Important Number of Connectors Required for Building Construction Formulas PDF

Formulas
Examples
with Units

List of 14
Important Number of Connectors Required for Building Construction Formulas

1) Maximum Moment in Span given Number of Shear Connectors Formula

Evaluate Formula

Formula

$$M_{max} = \frac{M \cdot N_1 \cdot \beta}{(N \cdot (\beta - 1)) + N_1}$$

Example with Units

$$108\,\text{kN*m} = \frac{30\,\text{kN*m} \cdot 12 \cdot 0.6}{(25 \cdot (0.6 - 1)) + 12}$$

2) Moment at Concentrated Load given Number of Shear Connectors Formula

Evaluate Formula

Formula

$$M = \left(\frac{(N \cdot (\beta - 1)) + N_1}{N_1 \cdot \beta}\right) \cdot M_{max}$$

Example with Units

$$28.0556\,\text{kN*m} = \left(\frac{(25 \cdot (0.6 - 1)) + 12}{12 \cdot 0.6}\right) \cdot 101\,\text{kN*m}$$

3) Number of Shear Connectors Formula

Evaluate Formula

Formula

$$N = N_1 \cdot \frac{\left(\left(\frac{M \cdot \beta}{M_{max}}\right) - 1\right)}{\beta - 1}$$

Example with Units

$$24.6535 = 12 \cdot \frac{\left(\left(\frac{30\,\text{kN*m} \cdot 0.6}{101\,\text{kN*m}}\right) - 1\right)}{0.6 - 1}$$

4) Number of Shear Connectors required between Maximum and Zero Moment Formula

Evaluate Formula

Formula

$$N_1 = \frac{N \cdot (\beta - 1)}{\left(\frac{M \cdot \beta}{M_{max}}\right) - 1}$$

Example with Units

$$12.1687 = \frac{25 \cdot (0.6 - 1)}{\left(\frac{30\,\text{kN*m} \cdot 0.6}{101\,\text{kN*m}}\right) - 1}$$

5) Total Number of Connectors Resisting Total Horizontal Shear Formula

Evaluate Formula

Formula

$$N = \frac{V_h}{q}$$

Example with Units

$$24042.8571 = \frac{4207.5\,\text{kN}}{175\,\text{N}}$$

6) Shear on Connectors Formulas

6.1) Actual Area of Effective Concrete Flange given Total Horizontal Shear Formula

Evaluate Formula

Formula

$$A_c = \frac{2 \cdot V_h}{0.85 \cdot f_c}$$

Example with Units

$$200000\,\text{mm}^2 = \frac{2 \cdot 4207.5\,\text{kN}}{0.85 \cdot 49.5\,\text{MPa}}$$

6.2) Area of Longitudinal Reinforcement at Support within Effective Area given Total Horizontal Shear Formula

Evaluate Formula

Formula

$$A_{sr} = \frac{2 \cdot V_h}{F_{yr}}$$

Example with Units

$$56100\,\text{mm}^2 = \frac{2 \cdot 4207.5\,\text{kN}}{150\,\text{MPa}}$$

6.3) Area of Steel Beam given Total Horizontal Shear to be Resisted by Shear Connectors Formula

Evaluate Formula

Formula

$$A_s = \frac{2 \cdot V_h}{F_y}$$

Example with Units

$$33660\,\text{mm}^2 = \frac{2 \cdot 4207.5\,\text{kN}}{250\,\text{MPa}}$$

6.4) Specified Compressive Strength of Concrete given Total Horizontal Shear Formula

Evaluate Formula

Formula

$$f_c = \frac{2 \cdot V_h}{0.85 \cdot A_c}$$

Example with Units

$$49.5\,\text{MPa} = \frac{2 \cdot 4207.5\,\text{kN}}{0.85 \cdot 200000\,\text{mm}^2}$$

6.5) Specified Minimum Yield Stress of Longitudinal Reinforcement given Total Horizontal Shear Formula

Evaluate Formula

Formula

$$F_{yr} = \frac{2 \cdot V_h}{A_{sr}}$$

Example with Units

$$150\,\text{MPa} = \frac{2 \cdot 4207.5\,\text{kN}}{56100\,\text{mm}^2}$$

6.6) Total Horizontal Shear Formula

Evaluate Formula

Formula

$$V_h = \frac{0.85 \cdot f_c \cdot A_c}{2}$$

Example with Units

$$4207.5\,\text{kN} = \frac{0.85 \cdot 49.5\,\text{MPa} \cdot 200000\,\text{mm}^2}{2}$$

6.7) Total Horizontal Shear between Interior Support and Point of Contraflexure Formula

Evaluate Formula

Formula

$$V_h = \frac{A_{sr} \cdot F_{yr}}{2}$$

Example with Units

$$4207.5\,\text{kN} = \frac{56100\,\text{mm}^2 \cdot 150\,\text{MPa}}{2}$$

6.8) Total Horizontal Shear to be Resisted by Shear Connectors Formula

Evaluate Formula

Formula

$$V_h = \frac{A_s \cdot F_y}{2}$$

Example with Units

$$4207.5\,\text{kN} = \frac{33660\,\text{mm}^2 \cdot 250\,\text{MPa}}{2}$$

6.9) Yield Strength of Steel given Total Horizontal Shear to be Resisted by Shear Connectors Formula

Evaluate Formula

Formula

$$F_y = \frac{2 \cdot V_h}{A_s}$$

Example with Units

$$250\,\text{MPa} = \frac{2 \cdot 4207.5\,\text{kN}}{33660\,\text{mm}^2}$$

Variables used in list of Number of Connectors Required for Building Construction Formulas above

- A_c Actual Area of Effective Concrete Flange *(Square Millimeter)*
- A_s Area of Steel Beam *(Square Millimeter)*
- A_{sr} Area of Longitudinal Reinforcement *(Square Millimeter)*
- f_c 28-Day Compressive Strength of Concrete *(Megapascal)*
- F_y Yield Stress of Steel *(Megapascal)*
- F_{yr} Specified Minimum Yield Stress *(Megapascal)*
- M Moment at Concentrated Load *(Kilonewton Meter)*
- M_{max} Maximum Moment in Span *(Kilonewton Meter)*
- N Number of Shear Connectors
- N_1 No. of Shear Connectors Required
- q Allowable Shear for One Connector *(Newton)*
- V_h Total Horizontal Shear *(Kilonewton)*
- β Beta

Constants, Functions, Measurements used in list of Number of Connectors Required for Building Construction Formulas above

- Measurement: **Area** in Square Millimeter (mm²)
  Area Unit Conversion
- Measurement: **Force** in Kilonewton (kN), Newton (N)
  Force Unit Conversion
- Measurement: **Torque** in Kilonewton Meter (kN*m)
  Torque Unit Conversion
- Measurement: **Moment of Force** in Kilonewton Meter (kN*m)
  Moment of Force Unit Conversion
- Measurement: **Stress** in Megapascal (MPa)
  Stress Unit Conversion

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