Important Adjustment Factors for Design Values Formulas PDF

Formulas
Examples
with Units

List of 16
Important Adjustment Factors for Design Values Formulas

1) Adjusted Design Value for Compression Parallel to Grain Formula

Evaluate Formula

Formula

$$F' = \left(F_c \cdot C_D \cdot C_m \cdot C_t \cdot C_F \cdot C_p \right)$$

Example with Units

$$5.6643\,\text{MPa} = \left(7.5\,\text{MPa} \cdot 0.74 \cdot 0.81 \cdot 0.8 \cdot 1.05 \cdot 1.5 \right)$$

2) Adjusted Design Value for Compression Perpendicular to Grain Formula

Evaluate Formula

Formula

$$F' = F_{c\perp} \cdot C_m \cdot C_t \cdot C_b$$

Example with Units

$$5.8757\,\text{MPa} = 9\,\text{MPa} \cdot 0.81 \cdot 0.8 \cdot 1.0075$$

3) Adjusted Design Value for End Grain in Bearing Parallel to Grain Formula

Evaluate Formula

Formula

$$F' = F_g \cdot C_D \cdot C_t$$

Example with Units

$$10.064\,\text{MPa} = 17\,\text{MPa} \cdot 0.74 \cdot 0.8$$

4) Adjusted Design Value for Shear Formula

Evaluate Formula

Formula

$$F' = F_v \cdot C_D \cdot C_m \cdot C_t \cdot C_H$$

Example with Units

$$9.3506\,\text{MPa} = 30\,\text{MPa} \cdot 0.74 \cdot 0.81 \cdot 0.8 \cdot 0.65$$

5) Adjusted Design Value for Tension Formula

Evaluate Formula

Formula

$$F' = \left(F_t \cdot C_D \cdot C_m \cdot C_t \cdot C_F \right)$$

Example with Units

$$8.4084\,\text{MPa} = \left(16.70\,\text{MPa} \cdot 0.74 \cdot 0.81 \cdot 0.8 \cdot 1.05 \right)$$

6) Bearing Area Factor Formulas

6.1) Bearing Area Factor Formula

Evaluate Formula

Formula

$$C_b = \left(\frac{l_{b1} + 0.375}{l_{b1}} \right)$$

Example with Units

$$1.0075 = \left(\frac{50.0\,\text{mm} + 0.375}{50.0\,\text{mm}} \right)$$

6.2) Bearing Length given Bearing Area Factor Formula

Evaluate Formula

Formula

$$l_{b1} = \left(\frac{0.375}{C_b - 1}\right)$$

Example with Units

$$50\,\text{mm} = \left(\frac{0.375}{1.0075 - 1}\right)$$

7) Column Stability and Buckling Stiffness Factor Formulas

7.1) Buckling Stiffness Factor Formula

Evaluate Formula

Formula

$$C_T = 1 + \left(\frac{K_M \cdot L_e}{K_T \cdot E}\right)$$

Example with Units

$$97.8136 = 1 + \left(\frac{1200 \cdot 2380\,\text{mm}}{0.59 \cdot 50\,\text{MPa}}\right)$$

7.2) Slenderness Ratio for Beams Formula

Evaluate Formula

Formula

$$R_B = \sqrt{\frac{L_e \cdot d}{(w)^2}}$$

Example with Units

$$13.528 = \sqrt{\frac{2380\,\text{mm} \cdot 200\,\text{mm}}{(51\,\text{mm})^2}}$$

8) Radial Stresses and Curvature Factor Formulas

8.1) Bending Moment given Radial Stress in Member Formula

Evaluate Formula

Formula

$$M'_b = \frac{2 \cdot \sigma_r \cdot R \cdot w \cdot d}{3}$$

Example with Units

$$800.0003\,\text{N*m} = \frac{2 \cdot 1.30719\,\text{MPa} \cdot 90\,\text{mm} \cdot 51\,\text{mm} \cdot 200\,\text{mm}}{3}$$

