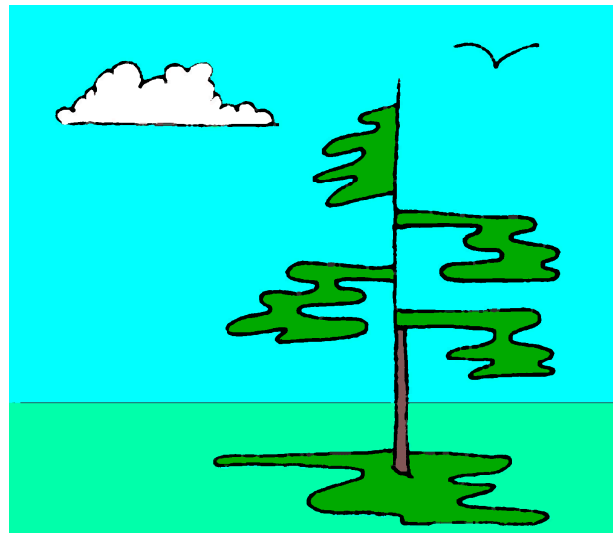


**NorthWoods Software****Program Name: Concrete\_E****Project Name:****Project Number:****Project Description:****Project Designer: Dik****Last Revised (yy-mm-dd): 18-05-18****Reference: CSA Standard A23.3-14****Concrete Properties:**

$$\Phi_c := 0.65$$

Material Factor for Concrete

8.4.2

$$f'_c := 25 \text{ MPa}$$

28 day Concrete Compressive Strength

$$\gamma_c := 2500 \frac{\text{kg}}{\text{m}^3}$$

Concrete Density Factor

$$\lambda := 1.00$$

 $\lambda = 1.00$  Regular Weight Concrete 2150=2500 $\lambda = 0.85$  Semi-Low Density Concrete 1850-2150 $\lambda = 0.75$  Low Density Concrete less than 1850**Concrete Modulus of Elasticity**

$$\text{if } \left( \gamma_c < 1500 \frac{\text{kg}}{\text{m}^3} \right) \vee \left( \gamma_c > 2500 \frac{\text{kg}}{\text{m}^3} \right)$$

Equation 8.1

$$E_c := 0.0$$

else

$$E_c := \left( \frac{3300 \cdot \sqrt{f'_c}}{\text{MPa}^{.5}} + 6900 \right) \cdot \left( \frac{\gamma_c}{2300} \right)^{1.5} \frac{\text{m}}{\text{kg}^{.5}} \text{ MPa}$$

$$E_c = 3846 \text{ ksi}$$

$$E_c = 26518 \text{ MPa}$$

**Alternative Modulus of Elasticity**

$$20 \leq f'_c \leq 40$$

Equation 8.2

$$E_c := \frac{4500 \cdot \sqrt{f'_c}}{\text{MPa}^{.5}} \text{ MPa}$$

$$E_c = 3263 \text{ ksi}$$

$$E_c = 22500 \text{ MPa}$$