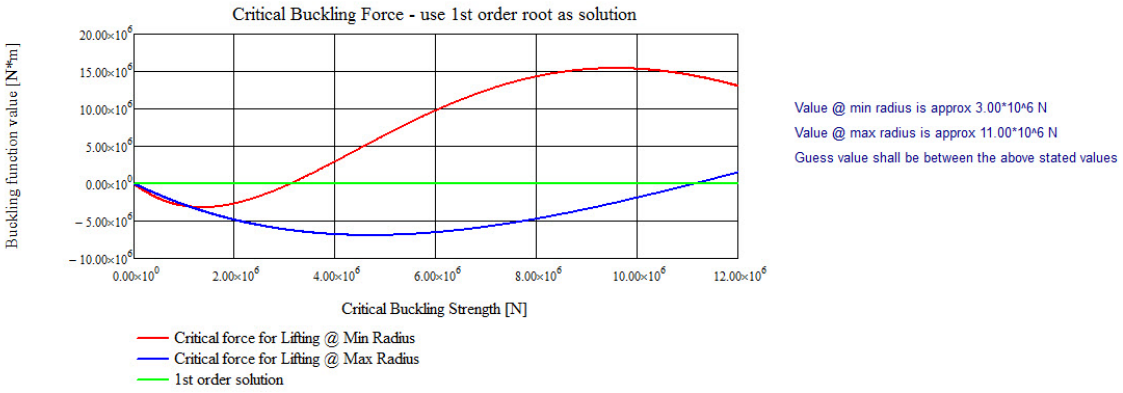
$$X(P_{CR}, z) := P_{CR} \cdot L_3(z) \cdot s_1(P_{CR}) \cdot s_2(P_{CR}, z) - 3 \cdot E_{steel} \cdot I_{Act\_Rod} \cdot q_1(P_{CR}) \cdot C_1(P_{CR}) \cdot s_2(P_{CR}, z) - 3 \cdot E_{steel} \cdot I_{Act\_Rod} \cdot q_2(P_{CR}) \cdot C_2(P_{CR}, z) \cdot s_1(P_{CR})$$



Value @ min radius is approx 3.00*10^6 N

Value @ max radius is approx 11.00*10^6 N

Guess value shall be between the above stated values

Figure 1

Guess $F_{CR} := 7000kN$

Lifting Radius Range $LR := L_{Min\_Main}, L_{Min\_Main} + 100mm .. L_{Max\_Main}$

Equation for buckling of actuator Given $0 = F_{CR} \cdot L_3(LR) \cdot s_1(F_{CR}) \cdot s_2(F_{CR}, LR) - 3 \cdot E_{steel} \cdot I_{Act\_Rod} \cdot q_1(F_{CR}) \cdot C_1(F_{CR}) \cdot s_2(F_{CR}, LR) - 3 \cdot E_{steel} \cdot I_{Act\_Rod} \cdot q_2(F_{CR}) \cdot C_2(F_{CR}, LR) \cdot s_1(F_{CR})$

Find critical force at specific lifting radius $P_{CR}(LR) := Find(F_{CR})$

Euler's Critical Force - using MOI of Tube $Euler_{Tube}(z) := \frac{\pi^2 \cdot E_{steel} \cdot I_{Act\_Tube}}{Act_{length}(\beta_{boom}(z))^2}$

Euler's Critical Force - using MOI of Rod $Euler_{Rod}(z) := \frac{\pi^2 \cdot E_{steel} \cdot I_{Act\_Rod}}{Act_{length}(\beta_{boom}(z))^2}$

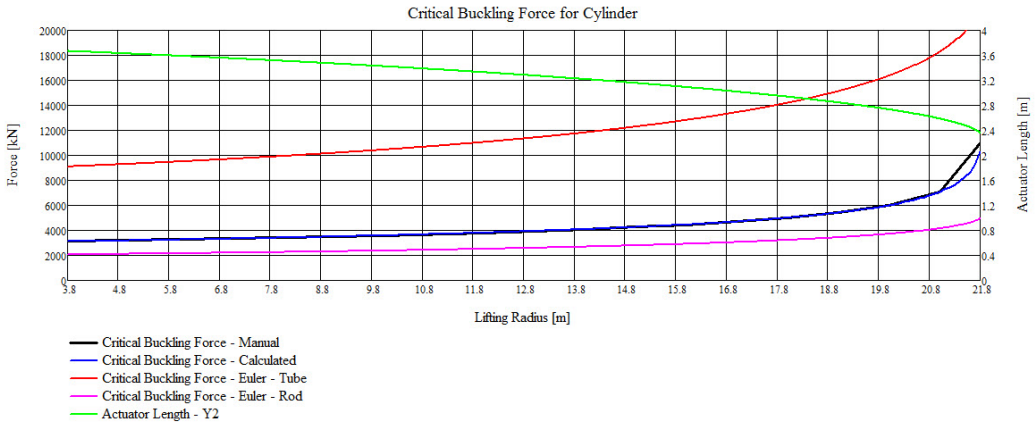


Figure 2

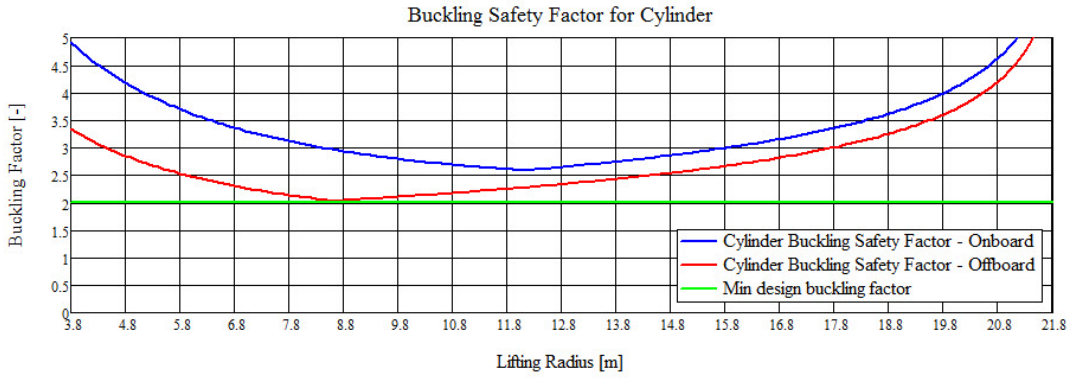


Figure 3