

### Answer on Question #59650-Engineering-Other

A steel rail is 15m long and is laid at temperature of 25c. The maximum temperature expected is 45c

1. Estimate the minimum gap between two rails to be left so that temperature stresses do not develop.
2. Calculate the thermal stress develop in the rail if no expansion joint is provided.
3. Calculate the thermal stress developed in the rail if a 2.5mm gap is provided.

### Solution

$$l = 15 \text{ m}, T = 45 - 25 = 20^\circ\text{C}.$$

Since the coefficient of linear thermal expansion and Young's modulus are not given assume suitable data.

$$\alpha = 12 \cdot 10^{-6} \frac{1}{^\circ\text{C}}, E = 200 \cdot 10^3 \frac{\text{N}}{\text{mm}^2}.$$

1.

$$dl = \alpha T l = 12 \cdot 10^{-6} \cdot 20 \cdot 15 \cdot 10^3 = 3.6 \text{ mm}.$$

2.

$$\sigma = \alpha T E = 12 \cdot 10^{-6} \cdot 20 \cdot 200 \cdot 10^3 = 48 \frac{\text{N}}{\text{mm}^2}.$$

3.

$$\sigma = E \frac{dl}{l} = 200 \cdot 10^3 \frac{2.5}{15 \cdot 10^3} = 33 \frac{\text{N}}{\text{mm}^2}.$$