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AUGUST NEWSLETTER

July has come and gone, and hopefully the weather will improve, the All Blacks will keep winning and you our customers will decide to reward our efforts with your continuing support. The writer of this newsletter is gratified by the positive feedback on the last issue, and is open to suggestion for topics for future issues. What do ***you*** want to know? All correspondence will be acknowledged, and you will have the writer's gratitude for helping remove the monthly mental block.

How *Tight* Is *Tight???*

Most know from experience that a Bolt and Nut can be overtightened to the point of failure, by either nut stripping or bolt breaking. Few realise that more bolts and nuts fail in service through being undertightened, than being overtightened. Those who read last month's newsletter may remember that overtightened coarse thread bolts usually fail by fracture, and therefore don't get into service.

Loose nuts result from using the wrong grade bolt, as often as from undertightening.

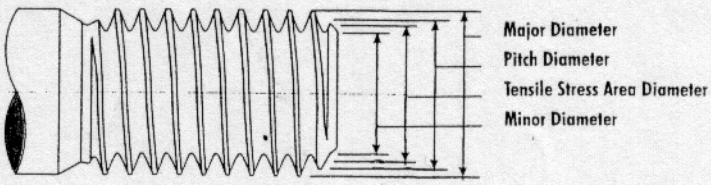
Why?

One of the primary forces acting on a bolt and nut is tension. Under tension all grades of steel bolts will stretch.

Up to a point (the yield point), this stretch is impermanent, or elastic, and the bolt will return to its original dimensions when the tension is removed. However if the tension is such to cause the bolt to stretch by 0.2% of its original the stretch is likely to be permanent.

Once the Yield Point is exceeded the bolt will continue to support increasing loads, but it will also continue to stretch, rapidly and permanently. (Obviously if the load is removed from a stretched bolt, the nut will be loose) When the tension equals the tensile strength of the reduced diameter of the stretched bolt ... the bolt fractures.

When bolts are broken in tension, the break will generally occur in the thread. Many therefor assume that the breaking load can be calculated on the basis of the minor diameter of the thread. Tests have proven however that the breaking load is more accurately estimated on the mean of the pitch and minor diameters of the thread This calculation gives a figure known as the "Stress Area", and is generally accepted as the basis for calculating the strength in tension of all externally threaded parts. See sketch below.



The secret of success with bolts and nuts is to create a preload in the bolt as near as possible to the Yield Point, without exceeding it. This tension is called the Proof Load, and is the maximum safe load the bolt can support.

It would be convenient if a bolt's tension could be measured directly on the shop floor, but unfortunately this is not readily possible. Instead the measurement is usually made indirectly utilizing another force that acts on bolts and nuts. That force is "Torque" – the twisting force applied during tightening. Most Torque/Tension tables will recommend a torque sufficient to develop a preload of 65% of the yield strength in the thread stress area of the bolt and nut. These tables must be treated carefully, particularly when plated finishes are being used. Why 65%? Check the relative accuracy of the most common means of tightening below:

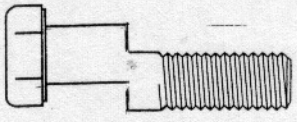
- Operator Judgement ± 35%
- Torque Wrench ± 25%
- Bolt Elongation ± 5%
- Strain Gauge ± 1%

Steelmasters will provide torque/tension tables for all grades of bolts, on request.

Specials Corner

These would come in handy for some Engineers we all know ...

For holes that don't line up:



For holes that still don't line up: