A ball bearing is to be used on a shaft whose rotational speed is 60 revolutions-per-second and is to support a 600 pound radial load and a 400 pound thrust load. The bearing is to have a life of 5000 hours at a reliability of 99.9% and to fit on a shaft whose diameter is to be not less than 2.00 inch. Select the most economical radial ball bearing for this application using the Timken data.
\[ \omega = 60 \text{ rev/sec} \]
\[ = 3600 \text{ rev/min} \]

\[ F_t = 400 \]
\[ F_r = 600 \]

\[ L = 5000 \text{ hours} \]
\[ K_r = 0.21 \ (99.9\%) \]
\[ K_a = 1.0 \]

\[ C_{ref} = K_a F_e \left( \frac{L}{K_r L_r} \right)^{0.3} \]

\[ F_e \ (F_r = 0.67) \]
\[ F_e = (600 \text{ lb})(4.45 \frac{N}{lb}) \left[ 1 + 1.115 (0.67 - 0.35) \right] \]

\[ F_e = \sqrt{3622 \text{ N}} \]
\[ = 36 \text{ kN} \]

\[ L = (5000 \text{ hr})(60 \frac{\text{ min}}{\text{ hr}})(3600 \frac{\text{ Rev}}{\text{ min}}) \]
\[ L = 1080 \times 10^6 \text{ cycles} \]

\[ C_{Rea} = (1)(3.6) \left[ \frac{1080}{214.90} \right]^{0.3} \]

\[ C_{Rea} = 12.2 \text{ kN} \]

\[ \Delta \rho_{min} = 2.00 \text{ in} \approx 51 \text{ mm} \]

\[ \text{Use} \ 212 \]