Date: 5/2/2024

Bolt Calculations.

$P_{max} = 7.5\ N/mm^2$.

$F = P_{max} \times$ cross-sectional area.

$= 7.5 \times \frac{\pi}{4} \times 69^2$

$F = 28044\ N$

Shear stress $\tau = \frac{\text{Force}}{\text{cross-section area of bolt.}}$

A_b of M6 bolt $= \frac{\pi}{4} \times 6^2 = 28.274\ mm^2$.

Force acting on each bolt $= \frac{\text{Total force}}{\text{No. of bolt.}}$

$= \frac{28044}{8}$

$= 3505.5\ N$.

Shear stress on each bolt $= \frac{\text{Force}}{A_b}$

$= \frac{3505.5\ N}{28.274\ mm^2}$

$= 123.98\ N/mm^2$.

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Yield strength of bolt (mild steel) = 440 N/mm²

from Rule of thumb, shear stress = 60% of yield strength

$= \frac{60}{100} \times 440 = 264 \text{ N/mm}^2$.

using a safety factor of 1.5

Maximum allowable shear stress = $\frac{264}{1.5}$

$= 176 \text{ N/mm}^2$.

$123.98 \text{ N/mm}^2 < 176 \text{ N/mm}^2$.

The design of 8 M6 bolts (Mild steel) is Safe.