

System design

Calculating expansion and contraction

The change in length (relative to its original length) due to temperature is expressed by the parameter "linear coefficient of thermal expansion". This parameter can be incorporated into a simple equation to calculate the change in length of a pipe for a given change in temperature.

The following formula is used:

$$\Delta L = L \cdot \Delta T \cdot \sigma$$

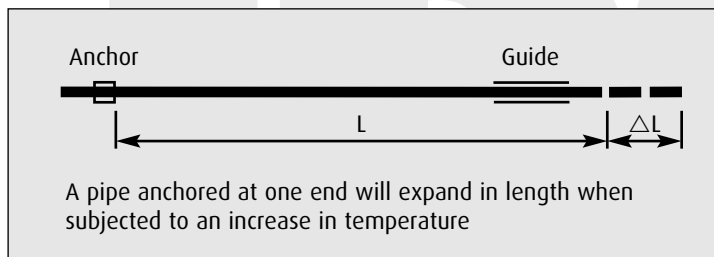
where

- ΔL = Change in length (mm)
- L = Length of pipe being studied (m)
- ΔT = Temperature change ($^{\circ}\text{C}$)
- σ = Material coefficient of linear expansion (see below)

Coefficient of linear expansion by material(σ)

- PVC-U = 0.08 mm/m $^{\circ}\text{C}$
- PVC-C = 0.07 mm/m $^{\circ}\text{C}$
- ABS = 0.10 mm/m $^{\circ}\text{C}$
- PE = 0.20 mm/m $^{\circ}\text{C}$
- PP = 0.15 mm/m $^{\circ}\text{C}$
- PVDF = 0.12 mm/m $^{\circ}\text{C}$
- ECTFE = 0.10 mm/m $^{\circ}\text{C}$

Remember to incorporate the installation temperature into the calculation if appropriate, as well as the change in operating temperatures.



Example:

An ABS straight pipe run 250metres long is installed in ambient temperature conditions of 10°C . The maximum operating temperature is 35°C . The minimum operating temperature is 15°C . How much expansion is expected?

$$\Delta L = L \cdot \Delta T \cdot \sigma$$

$$\Delta L = 250 \cdot (35 - 10) \cdot 0.10$$

$$\Delta L = 625\text{mm}$$