

Motor torque required to lift tiedown anchor block

jbh 4-21-99 file: torque.mcd

Work done by motor shaft = work done by jack / efficiency

F = force = 120,000 lbs

L = distance jack moves

η = efficiency = .57 (from Nook data sheet)

θ is angle turned by motor shaft

Torque x θ radians = Torque x $2\pi \theta$ revolutions = F L / η

L = jack travel in inches = θ revolutions x 1" / (10.66 x 90)

(Nook jack screw pitch is 1", jack gear ratio is 10.66:1 ,
Winsmith input gearbox ratio is 90:1)

So Torque = F L / ($2\pi \eta \theta$ revolutions)

= F / ($2\pi \eta 10.66 90$) =

120,000 / ($2\pi .57 10.66 90$) = 35 inch pounds = 2.9 ft lbs.

The rated torque of the Kollmorgen M207-C motor is
4.75 ft lbs (continuous stall) (Current for this torque is 10A).
14.4 ft lbs (peak)