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Design of Anchor Bolt & Bolting Chair Formulas

Calculators! Examples! Conversions!

List of 14 Design of Anchor Bolt & Bolting Chair Formulas

Design of Anchor Bolt & Bolting Chair

1) Cross Sectional Area of Bolt

Open Calculator

fx $$A_{bolt} = \frac{P_{bolt}}{f_{bolt}}$$

ex $$20.43416\text{mm}^2 = \frac{2151.921\text{N}}{105.31\text{N}/\text{mm}^2}$$

2) Diameter of Anchor Bolt Circle

Open Calculator

fx $$D_{bc} = \frac{(4 \cdot (\text{Wind}_{\text{Force}})) \cdot (\text{Height} - c)}{N \cdot P_{\text{Load}}}$$

ex $$741.3926\text{mm} = \frac{(4 \cdot (3841.6\text{N})) \cdot (4000\text{mm} - 1250\text{mm})}{2 \cdot 28498.8\text{N}}$$

3) Diameter of Bolt given Cross Sectional Area

Open Calculator

fx $$d_b = \left(A_{bolt} \cdot \left(\frac{4}{\pi}\right)\right)^{0.5}$$

ex $$5.100743\text{mm} = \left(20.43416\text{mm}^2 \cdot \left(\frac{4}{\pi}\right)\right)^{0.5}$$

4) Height of Lower Part of Vessel

Open Calculator

fx $$h_1 = \frac{P_{lw}}{k_1 \cdot k_{coefficient} \cdot p_1 \cdot D_o}$$

ex $$2.022947\text{m} = \frac{67\text{N}}{0.69 \cdot 4 \cdot 20\text{N/m}^2 \cdot 0.6\text{m}}$$

5) Height of Upper Part of Vessel

Open Calculator

fx $$h_2 = \frac{P_{uw}}{k_1 \cdot k_{coefficient} \cdot p_2 \cdot D_o}$$

ex $$1.796498\text{m} = \frac{119\text{N}}{0.69 \cdot 4 \cdot 40\text{N/m}^2 \cdot 0.6\text{m}}$$

6) Load on Each Bolt

Open Calculator

fx $$P_{bolt} = f_c \cdot \left(\frac{A}{n}\right)$$

ex $$2151.921\text{N} = 2.213\text{N/mm}^2 \cdot \left(\frac{102101.98\text{mm}^2}{105}\right)$$

7) Maximum Compressive Load

Open Calculator

fx $$P_{Load} = f_{horizontal} \cdot (L_{Horizontal} \cdot a)$$

ex $$28498.8\text{N} = 2.2\text{N/mm}^2 \cdot (127\text{mm} \cdot 102\text{mm})$$

8) Maximum Seismic Moment

Open Calculator

fx $$M_s = \left(\left(\frac{2}{3}\right) \cdot C \cdot \Sigma W \cdot H\right)$$

ex $$4.7E\hat{}7N*mm = \left(\left(\frac{2}{3}\right) \cdot 0.093 \cdot 50000N \cdot 15m\right)$$

9) Maximum Stress in Horizontal Plate fixed at Edges

Open Calculator

fx $$f_{Edges} = 0.7 \cdot f_{horizontal} \cdot \left(\frac{(L_{Horizontal})^2}{(T_h)^2}\right) \cdot \left(\frac{(a)^4}{\left((L_{Horizontal})^4 + (a)\right)^4}\right)$$

ex $$531.723N/mm^2 = 0.7 \cdot 2.2N/mm^2 \cdot \left(\frac{(127mm)^2}{(6.8mm)^2}\right) \cdot \left(\frac{(102mm)^4}{\left((127mm)^4 + (102mm)\right)^4}\right)$$

10) Mean Diameter of Skirt in Vessel

Open Calculator

fx $$D_{sk} = \left(\frac{4 \cdot M_w}{(\pi \cdot (f_{wb}) \cdot t_{sk})}\right)^{0.5}$$

ex $$19893.55mm = \left(\frac{4 \cdot 370440000N*mm}{(\pi \cdot (1.01N/mm^2) \cdot 1.18mm)}\right)^{0.5}$$

11) Number of Bolts

Open Calculator

fx $$n = \frac{\pi \cdot D_{sk}}{600}$$

ex $$104.1624 = \frac{\pi \cdot 19893.55\text{mm}}{600}$$

12) Stress due to Internal Pressure

Open Calculator

fx $$f_{cs1} = \frac{p \cdot D}{2 \cdot t}$$

ex $$140000\text{N/mm}^2 = \frac{0.7\text{N/mm}^2 \cdot 80000000\text{mm}}{2 \cdot 200\text{mm}}$$