8.2) Cross Section Depth given Radial Stress in Member Formula

Evaluate Formula

Formula

$$d = \frac{3 \cdot M'_b}{2 \cdot \sigma_r \cdot R \cdot w}$$

Example with Units

$$199.9999\,\text{mm} = \frac{3 \cdot 800\,\text{N*m}}{2 \cdot 1.30719\,\text{MPa} \cdot 90\,\text{mm} \cdot 51\,\text{mm}}$$

8.3) Cross Section Width given Radial Stress in Member Formula

Evaluate Formula

Formula

$$w = \frac{3 \cdot M'_b}{2 \cdot \sigma_r \cdot R \cdot d}$$

Example with Units

$$51\,\text{mm} = \frac{3 \cdot 800\,\text{N*m}}{2 \cdot 1.30719\,\text{MPa} \cdot 90\,\text{mm} \cdot 200\,\text{mm}}$$

8.4) Curvature Factor for Adjustment in Design Value for Curved Portions of Wood Formula

Evaluate Formula

Formula

$$C_c = 1 - \left(2000 \cdot \left(\frac{t}{R}\right)^2\right)$$

Example with Units

$$0.8 = 1 - \left(2000 \cdot \left(\frac{0.9\,\text{mm}}{90\,\text{mm}}\right)^2\right)$$

8.5) Radial Stress Induced by Bending Moment in Member Formula

Evaluate Formula

Formula

$$\sigma_r = 3 \cdot \frac{M'_b}{2 \cdot R \cdot w \cdot d}$$

Example with Units

$$1.3072\,\text{MPa} = 3 \cdot \frac{800\,\text{N*m}}{2 \cdot 90\,\text{mm} \cdot 51\,\text{mm} \cdot 200\,\text{mm}}$$

8.6) Radius of Curvature given Radial Stress in Member Formula

Evaluate Formula

Formula

$$R = \frac{3 \cdot M'_b}{2 \cdot \sigma_r \cdot w \cdot d}$$

Example with Units

$$90\,\text{mm} = \frac{3 \cdot 800\,\text{N*m}}{2 \cdot 1.30719\,\text{MPa} \cdot 51\,\text{mm} \cdot 200\,\text{mm}}$$

8.7) Size Factor for Adjustment in Design Value for Bending Formula

Evaluate Formula

Formula

$$C_F = \left(\frac{12}{d}\right)^{\frac{1}{9}}$$

Example with Units

$$1.0479 = \left(\frac{12}{200\,\text{mm}}\right)^{\frac{1}{9}}$$

Variables used in list of Adjustment Factors for Design Values Formulas above

- C_b Bearing Area Factor
- C_c Curvature Factor
- C_D Load Duration Factor
- C_F Size Factor
- C_H Shear Stress Factor
- C_m Wet Service Factor
- C_p Column Stability Factor
- C_t Temperature Factor
- C_T Buckling Stiffness Factor
- **d** Depth of Cross Section *(Millimeter)*
- **E** Modulus of Elasticity *(Megapascal)*
- **F'** Adjusted Design Value *(Megapascal)*
- F_c Design Value for Parallel Compression *(Megapascal)*
- $F_{c\perp}$ Design Value for Compression Perpendicular *(Megapascal)*
- F_g Design Value for Bearing *(Megapascal)*
- F_t Design Value for Tension *(Megapascal)*
- F_v Design Value for Shear *(Megapascal)*
- K_M Stiffness Factor for Wood
- K_T Stiffness Factor for Lumber
- l_{b1} Length of Bearing *(Millimeter)*
- L_e Effective Length *(Millimeter)*
- M'_b Bending Moment for Radial Stress *(Newton Meter)*
- **R** Radius of Curvature at Centerline of Member *(Millimeter)*
- R_B Slenderness Ratio
- **t** Lamination Thickness *(Millimeter)*
- **w** Width of Cross Section *(Millimeter)*
- σ_r Radial Stress *(Megapascal)*

Constants, Functions, Measurements used in list of Adjustment Factors for Design Values Formulas above

- Functions: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: **Length** in Millimeter (mm)
  Length Unit Conversion
- Measurement: **Pressure** in Megapascal (MPa)
  Pressure Unit Conversion
- Measurement: **Moment of Force** in Newton Meter (N*m)
  Moment of Force Unit Conversion
- Measurement: **Stress** in Megapascal (MPa)
  Stress Unit Conversion

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