Therefore, the variation of temperature will be followed by the variation of pressure in pipe. The effect of temperature change can be calculated with the following formula :

1. Restrained Pipe :

$$dP = \frac{\beta - 2\alpha}{\{D/(Et)(1-V^2)\} + C}$$

2. Unrestrained Pipe :

$$dP = \frac{\beta - 3\alpha}{\{D/(Et)(5-4V)/4\} + C}$$

Where :

dP = Pressure rise / drop in PSI for lo rise I drop in temperature

$\alpha$ = Coefficient of expansion of pipe = 1.117 E-05

$\beta$ = Coefficient of expansion of water
$(-64 - 265 + 17.0105t - 0.20369t^2 - 0.00160 - t^3) \times 10^{-6} / °C$
Where : t = Water Temperature

E = Young modulus of pipe = 30 E = 0.6 PSI

V = Poisson Ratio = 0.3

D = Pipe OD ( inch )

T = Pipe Thickness ( inch )

C = Compressibility of water

**Reference : J.C. Gray** - *How Temperature Affects Pipeline Hydrostatic Testing Pipeline and Gas Journal ( December 1986 ).*

In piping system hydrostatic test the water medium will pressurize until the testing pressure.
In great water volume and long pipeline, time for stabilization should be allowed to reach the pressure balance and heat transfer to all water volume in pipe.

## 7.0. LIMIT OF TEST PRESSURE

7.1. The allowable maximum pressure should not greater than " Flange Rating " or limited by 90% of pipe SMYS, which is lesser. The minimum test pressure at any point shall be 1.5 times design pressure.

7.2. If the pressures drop during the holding period and is not attributed to changes in temperature and is less than 0.2% of test pressure, the result is considered satisfactory.

7.3. If the pressure drop during the holding period and is not attributed to changes in temperature and is greater than 0.2% of test pressure, refer to section 6.0. for effect of temperature on hydrostatic testing pressure