

主要な単位の換算

(1) 力の単位

ニュートン [N] : 1 [kg]の質量の物体に 1 [m/s²]の加速度を与える大きさ

$$\therefore 1 [N] = 1 [kg] \times 1 [m/s^2] = 1 [kgm/s^2] = \frac{1}{9.80665} [kg重]$$

$$1 [kN] = 1 \times 10^3 [N] = 1 \times 10^3 [kgm/s^2] = \frac{1 \times 10^3}{9.80665} [kg重] = \frac{1}{9.80665} [ton重]$$

ただし, 1 [重] = 1 [重力加速度] = 9.80665 [m/s²]

$$\text{例) } 500 [kN] = \frac{500}{9.80665} [ton重] = 50.986 [ton重]$$

(2) モーメントの単位

$$1 [kNm] = 1 \times 10^3 [Nm] = 1 \times 10^3 [kgm/s^2][m] = \frac{1 \times 10^3}{9.80665} [kg重m]$$

$$= \frac{1}{9.80665} [ton重m]$$

$$1 [ton重m] = 9.80665 [kNm]$$

$$1 [kg重m] = 9.80665 [Nm]$$

(3) 圧力の単位

パスカル [Pa] : 1 [m²]当たり 1 [N]の力が作用する圧力

$$\therefore 1 [Pa] = 1 [N/m^2]$$

$$1 [Pa] = 1 [N/m^2] = \frac{1}{9.80665} [kg重/m^2] = \frac{1}{9.80665 \times 10^2 \times 10^2} [kg重/cm^2]$$

$$= \frac{1 \times 10^{-4}}{9.80665} [kg重/cm^2]$$

$$1 [MPa] = 1 \times 10^6 [Pa] = 1 \times 10^6 \times \frac{1 \times 10^{-4}}{9.80665} [kg重/cm^2] = \frac{1 \times 10^2}{9.80665} [kg重/cm^2]$$

$$1 [Pa] = 1 [N/m^2] = \frac{1}{10^3 \times 10^3} [N/mm^2] = 1 \times 10^{-6} [N/mm^2]$$

$$1 [MPa] = 1 [N/mm^2]$$

$$\text{例) } 200\,000 [MPa] = 200\,000 \times \frac{1 \times 10^2}{9.80665} [kg重/cm^2] = 2.03944 \times 10^6 [kg重/cm^2]$$

この値は、鉄のヤング係数に相当する。コンクリートのヤング係数は鉄の約 1/10

(4) 仕事, エネルギーの単位

ジュール [J] : 1 [N]の大きさの力が, その力の方向に 1 [m]動かすときになす仕事

$$1 [J] = 1 [Nm] = 10^7 [erg], \quad 1 [kg重m] = 9.80665 [Nm] = 9.80665 [J]$$

$$1 [J] = 1 [Nm] = 10^{-3} [kNm] = 1 [kN mm]$$