12.4 VARIATION OF MECHANICAL PROPERTIES OF STEEL WITH TEMPERATURE

12.4.1 Variation of yield stress with temperature The influence of temperature on the yield stress of steel shall be taken as follows:

$$\frac{f_y(T)}{f_y(20)} = 1.0 \qquad \text{when } 0°C < T \leq 215°C; \text{ and}$$

$$= \frac{905 - T}{690} \qquad \text{when } 215°C < T \leq 905°C$$

where

$f_y(T)$ = yield stress of steel at T °C

$f_y(20)$ = yield stress of steel at 20°C

T = temperature of the steel in °C.

This relationship is shown by Curve 1 in Figure 12.4.

12.4.2 Variation of modulus of elasticity with temperature The influence of temperature on the modulus of elasticity of steel shall be taken as follows:

$$\frac{E(T)}{E(20)} = 1.0 + \left[\frac{T}{2000\left[\ln\left(\frac{T}{1100}\right)\right]}\right] \qquad \text{when } 0°C < T \leq 600\ °C; \text{ and}$$

$$= \frac{690\left(1 - \frac{T}{1000}\right)}{T - 53.5} \qquad \text{when } 600°C < T \leq 1000°C$$

where

$E(T)$ = modulus of elasticity of steel at T °C

$E(20)$ = modulus of elasticity of steel at 20°C.

This relationship is shown by Curve 2 in Figure 12.4.