$$A = l^2 = \{l_0(1+\alpha\cdot\Delta T)\}^2$$

$$A = l_0^2(1+2\alpha\cdot\Delta T + \underline{\alpha^2\cdot\Delta T^2})$$

$\because$ α is very small α^2 can be negected

$$A = l_0^2(1+2\alpha\cdot\Delta T)$$

$$A = A_0(1+2\alpha\cdot\Delta T) \quad \text{— (4)}$$

comparing eq (3) & (4) $\boxed{\beta = 2\alpha}$ — (5)

(11) Relation Between α and γ : Let there is a cube of side l_0 at temp T_0

$$V_0 = l_0^3 \quad \text{— (5)}$$

At T ; $V = V_0(1+\gamma\cdot\Delta T)$ — (6)

$$l = l_0(1+\alpha\cdot\Delta T) \quad \text{— (7)}$$

At temp. T $V = l^3 \Rightarrow V = l_0(1+\alpha\cdot\Delta T)^3$

$\because$ α is small, α^2 and α^3 can be neglected

$$V = l_0(1+3\alpha\cdot\Delta T) \quad \text{— (8)}$$

comparing eq (6) and eq (8) $\boxed{\gamma = 3\alpha}$