

Calculation of Pipe Expansion

A pipe will expand when heated up and contract when cooled. This can be expressed through the expansion formula.

The temperature expansion of pipes depends on the start and final temperature and the expansion coefficient of the piping material. The general expansion formula can be expressed as:

$$(1) \Delta l = L_o * \Delta t * a$$

where

Δl = expansion (inches)

L_o = length of pipe (inch)

Δt = temperature difference (°F)

a = linear expansion coefficient (inch/inch°F)

The expansion coefficient may vary with the temperature as shown in this table:

Expansion coefficient * 10 ⁻⁶	Temperature range (°F)							
	-30 - 32	32 - 212	32 - 400	32 - 600	32 - 750	32 - 900	32 - 1100	32 - 1300
Alloy Steel 1% Cr. 1/2% Mo	7,7	8,0	8,4	8,8	9,2	9,6	9,8	
Mild Steel 0,1-0,2% C	7,1	7,8	8,3	8,7	9,0	9,5	9,7	
Stainless Steel 18% Cr. 8% Ni	10,8	11,1	11,5	11,8	12,1	12,4	12,6	12,8

The same formula (1) can be used with SI units. The expansion coefficient must of course be adjusted to °C.