



RESIDENTIAL FIRE  
SAFETY SYSTEMS

SPRINKLER INSULATION

INSTALLATION GUIDE

## Uponor AquaSAFE™ Attic Insulation Guidelines

*This document is intended to provide guidelines for insulating Uponor AquaSAFE™ multipurpose residential fire sprinkler systems that include tubing installed in attics. These are recommendations only and are not intended to provide a guarantee against freezing or over pressurization. All state and local building code requirements must always be followed and supersede any recommendations made herein.*

Uponor's AquaSAFE multipurpose fire sprinkler system uses flexible Uponor AquaPEX® tubing to integrate the fire sprinklers with a home's cold-water plumbing. Because water-filled residential fire sprinkler tubing is often installed in attics, care must be

taken to protect the tubing from excessive cold and heat. Although the flexibility of Uponor AquaPEX tubing makes it more resistant to freeze damage than rigid pipe, it must still be properly insulated to ensure proper performance.

According to the NFPA (National Fire Protection Association), sprinkler tubing must be maintained between 40°F to 120°F. In regions that experience extreme temperatures, proper insulation of any tubing is essential.

A determination of the level of insulation necessary to meet the NFPA standards is dependent upon four variables:

1.  $T_i$ : The temperature of the indoor, conditioned living space
2.  $T_o$ : The temperature of the outdoor, unconditioned attic space
3.  $R_i$ : The R-value of the insulation between the tubing and the conditioned living space below
4.  $R_o$ : The R-value of the insulation above the tubing

Use the following formulas to determine the amount of insulation required above the tubing:

- For cold regions:  $R_o = R_i (T_o - 40) / (40 - T_i)$
- For hot regions:  $R_o = R_i (T_o - 120) / (120 - T_i)$

**Note:** All temperatures are in °F.

### Preferred Installation Method

To achieve maximum protection of tubing from extreme hot or cold temperatures, insulation should be installed only above the tubing. This will maximize the effectiveness of the insulation and allow the tubing to remain closer to the temperature of the living space below (**Figure 1**).

If fire sprinkler tubing is installed in this fashion, the formulas above indicate that insulating the attic according to the U.S. Department of Energy<sup>1</sup> guidelines will also properly protect the tubing from excessively cold or hot temperatures.

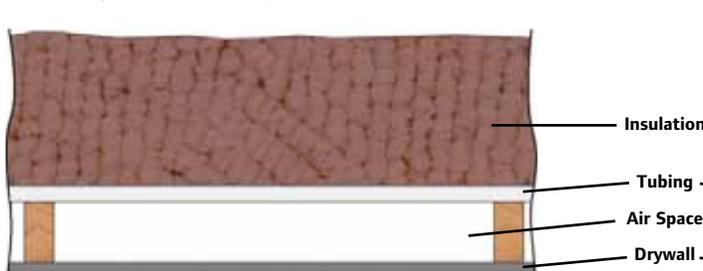


Figure 1: Preferred Installation Method

### Alternative Installation Method

If any insulation is allowed beneath the tubing, thereby insulating it from the conditioned living space as demonstrated below (**Figure 2**), additional insulation must be installed above the tubing in order to maximize protection. The ratio of the R-value above the tubing ( $R_o$ ) over the R-value under the tubing ( $R_i$ ) must be high enough to keep the temperature of the tubing between the required 40°F to 120°F.



Figure 2: Alternative Installation Method

<sup>1</sup>Insulation Fact Sheet, United States Department of Energy. [http://www.ornl.gov/sci/roofs+walls/insulation/ins\\_08.html](http://www.ornl.gov/sci/roofs+walls/insulation/ins_08.html)

### Protection from Heat

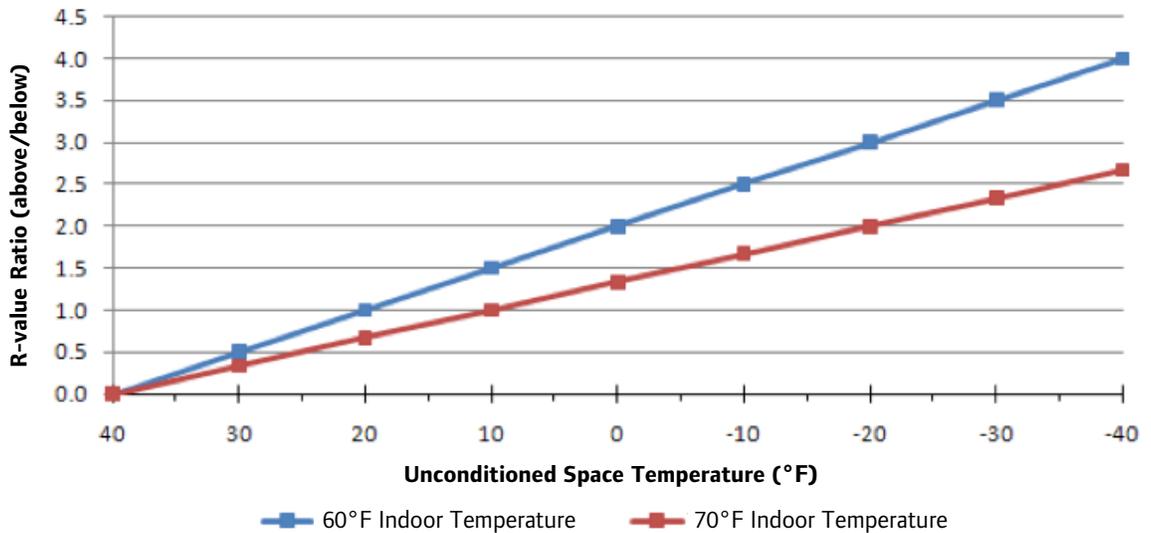
In excessively hot conditions, a 2:1 ratio of  $R_o:R_i$  calculated in accordance with the formulas on the previous page will maintain the temperature of the tubing below 120°F for unconditioned attic temperatures of 180°F with a conditioned space temperature as high as 85°F.

### Protection from Cold

In cold climates, **Graph 1** shows the acceptable  $R_o:R_i$  ratios for various attic temperatures ( $T_o$ ) and conditioned-space temperatures ( $T_i$ ).

If local conditions differ from those provided in **Graph 1**, recommended insulation levels may be calculated according to the formulas on the previous page.

**R-value Ratio vs. Attic Temperature — Protection from Cold**



**Graph 1: R-value Ratio vs. Attic Temperature — Protection from Cold**

**Uponor, Inc.**  
5925 148th Street West  
Apple Valley, MN 55124 USA  
Tel: 800.321.4739  
Fax: 952.891.2008  
Web: [www.uponor-usa.com](http://www.uponor-usa.com)

**Uponor Ltd.**  
2000 Argentia Rd., Plaza 1, Ste. 200  
Mississauga, ON L5N 1W1 CANADA  
Tel: 888.994.7726  
Fax: 800.638.9517  
Web: [www.uponor.ca](http://www.uponor.ca)

**Uponor**