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Number of Connectors Required for Building Construction Formulas

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List of 14 Number of Connectors Required for Building Construction Formulas

Number of Connectors Required for Building Construction

1) Maximum Moment in Span given Number of Shear Connectors

Open Calculator

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

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

2) Moment at Concentrated Load given Number of Shear Connectors

Open Calculator

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

ex $$28.05556\text{kN*m} = \left(\frac{(25 \cdot (0.6 - 1)) + 12}{12 \cdot 0.6} \right) \cdot 101\text{kN*m}$$

3) Number of Shear Connectors

Open Calculator

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

$$24.65347 = 12 \cdot \frac{\left(\left(\frac{30kN*m \cdot 0.6}{101kN*m}\right) - 1\right)}{0.6 - 1}$$

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

Open Calculator

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

$$12.16867 = \frac{25 \cdot (0.6 - 1)}{\left(\frac{30kN*m \cdot 0.6}{101kN*m}\right) - 1}$$

5) Total Number of Connectors Resisting Total Horizontal Shear

Open Calculator

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

$$24042.86 = \frac{4207.5kN}{175N}$$

Shear on Connectors

6) Actual Area of Effective Concrete Flange given Total Horizontal Shear

Open Calculator

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

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

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

Open Calculator

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

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

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

Open Calculator

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

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

9) Specified Compressive Strength of Concrete given Total Horizontal Shear

Open Calculator

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

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

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

Open Calculator

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

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

11) Total Horizontal Shear

Open Calculator

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

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

12) Total Horizontal Shear between Interior Support and Point of Contraflexure

Open Calculator

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

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

13) Total Horizontal Shear to be Resisted by Shear Connectors

Open Calculator

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

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

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

Open Calculator

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

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

Variables Used

- 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

- 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

Check other formula lists

- **Allowable-Stress Design Formulas**
- **Base and Bearing Plates Formulas**
- **Bearing, Stresses, Plate Girders & Ponding Considerations Formulas**
- **Cold Formed or Light Weighted Steel Structures Formulas**
- **Composite Construction in Buildings Formulas**
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- **Number of Connectors Required for Building Construction Formulas**
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