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Load Distribution to Bents and Shear Walls Formulas

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List of 11 Load Distribution to Bents and Shear Walls Formulas

Load Distribution to Bents and Shear Walls

1) Concentrated Load given Deflection at Top

Open Calculator

fx $$P = \frac{\delta \cdot E \cdot t}{4 \cdot \left(\left(\left(\frac{H}{L} \right)^3 \right) + \left(0.75 \cdot \left(\frac{H}{L} \right) \right) \right)}$$

ex $$516.5165\text{kN} = \frac{0.172\text{m} \cdot 20\text{MPa} \cdot 0.4\text{m}}{4 \cdot \left(\left(\left(\frac{15\text{m}}{25\text{m}} \right)^3 \right) + \left(0.75 \cdot \left(\frac{15\text{m}}{25\text{m}} \right) \right) \right)}$$

2) Concentrated Load given Deflection at Top Due to Fixed against Rotation

Open Calculator

fx $$P = \frac{\delta \cdot E \cdot t}{\left(\frac{H}{L} \right)^3 + \left(3 \cdot \left(\frac{H}{L} \right) \right)}$$

ex $$682.5397\text{kN} = \frac{0.172\text{m} \cdot 20\text{MPa} \cdot 0.4\text{m}}{\left(\frac{15\text{m}}{25\text{m}} \right)^3 + \left(3 \cdot \left(\frac{15\text{m}}{25\text{m}} \right) \right)}$$

3) Deflection at Top due to Concentrated Load

Open Calculator

fx $$\delta = \left(\frac{4 \cdot P}{E \cdot t}\right) \cdot \left(\left(\frac{H}{L}\right)^3 + 0.75 \cdot \left(\frac{H}{L}\right)\right)$$

ex $$0.171998\text{m} = \left(\frac{4 \cdot 516.51\text{kN}}{20\text{MPa} \cdot 0.4\text{m}}\right) \cdot \left(\left(\frac{15\text{m}}{25\text{m}}\right)^3 + 0.75 \cdot \left(\frac{15\text{m}}{25\text{m}}\right)\right)$$

4) Deflection at Top due to Fixed against Rotation

Open Calculator

fx $$\delta = \left(\frac{P}{E \cdot t}\right) \cdot \left(\left(\frac{H}{L}\right)^3 + 3 \cdot \left(\frac{H}{L}\right)\right)$$

ex $$0.130161\text{m} = \left(\frac{516.51\text{kN}}{20\text{MPa} \cdot 0.4\text{m}}\right) \cdot \left(\left(\frac{15\text{m}}{25\text{m}}\right)^3 + 3 \cdot \left(\frac{15\text{m}}{25\text{m}}\right)\right)$$

5) Deflection at Top due to Uniform Load

Open Calculator

fx $$\delta = \left(\frac{1.5 \cdot w \cdot H}{E \cdot t}\right) \cdot \left(\left(\frac{H}{L}\right)^3 + \left(\frac{H}{L}\right)\right)$$

ex $$0.172125\text{m} = \left(\frac{1.5 \cdot 75\text{kN} \cdot 15\text{m}}{20\text{MPa} \cdot 0.4\text{m}}\right) \cdot \left(\left(\frac{15\text{m}}{25\text{m}}\right)^3 + \left(\frac{15\text{m}}{25\text{m}}\right)\right)$$

6) Modulus of Elasticity given Deflection at Top Due to Concentrated Load

Open Calculator

fx $$E = \left(\frac{4 \cdot P}{\delta \cdot t}\right) \cdot \left(\left(\frac{H}{L}\right)^3 + 0.75 \cdot \left(\frac{H}{L}\right)\right)$$

ex $$19.99975\text{MPa} = \left(\frac{4 \cdot 516.51\text{kN}}{0.172\text{m} \cdot 0.4\text{m}}\right) \cdot \left(\left(\frac{15\text{m}}{25\text{m}}\right)^3 + 0.75 \cdot \left(\frac{15\text{m}}{25\text{m}}\right)\right)$$