13) Wind Pressure acting on Lower Part of Vessel

Open Calculator

fx $$p_1 = \frac{P_{lw}}{k_1 \cdot k_{coefficient} \cdot h_1 \cdot D_o}$$

ex $$19.26616\text{N/m}^2 = \frac{67\text{N}}{0.69 \cdot 4 \cdot 2.1\text{m} \cdot 0.6\text{m}}$$

14) Wind Pressure acting on Upper Part of Vessel

Open Calculator

fx $$p_2 = \frac{P_{uw}}{k_1 \cdot k_{coefficient} \cdot h_2 \cdot D_o}$$

ex $$39.7016\text{N/m}^2 = \frac{119\text{N}}{0.69 \cdot 4 \cdot 1.81\text{m} \cdot 0.6\text{m}}$$

Variables Used

- **a** Effective Width of Horizontal Plate *(Millimeter)*
- **A** Area of Contact in Bearing Plate and Foundation *(Square Millimeter)*
- A_{bolt} Cross Sectional Area of Bolt *(Square Millimeter)*
- **c** Clearance between Vessel Bottom and Foundation *(Millimeter)*
- **C** Seismic Coefficient
- **D** Vessel Diameter *(Millimeter)*
- d_b Diameter of Bolt *(Millimeter)*
- D_{bc} Diameter of Anchor Bolt Circle *(Millimeter)*
- D_o Outside Diameter of Vessel *(Meter)*
- D_{sk} Mean Diameter of Skirt *(Millimeter)*
- f_{bolt} Permissible Stress for Bolt Materials *(Newton per Square Millimeter)*
- f_c Stress in Bearing Plate and Concrete Foundation *(Newton per Square Millimeter)*
- f_{cs1} Stress due to Internal Pressure *(Newton per Square Millimeter)*
- f_{Edges} Maximum Stress in Horizontal Plate fixed at Edges *(Newton per Square Millimeter)*
- $f_{horizontal}$ Maximum Pressure on Horizontal Plate *(Newton per Square Millimeter)*
- f_{wb} Axial Bending Stress at Base of Vessel *(Newton per Square Millimeter)*
- **H** Total Height of Vessel *(Meter)*
- h_1 Height of Lower Part of Vessel *(Meter)*
- h_2 Height of Upper Part of Vessel *(Meter)*
- **Height** Height of Vessel above Foundation *(Millimeter)*
- k_1 Coefficient depending on Shape Factor
- $k_{coefficient}$ Coefficient Period of One Cycle of Vibration
- $L_{Horizontal}$ Length of Horizontal Plate *(Millimeter)*
- M_s Maximum Seismic Moment *(Newton Millimeter)*

- **M_w** Maximum Wind Moment *(Newton Millimeter)*
- **n** Number of Bolts
- **N** Number of Brackets
- **p** Internal Design Pressure *(Newton per Square Millimeter)*
- **p_1** Wind Pressure acting on Lower Part of Vessel *(Newton per Square Meter)*
- **p_2** Wind Pressure acting on Upper Part of Vessel *(Newton per Square Meter)*
- **P_{bolt}** Load on Each Bolt *(Newton)*
- **P_{Load}** Maximum Compressive Load on Remote Bracket *(Newton)*
- **P_{lw}** Wind Load acting on Lower Part of Vessel *(Newton)*
- **P_{uw}** Wind Load acting on Upper Part of Vessel *(Newton)*
- **t** Shell Thickness *(Millimeter)*
- **T_h** Thickness of Horizontal Plate *(Millimeter)*
- **t_{sk}** Thickness of Skirt *(Millimeter)*
- **$Wind_{Force}$** Total Wind Force acting on Vessel *(Newton)*
- **ΣW** Total Weight of Vessel *(Newton)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Measurement: **Length** in Millimeter (mm), Meter (m)
  Length Unit Conversion
- Measurement: **Area** in Square Millimeter (mm²)
  Area Unit Conversion
- Measurement: **Pressure** in Newton per Square Meter (N/m²), Newton per Square Millimeter (N/mm²)
  Pressure Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Moment of Force** in Newton Millimeter (N*mm)
  Moment of Force Unit Conversion
- Measurement: **Bending Moment** in Newton Millimeter (N*mm)
  Bending Moment Unit Conversion
- Measurement: **Stress** in Newton per Square Millimeter (N/mm²)
  Stress Unit Conversion

Check other formula lists

- Design of Anchor Bolt & Bolting Chair Formulas
- Design Thickness of Skirt Formulas
- Lug or Bracket Support Formulas
- Saddle Support Formulas
- Skirt Supports Formulas

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