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Sub-Standard Threaded Rods Entering North American Market

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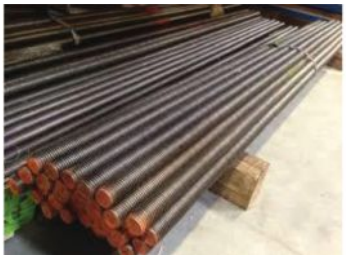
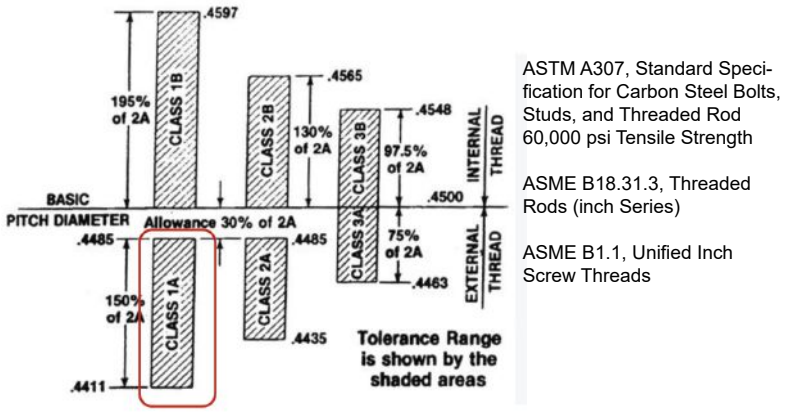




ASTM A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength

ASME B18.31.3, Threaded Rods (inch Series)

ASME B1.1, Unified Inch Screw Threads

Fig. 1 — Product requirements for *ASTM A307* threaded rod.

Over the course of the past several years, threaded rod manufacturers in North America have become aware that substantial volumes of imported sub-standard threaded rod have been arriving into the marketplace since 2012. These products are sold as "*A307"* threaded rod, however, in many cases they do not meet the requirements of *ASTM A307*, raising concerns about product safety and unfair competition.

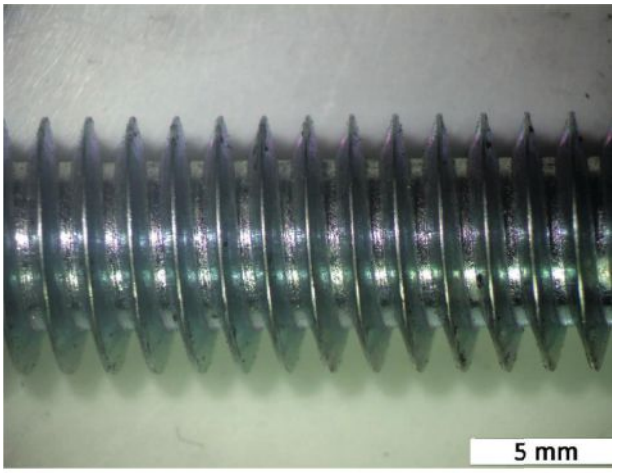
Products that are made in accordance with *ASTM A307* have a minimum tensile strength of 60,000 psi. They are typically made of low-carbon steel and they are not heat treated. Dimensional characteristics of *ASTM A307* threaded rods are given in *ASME B18.31.3*. The thread form is Unified Inch with the standard 60 degrees UN thread profile, as specified in *ASME B1.1*. Threads are typically manufactured to Class 1A, which is the thread class with the largest tolerance and the loosest fit (see **Figure 1**).

Quality inspection of imported threaded rods have revealed in many cases the basic 60° profile of UN screw threads is not being respected. These threaded rods have thread flank angles in the range of 43° to 48°, but flank angles as low as 37° to 40° are not uncommon (**Figure 2**). These parts pass the GO GAGE inspection, which is the most common dimension verification. They also pass the minimum tensile strength requirement. However, the consequence of this nonconformance is that the thread engagement between the rod-nut assembly is reduced and cannot withstand the same load. When assembled with a nut, an aberrant looseness of fit, i.e., "slop" is evident. The nut literally "jiggles" on the threaded rod. The reduced ability to carry a load, i.e., "grip strength" can result in unexpected and catastrophic failure of loaded assembly in service. Test results obtained from an independent laboratory show a direct correlation between flank angle and grip strength. The test data shown in **Figure 3** indicate that grip strength is reduced by as much as 40% when the flank angle is decreased from 60° to 45°.

This significant reduction of grip strength is cause for concern as threaded rods are often integral to any load-bearing assembly. One common application is for pipe hanger assemblies such as those used for water supply and sprinkler systems. The use of sub-standard and nonconforming threaded rod raises concerns over the structural integrity of these assemblies. This problem can be further exacerbated if the external threads of the rods and internal threads of the nuts happen to be respectively at the minimum and maximum of Class 1A thread tolerances.