7) Modulus of Elasticity given Deflection at Top Due to Fixed against Rotation

Open Calculator

fx $$E = \left(\frac{P}{\delta \cdot t}\right) \cdot \left(\left(\frac{H}{L}\right)^3 + 3 \cdot \left(\frac{H}{L}\right)\right)$$

ex $$15.13494\text{MPa} = \left(\frac{516.51\text{kN}}{0.172\text{m} \cdot 0.4\text{m}}\right) \cdot \left(\left(\frac{15\text{m}}{25\text{m}}\right)^3 + 3 \cdot \left(\frac{15\text{m}}{25\text{m}}\right)\right)$$

8) Modulus of Elasticity of Wall Material given Deflection

Open Calculator

fx $$E = \left(\frac{1.5 \cdot w \cdot H}{\delta \cdot t}\right) \cdot \left(\left(\frac{H}{L}\right)^3 + \left(\frac{H}{L}\right)\right)$$

ex $$20.01453\text{MPa} = \left(\frac{1.5 \cdot 75\text{kN} \cdot 15\text{m}}{0.172\text{m} \cdot 0.4\text{m}}\right) \cdot \left(\left(\frac{15\text{m}}{25\text{m}}\right)^3 + \left(\frac{15\text{m}}{25\text{m}}\right)\right)$$

9) Wall Thickness given Deflection

Open Calculator

$$t = \left(\frac{1.5 \cdot w \cdot H}{E \cdot \delta}\right) \cdot \left(\left(\frac{H}{L}\right)^3 + \left(\frac{H}{L}\right)\right)$$

$$0.400291\text{m} = \left(\frac{1.5 \cdot 75\text{kN} \cdot 15\text{m}}{20\text{MPa} \cdot 0.172\text{m}}\right) \cdot \left(\left(\frac{15\text{m}}{25\text{m}}\right)^3 + \left(\frac{15\text{m}}{25\text{m}}\right)\right)$$

10) Wall Thickness given Deflection at Top due to Concentrated Load

Open Calculator

$$t = \left(\frac{4 \cdot P}{E \cdot \delta}\right) \cdot \left(\left(\frac{H}{L}\right)^3 + 0.75 \cdot \left(\frac{H}{L}\right)\right)$$

$$0.399995\text{m} = \left(\frac{4 \cdot 516.51\text{kN}}{20\text{MPa} \cdot 0.172\text{m}}\right) \cdot \left(\left(\frac{15\text{m}}{25\text{m}}\right)^3 + 0.75 \cdot \left(\frac{15\text{m}}{25\text{m}}\right)\right)$$

11) Wall Thickness given Deflection at Top due to Fixed against Rotation

Open Calculator

$$t = \left(\frac{P}{E \cdot \delta}\right) \cdot \left(\left(\frac{H}{L}\right)^3 + 3 \cdot \left(\frac{H}{L}\right)\right)$$

$$0.302699\text{m} = \left(\frac{516.51\text{kN}}{20\text{MPa} \cdot 0.172\text{m}}\right) \cdot \left(\left(\frac{15\text{m}}{25\text{m}}\right)^3 + 3 \cdot \left(\frac{15\text{m}}{25\text{m}}\right)\right)$$

Variables Used

- **E** Modulus of Elasticity of Wall Material *(Megapascal)*
- **H** Height of the Wall *(Meter)*
- **L** Length of Wall *(Meter)*
- **P** Concentrated Load on Wall *(Kilonewton)*
- **t** Wall Thickness *(Meter)*
- **w** Uniform Lateral Load *(Kilonewton)*
- **δ** Deflection of Wall *(Meter)*

Constants, Functions, Measurements used

- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Pressure** in Megapascal (MPa)
  Pressure Unit Conversion
- Measurement: **Force** in Kilonewton (kN)
  Force Unit Conversion

Check other formula lists

- **Load Distribution to Bents and Shear Walls Formulas**

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