Table 6 - Insulation thicknesses for protection against freezing in buildings other than dwellings

England, Scotland & Wales:

Refer to *BS 5422: 2009* Table 29 or TIMSA Guide Section 7.[1,2], page 29.

	Outside diameter (mm)	Inside diameter (bore) (mm)	Thickness of Isover Foil Faced Pipe Section (mm)	
			Specified conditions 1	Specified conditions 2
			Indoor	Outdoor
Copper pipe 3	15	13.6	80	420
	22	20.2	25	60
	28	26.2	20	30
	35	32.6	20	20
	42	39.6	20	20
	54	51.6	20	20
	76.1	73.1	20	20
	108	105	20	20
Steel pipe 4	21.3	16	50	175
	26.9	21.6	25	40
	33.7	27.2	20	20
	42.4	35.9	20	20
	48.3	41.8	20	20
	60.3	53	20	20
	76.1	68.8	20	20
	88.9	80.8	20	20

3 To table 3 of *BS EN 1057: 1996*

4 To table 4 of *BS 1387: 1985*

Specified conditions [1]: water temperature 2°C; ambient temperature -6°C; evaluation period 12h; permitted ice formation 50 %; indoor.

Specified conditions [2]: water temperature 2°C; ambient temperature -10°C; evaluation period 12h; permitted ice formation 50%; outdoor.

Thermal conductivity (Lambda λ) [W/mK)]

NOTE: Thicknesses given are calculated specifically against the criteria noted in the table. Adopting these thicknesses may not satisfy other design requirements.

NOTE: Some of the insulation thicknesses given are too large to be applied in practice but are included to highlight the difficulty in protecting small diameter pipes against freezing. To provide the appropriate degree of frost protection to certain sizes of pipes, it may be necessary to provide additional heat to the system, for example by circulating the water or trace heating. Where electric trace heating is fitted to pipework, oversized pre-formed sections of glass mineral wool insulation shall be provided to accommodate the thickness of the trace heating cable.

NOTE: Assumed densities (λ) and heat capacities (cp); λ water = 1 000 kg/m³, cp water = 4 200 J/kgλK λ steel = 7 840 kg/m³, cp steel = 455 J/kgλK λ copper = 8 900 kg/m³, cp copper = 390 J/kgλK

NOTE: Thicknesses of insulation based on inner diameter of pipe.

NOTE: Local climate data used for London based on average annual values. Temperature 11°C and wind velocity 4.4m/s.