

# Tightening Torques

The importance of correct bolt tightening cannot be over emphasised. Determining the correct torque can, however present problems.

Approximately, 90% of the applied torque is employed in overcoming friction - 50% at the bearing face of the nut and 40% between the mating threads. It can, therefore, be seen that only something in the order of 10% effort is employed inducing axial load in the bolt.

Unfortunately, because of the variations in the frictional conditions, torque figures can give widely varying bolt tensions. The main precaution that can be taken is to calibrate the torque wrench for each batch of bolts. It is recognised, however that in many cases this is impracticable and for the majority of cases, the figures given in the tables may be taken as a useful guide.

**The torque values recommended in this book are approximate figures and are applicable to fasteners in the "as supplied" condition only.**

They do not take into account the effect of plated finishes, special lubricants or the effect of hard and smooth mating surfaces such as hardened washers etc.

For bolt loads and diameters not shown in the tables, the following formula may be used :

Torque = 0.2 x bolt load (Kl) x Nominal Bolt dia., (mm) where 0.2 = constant (torque coefficient) - not to be confused with coefficient of friction).

During tightening, two stresses are applied to the bolt, torsion due to friction and tension in stretching the bolt. After tightening however, only tension exceeds the external tensile loads, the bolt will experience no further stress and will not fail, providing of course that the correct bolts have been selected and the joints have been adequately designed for the anticipated loads. It is important, therefore, that the clamping load in the joint is always greater than the external loading.

Correct pre-loading of the bolt resists the effect of fatigue. Provided, that the bolt pre-load is greater than an applied load, the fatigue life of the bolt will be infinite. The correct pre-load reduces the amplitude of the stress change in the bolt to a safe value.