PEX-a Expansion	PEX-b Insert
Feet of tubing	391	628
Required pressure	35% lower psi	24% higher psi

Dry-fit Concerns

Since fire sprinkler systems using insert fittings can be pre-assembled by inserting the fitting without expanding the tubing (called dry-fitting), the installer has to remember to crimp or press the tubing onto every fitting. If the installer misses just one connection, expensive leaks can result. It is impossible to dry fit Uponor's ProPEX expansion connections since the tubing has to be expanded before inserting the fitting.

Conclusion

The higher flow rate of Uponor's larger-diameter ProPEX expansion fittings results in a more efficient system that requires fewer materials and less labor to install.

- Less tubing (38% less in this example)
- Fewer fittings and connections
- Less labor to install
- Lower pressure requirements (20% to 35% lower in this example)
- No need for a pressure-increasing booster pump
- Fewer sprinklers, spaced further apart
- No potential for dry-fitting leaks

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