Important Design of Stiffeners under Loads Formulas PDF

Formulas
Examples
with Units

List of 12
Important Design of Stiffeners under Loads Formulas

1) Allowable Bearing Stress on Projected Area of Fasteners Formula

Evaluate Formula

Formula

$$F_p = 1.2 \cdot TS$$

Example with Units

$$9.84\,\text{MPa} = 1.2 \cdot 8.2\,\text{MPa}$$

2) Column Yield Stress given Cross-Sectional Area of Column Web Stiffeners Formula

Evaluate Formula

Formula

$$F_{yc} = \frac{P_{bf} - \left(A_{cs} \cdot F_{yst}\right)}{t_{wc} \cdot \left(t_f + 5 \cdot K\right)}$$

Example with Units

$$50\,\text{MPa} = \frac{5000\,\text{kN} - \left(20\,\text{m}^2 \cdot 50\,\text{MPa}\right)}{2\,\text{mm} \cdot \left(15\,\text{mm} + 5 \cdot 5\,\text{mm}\right)}$$

3) Column-Web Depth Clear of Fillets Formula

Evaluate Formula

Formula

$$d_c = \frac{4100 \cdot t_{wc}^{\,3} \cdot \sqrt{F_{yc}}}{P_{bf}}$$

Example with Units

$$46.3862\,\text{mm} = \frac{4100 \cdot 2\,\text{mm}^{\,3} \cdot \sqrt{50\,\text{MPa}}}{5000\,\text{kN}}$$

4) Computed Force for Column-Web Depth of Fillets Formula

Evaluate Formula

Formula

$$P_{bf} = \frac{4100 \cdot t_{wc}^{\,3} \cdot \sqrt{F_{yc}}}{d_c}$$

Example with Units

$$5041.9788\,\text{kN} = \frac{4100 \cdot 2\,\text{mm}^{\,3} \cdot \sqrt{50\,\text{MPa}}}{46\,\text{mm}}$$

5) Computed Load given Cross-Sectional Area of Column Web Stiffeners Formula

Evaluate Formula

Formula

$$P_{bf} = \left(A_{cs} \cdot F_{yst}\right) + \left(F_{yc} \cdot t_{wc} \cdot \left(t_f + 5 \cdot K\right)\right)$$

Example with Units

$$5000\,\text{kN} = \left(20\,\text{m}^2 \cdot 50\,\text{MPa}\right) + \left(50\,\text{MPa} \cdot 2\,\text{mm} \cdot \left(15\,\text{mm} + 5 \cdot 5\,\text{mm}\right)\right)$$

6) Cross sectional area of Column Web Stiffeners Formula

Evaluate Formula

Formula

$$A_{cs} = \frac{P_{bf} - F_{yc} \cdot t_{wc} \cdot \left(t_f + 5 \cdot K \right)}{F_{yst}}$$

Example with Units

$$20\,\text{m}^2 = \frac{5000\,\text{kN} - 50\,\text{MPa} \cdot 2\,\text{mm} \cdot \left(15\,\text{mm} + 5 \cdot 5\,\text{mm} \right)}{50\,\text{MPa}}$$

7) Distance between Outer Face of Column Flange and Web Toe given Cross-Sectional Area Formula

Evaluate Formula

Formula

$$K = \frac{\left(\frac{P_{bf} - \left(A_{cs} \cdot F_{yst} \right)}{F_{yc} \cdot t_{wc}} \right) - t_f}{5}$$

Example with Units

$$5\,\text{mm} = \frac{\left(\frac{5000\,\text{kN} - \left(20\,\text{m}^2 \cdot 50\,\text{MPa} \right)}{50\,\text{MPa} \cdot 2\,\text{mm}} \right) - 15\,\text{mm}}{5}$$

8) Stiffener Yield Stress given Cross Sectional Area of Column Web Stiffeners Formula

Evaluate Formula

Formula

$$F_{yst} = \frac{P_{bf} - F_{yc} \cdot t_{wc} \cdot \left(t_f + 5 \cdot K \right)}{A_{cs}}$$

Example with Units

$$50\,\text{MPa} = \frac{5000\,\text{kN} - 50\,\text{MPa} \cdot 2\,\text{mm} \cdot \left(15\,\text{mm} + 5 \cdot 5\,\text{mm} \right)}{20\,\text{m}^2}$$

9) Tensile Strength of Connected Part using Allowable Bearing Stress Formula

Evaluate Formula

Formula

$$TS = \frac{F_p}{1.2}$$

Example with Units

$$8.1667\,\text{MPa} = \frac{9.8\,\text{MPa}}{1.2}$$

10) Thickness of Column Flange Formula

Evaluate Formula

Formula

$$t_f = 0.4 \cdot \sqrt{\frac{P_{bf}}{F_{yc}}}$$

Example with Units

$$4\,\text{mm} = 0.4 \cdot \sqrt{\frac{5000\,\text{kN}}{50\,\text{MPa}}}$$

11) Thickness of Column Web given Column Web Depth Clear of Fillets Formula

Evaluate Formula

Formula

$$t_{wc} = \left(\frac{d_c \cdot P_{bf}}{4100 \cdot \sqrt{F_{yc}}} \right)^{\frac{1}{3}}$$

Example with Units

$$1.9944\,\text{mm} = \left(\frac{46\,\text{mm} \cdot 5000\,\text{kN}}{4100 \cdot \sqrt{50\,\text{MPa}}} \right)^{\frac{1}{3}}$$

12) Thickness of Column Web given Cross-Sectional Area of Column Web Stiffeners Formula

Evaluate Formula

Formula

$$t_{wc} = \frac{P_{bf} - \left(A_{cs} \cdot F_{yst} \right)}{F_{yc} \cdot \left(t_f + 5 \cdot K \right)}$$

Example with Units

$$2\,\text{mm} = \frac{5000\,\text{kN} - \left(20\,\text{m}^2 \cdot 50\,\text{MPa} \right)}{50\,\text{MPa} \cdot \left(15\,\text{mm} + 5 \cdot 5\,\text{mm} \right)}$$

Variables used in list of Design of Stiffeners under Loads Formulas above

- A_{cs} Cross Sectional Plate Area *(Square Meter)*
- d_c Web Depth *(Millimeter)*
- F_p Allowable Bearing Stress *(Megapascal)*
- F_{yc} Column Yield Stress *(Megapascal)*
- F_{yst} Stiffener Yield Stress *(Megapascal)*
- **K** Distance Between Flange and Web *(Millimeter)*
- P_{bf} Computed Force *(Kilonewton)*
- t_f Flange Thickness *(Millimeter)*
- t_{wc} Column Web Thickness *(Millimeter)*
- **TS** Tensile Strength MPA *(Megapascal)*

Constants, Functions, Measurements used in list of Design of Stiffeners under Loads 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: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Pressure** in Megapascal (MPa)
  Pressure Unit Conversion
- Measurement: **Force** in Kilonewton (kN)
  Force Unit Conversion

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