Important Composite Construction in Buildings Formulas PDF

Formulas
Examples
with Units

List of 13
Important Composite Construction in Buildings Formulas

1) Allowable Stress in Flanges Formula

Evaluate Formula

Formula

$$F_p = 0.66 \cdot F_y$$

Example with Units

$$165\,\text{MPa} = 0.66 \cdot 250\,\text{MPa}$$

2) Dead Load Moment given Maximum Steel Stress as per AISC Specifications Formula

Evaluate Formula

Formula

$$M_D = \left(\sigma_{max} \cdot S_s\right) - M_L$$

Example with Units

$$212\,\text{N*mm} = \left(2.18\,\text{N/mm}^2 \cdot 150\,\text{mm}^3\right) - 115\,\text{N*mm}$$

3) Dead Load Moment Given Maximum Stress in Bottom Flange Formula

Evaluate Formula

Formula

$$M_D = \left(\sigma_{max} \cdot S_{tr}\right) - M_L$$

Example with Units

$$430\,\text{N*mm} = \left(2.18\,\text{N/mm}^2 \cdot 250\,\text{mm}^3\right) - 115\,\text{N*mm}$$

4) Dead Load Moment given Maximum Unit Stress in Steel Formula

Evaluate Formula

Formula

$$M_D = \left(\sigma_{max} - \left(\frac{M_L}{S_{tr}}\right)\right) \cdot S_s$$

Example with Units

$$258\,\text{N*mm} = \left(2.18\,\text{N/mm}^2 - \left(\frac{115\,\text{N*mm}}{250\,\text{mm}^3}\right)\right) \cdot 150\,\text{mm}^3$$

5) Live Load Moment given Maximum Steel Stress as per AISC Specifications Formula

Evaluate Formula

Formula

$$M_L = \left(\sigma_{max} \cdot S_s\right) - M_D$$

Example with Units

$$47\,\text{N*mm} = \left(2.18\,\text{N/mm}^2 \cdot 150\,\text{mm}^3\right) - 280\,\text{N*mm}$$

6) Live Load Moment given Maximum Stress in Bottom Flange Formula

Evaluate Formula

Formula

$$M_L = \left(\sigma_{max} \cdot S_{tr}\right) - M_D$$

Example with Units

$$265\,\text{N*mm} = \left(2.18\,\text{N/mm}^2 \cdot 250\,\text{mm}^3\right) - 280\,\text{N*mm}$$

7) Live Load Moment given Maximum Unit Stress in Steel Formula

Evaluate Formula

Formula

$$M_L = \left(\sigma_{max} - \left(\frac{M_D}{S_s}\right)\right) \cdot S_{tr}$$

Example with Units

$$78.3333\,\text{N*mm} = \left(2.18\,\text{N/mm}^2 - \left(\frac{280\,\text{N*mm}}{150\,\text{mm}^3}\right)\right) \cdot 250\,\text{mm}^3$$

8) Maximum Steel Stress as per AISC Specifications Formula

Evaluate Formula

Formula

$$\sigma_{max} = \frac{M_D + M_L}{S_s}$$

Example with Units

$$2.6333\,\text{N/mm}^2 = \frac{280\,\text{N*mm} + 115\,\text{N*mm}}{150\,\text{mm}^3}$$

9) Maximum Stress in Bottom Flange Formula

Evaluate Formula

Formula

$$\sigma_{max} = \frac{M_D + M_L}{S_{tr}}$$

Example with Units

$$1.58\,\text{N/mm}^2 = \frac{280\,\text{N*mm} + 115\,\text{N*mm}}{250\,\text{mm}^3}$$

10) Maximum Unit Stress in Steel Formula

Evaluate Formula

Formula

$$\sigma_{max} = \left(\frac{M_D}{S_s}\right) + \left(\frac{M_L}{S_{tr}}\right)$$

Example with Units

$$2.3267\,\text{N/mm}^2 = \left(\frac{280\,\text{N*mm}}{150\,\text{mm}^3}\right) + \left(\frac{115\,\text{N*mm}}{250\,\text{mm}^3}\right)$$

11) Section Modulus of Steel Beam given Maximum Steel Stress as per AISC Specifications Formula

Evaluate Formula

Formula

$$S_s = \frac{M_D + M_L}{\sigma_{max}}$$

Example with Units

$$181.1927\,\text{mm}^3 = \frac{280\,\text{N*mm} + 115\,\text{N*mm}}{2.18\,\text{N/mm}^2}$$

12) Section Modulus of Transformed Composite Section given Maximum Stress in Bottom Flange Formula

Evaluate Formula

Formula

$$S_{tr} = \frac{M_D + M_L}{\sigma_{max}}$$

Example with Units

$$181.1927\,\text{mm}^3 = \frac{280\,\text{N*mm} + 115\,\text{N*mm}}{2.18\,\text{N/mm}^2}$$

13) Yield Strength given Allowable Stress in Flange Formula

Evaluate Formula

Formula

$$F_y = \frac{F_p}{0.66}$$

Example with Units

$$250\,\text{MPa} = \frac{165\,\text{MPa}}{0.66}$$

Variables used in list of Composite Construction in Buildings Formulas above

- F_p Allowable Bearing Stress *(Megapascal)*
- F_y Yield Stress of Steel *(Megapascal)*
- M_D Dead Load Moment *(Newton Millimeter)*
- M_L Live Load Moment *(Newton Millimeter)*
- S_s Section Modulus of Steel Beam *(Cubic Millimeter)*
- S_{tr} Section Modulus of Transformed Section *(Cubic Millimeter)*
- σ_{max} Maximum Stress *(Newton per Square Millimeter)*

Constants, Functions, Measurements used in list of Composite Construction in Buildings Formulas above

- Measurement: **Volume** in Cubic Millimeter (mm^3)
  Volume Unit Conversion
- Measurement: **Pressure** in Megapascal (MPa)
  Pressure Unit Conversion
- Measurement: **Torque** in Newton Millimeter (N*mm)
  Torque Unit Conversion
- Measurement: **Stress** in Megapascal (MPa), Newton per Square Millimeter (N/mm^2)
  Stress Unit Conversion

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