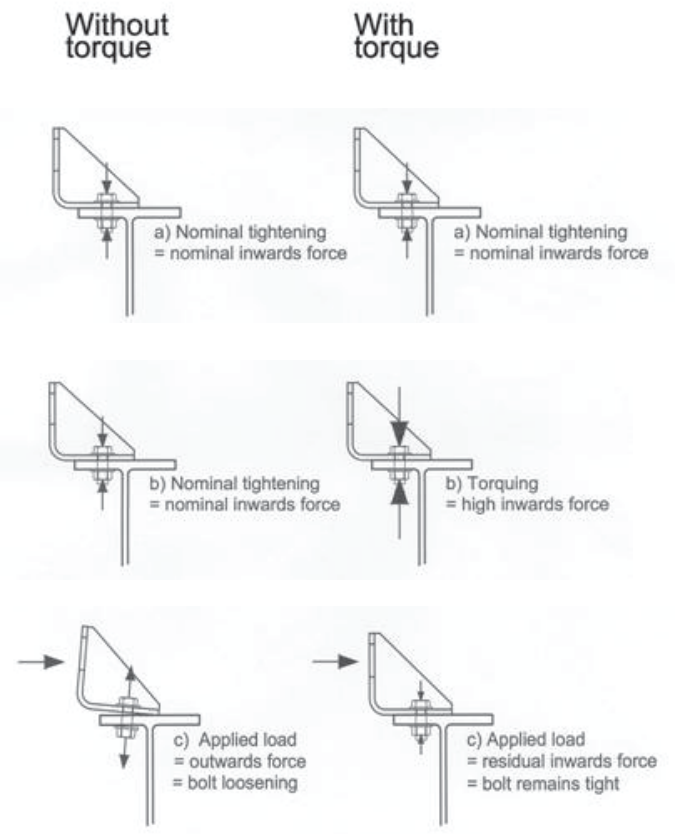
Torque	**Published Date: 20/04/2009**

Torque is a very complex theoretical subject, which is rarely explained fully. The following guide gives some factors to help understand the principles and why it is done.



When a setscrew is tightened (into a socket for instance) the angle of the thread converts the force applied into tension (or stretch) in the bolt shank. In other words the head is being held onto the washer and the fixing itself by a clamping action along the shaft.

Torquing a bolt applies a much higher inwards clamping force. This force should be specified to be higher than the final load on the bolt.

Under applied external loading, the head of the setscrew is pulled outwards against this clamping force, and under normal loading, the tension prevents any looseness developing, which might allow slipping. However if torquing is not carried out, it is possible that the outwards pull will exceed the inwards tension. The head will not sit firmly and the screw will become slack, allowing movement.

In order to prevent this, the setscrew must be tightened to a value at which the preload (inward force) is greater than the load (outward force) which can be applied to it. If the value is too low, the setscrew could work loose, and if it is too high the setscrew could break. Every bolt has a correct optimum value, which is based on the design capacity of the fixing and is known as the torque value. There is a relationship between the torque applied to a bolt and the resulting preload. Besides the torque required stretching the bolt, torque is also needed to overcome friction. Typically only 10 – 15% of the torque is used to stretch the bolt, 30% is lost in the threads and 50 – 55% is lost under the head. Because friction is such an important factor, different bolt materials will have different torque values. Torque values vary not only according to material and size, but also according to usage. For example, a setscrew with a nut may have a higher torque setting than a setscrew into an expansion fixing. Suppliers of proprietary fasteners recommend correct values for use with their products.