

Given: Photo (attached in w/w)
Ques: What is spalling? Why do
gears & bearings spall?

Ans: Spalling occurs in machine elements
with "rolling" contact; like gears & brgs.
This is caused by fatigue initiating
sub-surface at the location of
maximum shear stress (shown in
Hertzian contact stress plots).

2)

Most plots and answers are in the text book

2a.) What is $\frac{z}{b}$ for max τ_{max} ?

ANS: The textbook & graphs show the

max τ_{max} occurs $\frac{z}{b} = 0.786$

and equals $0.300 P_{max}$.

b) Given in book

c) ATTACHED (NEXT PG)

d) At $F_N = 50 \text{ kip}$ $P_{max} = 114,530 \text{ psi}$

$$\therefore \tau_{max} = 0.3 P_{max} = 0.3(114,530 \text{ psi}) =$$

$$\tau_{max} = 34.3 \text{ ksi}$$

Using Tresca (max shear stress theory)
w/ FOS = 5

$$FOS = \frac{\tau_{mat'l}}{\tau_{app}} = \frac{\tau_{mat'l}}{34.3 \text{ ksi}} = 5$$

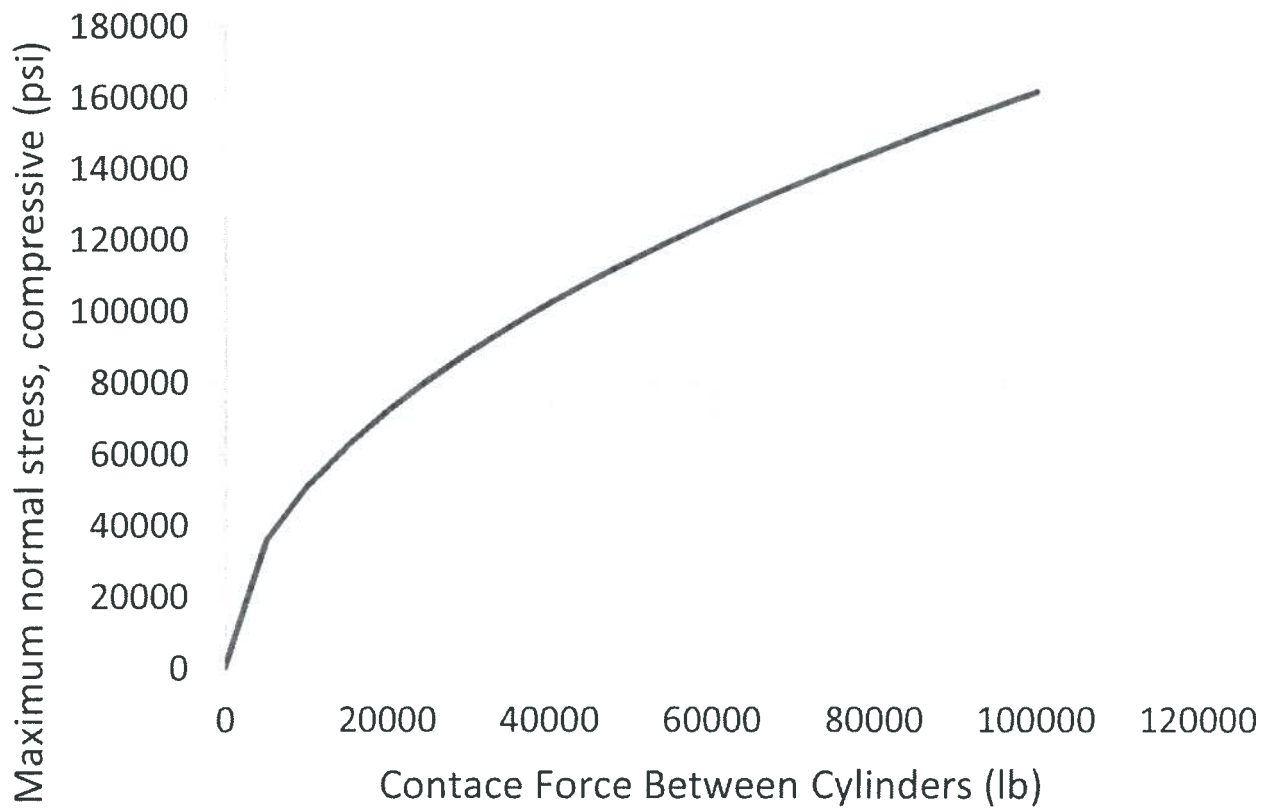
$$\tau_{mat'l} = 171.5 \text{ ksi}$$

$$S_{ys} = \text{Yield strength} = 2\tau_{ys} = 2(171.5 \text{ ksi})$$

$$S_{ys} = \underline{\underline{343 \text{ ksi}}}$$

-VERY HIGH STRENGTH
REQUIRED!

Max Normal Stress (psi)



Max shear is $0.3 \sigma_3$