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Important Formulas of Engine Cylinder

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List of 17 Important Formulas of Engine Cylinder

Important Formulas of Engine Cylinder

1) Allowable Tensile Stress for Stud Material

Open Calculator

fx $$\sigma_t = \frac{f_y}{f_s}$$

ex $$42.5\text{N/mm}^2 = \frac{85\text{N/mm}^2}{2}$$

2) Bore of Engine Cylinder given Length

Open Calculator

fx $$D_i = \frac{L}{1.725}$$

ex $$127.5362\text{mm} = \frac{220\text{mm}}{1.725}$$

3) Core Diameter of Studs

Open Calculator

fx $$d_c = \sqrt{D_i^2 \cdot \frac{p_{max}}{z \cdot \sigma_{ts}}}$$

ex $$17.24871\text{mm} = \sqrt{(128.5\text{mm})^2 \cdot \frac{4\text{MPa}}{6 \cdot 37\text{N/mm}^2}}$$

4) Gas Force Acting on Cylinder Cover

Open Calculator

fx $$F_g = \frac{\pi \cdot D_i^2}{4} \cdot p_{max}$$

ex $$51874.76\text{N} = \frac{\pi \cdot (128.5\text{mm})^2}{4} \cdot 4\text{MPa}$$

5) Indicated Mean Effective Pressure

Open Calculator

fx $$I_{mep} = IP \cdot \frac{60}{n \cdot l_s \cdot A_e}$$

ex $$0.317328\text{MPa} = 4950\text{W} \cdot \frac{60}{500 \cdot 190\text{mm} \cdot 9852\text{mm}^2}$$

6) Length of Engine Cylinder given Cylinder Bore

Open Calculator

fx $$L = 1.725 \cdot D_i$$

ex $$221.6625\text{mm} = 1.725 \cdot 128.5\text{mm}$$

7) Maximum Gas Pressure Inside Engine Cylinder

Open Calculator

fx $$p_{max} = 10 \cdot I_{mep}$$

ex $$3.6\text{MPa} = 10 \cdot 0.36\text{MPa}$$

8) Minimum Number of Studs for Cylinder Head

Open Calculator

fx $z = 10 \cdot D_i + 4$

ex $5.285 = 10 \cdot 128.5\text{mm} + 4$

9) Minimum Thickness of Dry Liner

Open Calculator

fx $t_d = 0.03 \cdot D_i$

ex $3.855\text{mm} = 0.03 \cdot 128.5\text{mm}$

10) Minimum Thickness of Water Jacket Wall

Open Calculator

fx $t_j = \frac{t}{3}$

ex $2.733333\text{mm} = \frac{8.2\text{mm}}{3}$

11) Nominal Diameter of Studs

Open Calculator

fx $d = \frac{d_c}{0.8}$

ex $23.125\text{mm} = \frac{18.5\text{mm}}{0.8}$

12) Outer Diameter of Engine Cylinder

Open Calculator

fx $D_o = D_i + 2 \cdot t$

ex $144.9\text{mm} = 128.5\text{mm} + 2 \cdot 8.2\text{mm}$

13) Pitch of Engine Cylinder Head Studs

Open Calculator

fx $$p = \pi \cdot \frac{D_p}{z}$$

ex $$104.7198\text{mm} = \pi \cdot \frac{200\text{mm}}{6}$$

14) Stroke Length of Engine given Length of Cylinder

Open Calculator

fx $$l_s = \frac{L}{1.15}$$

ex $$191.3043\text{mm} = \frac{220\text{mm}}{1.15}$$

15) Thickness of Cylinder Head

Open Calculator

fx $$t_h = D_i \cdot \sqrt{0.162 \cdot \frac{p_{max}}{\sigma_c}}$$

ex $$18.28587\text{mm} = 128.5\text{mm} \cdot \sqrt{0.162 \cdot \frac{4\text{MPa}}{32\text{N/mm}^2}}$$

16) Thickness of Engine Cylinder Wall

Open Calculator

fx $$t = p_{max} \cdot \frac{D_i}{2 \cdot \sigma_c} + C$$

ex $$9.53125\text{mm} = 4\text{MPa} \cdot \frac{128.5\text{mm}}{2 \cdot 32\text{N/mm}^2} + 1.5\text{mm}$$

17) Thickness of Engine Cylinder Wall given Cylinder Inner Diameter

Open Calculator

fx $t = 0.045 \cdot D_i + 1.60$

ex $7.3825\text{mm} = 0.045 \cdot 128.5\text{mm} + 1.60$

Variables Used

- A_e Cross Sectional Area of Engine Cylinder *(Square Millimeter)*
- **C** Reboring Allowance in Engine *(Millimeter)*
- **d** Nominal Diameter of Cylinder Head Stud *(Millimeter)*
- d_c Core Diameter of Cylinder Head Stud *(Millimeter)*
- D_i Inner Diameter of Engine Cylinder *(Millimeter)*
- D_o Outer Diameter of Cylinder *(Millimeter)*
- D_p Pitch Circle Diameter of Engine Stud *(Millimeter)*
- F_g Gas Force on Cylinder Cover *(Newton)*
- f_s Factor of Safety of Engine Stud
- f_y Yield Strength of Engine Studs *(Newton per Square Millimeter)*
- I_{mep} Indicated Mean Effective Pressure *(Megapascal)*
- **IP** Indicated Power of Engine *(Watt)*
- **L** Length of Engine Cylinder *(Millimeter)*
- l_s Stroke Length of Piston *(Millimeter)*
- **n** Number of Working Strokes per Minute
- **p** Pitch of Engine Studs *(Millimeter)*
- p_{max} Maximum Gas Pressure Inside Cylinder *(Megapascal)*
- **t** Thickness of Cylinder Wall *(Millimeter)*
- t_d Thickness of Dry Liner *(Millimeter)*
- t_h Thickness of Cylinder Head *(Millimeter)*
- t_j Thickness of Water Jacket Wall *(Millimeter)*
- **z** Number of Studs in Cylinder Head

- σ_c Circumferential Stress in Engine Wall *(Newton per Square Millimeter)*
- σ_t Tensile Stress in Engine Studs *(Newton per Square Millimeter)*
- σ_{ts} Tensile Stress in Cylinder Head Studs *(Newton per Square Millimeter)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: **Length** in Millimeter (mm)
  Length Unit Conversion
- Measurement: **Area** in Square Millimeter (mm²)
  Area Unit Conversion
- Measurement: **Pressure** in Megapascal (MPa)
  Pressure Unit Conversion
- Measurement: **Power** in Watt (W)
  Power Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Stress** in Newton per Square Millimeter (N/mm²)
  Stress Unit Conversion

Check other formula lists

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