The motivation for supplying threaded rod products with reduced thread angle is simple. It reduces the quantity of steel used to manufacture a part by as much as 10% to 15%. Given that threaded rods are sold by weight, the lower weight of nonconforming parts means lower prices. This practice is tolerated and sometimes even encouraged because a common misconception is that, "it's just threaded rod" and is not used in critical applications.

Although it may be true that threaded rods are not always used in critical applications, they are often used in load bearing joints where failure of the assembly can have serious consequences in terms of safety, damage and inevitable litigation. This practice certainly has a negative impact on product integrity, but it also amounts to unfair competition for manufacturers and suppliers who make and sell conforming product.



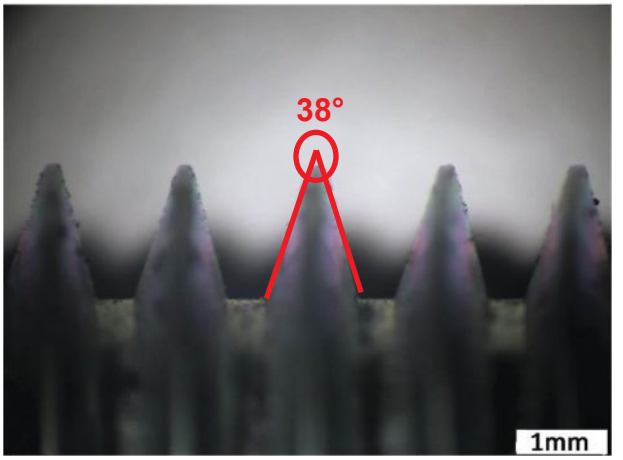


Fig. 2 — Nonconforming thread angle on threaded rod. This example shows a 38° thread instead of a required 60° thread.

How to Inspect for Nonconforming Threaded Rod

There are simple tools that are available to inspect and detect nonconforming threaded rod products, regardless of what the paperwork and/or certificates say.

1. NOGO Gage verification—The NOGO thread gage is designed to intersect the flank of the thread at the pitch diameter cylinder. The pitch diameter cylinder (i.e., the point at which the distance across the thread is equal to the distance between the threads) is closer to the axis of the thread on a 38° thread than on a 60° thread. Therefore, a non-conforming part will accept (i.e., fail) the NOGO gage. The NOGO ring gage is the easiest tool to inspect the parts for nonconformig thread angle (**Figure 4**).
2. Visual inspection—The profile and angle of the thread can be easily inspected by using an optical comparator. Anything less than 55° angle should be cause for rejection.
3. Weight—A simple tool is also to monitor weight of shipments. If the rods weigh less than the standards weights, they are very likely to be non-conforming.

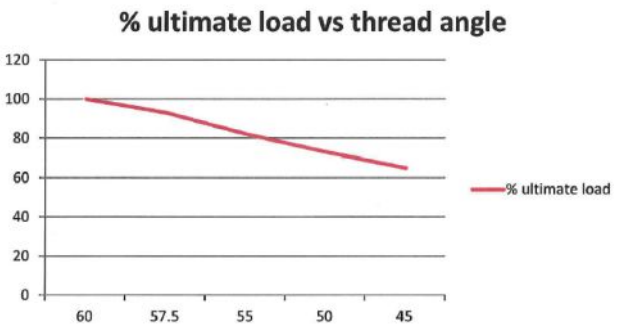


Fig. 3 — Negative effect of reduced thread angle of Grip Strength, depicted as percentage of ultimate load achieved with a standard 60° thread.

Fig. 4 — If the 2A NOGO gage goes over, then the threads are nonconforming according to *ASME B1.3* System 21.

For example:
3/8-16 x 120" rod weighs NOT less than 2.8 lb
1/2-13 x 120" rod weighs NOT less than 5.2 lb
5/8-11 x 120" rod weighs NOT less than 8.3 lb
3/4-10 x 120" rod weighs NOT less than 12.2 lb

How is this product finding its way into the market? These products are being made and imported because there is a market for them. Overseas manufacturers fall into one of three categories: (i) makes only conforming product, (ii) offers the costumer the option to choose between "standard threads" and "45° threads" based on price and (iii) produces and sells low angle threads as a "standard" part. On the other side, importers fall into two categories: (i) knowingly purchases nonconforming products to reduce cost and (ii) unknowingly purchases nonconforming product based solely on price.

It is contingent upon importers in the USA and Canada to question whether they are importing nonconforming threaded rods and to understand what safety and legal implications can result from such practice. As an industry, we must raise awareness, demand that the market complies with good and fair practice and encourage due diligence on the part of overseas manufacturers and North American importers.

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About the IFI:
*Founded in 1931, the **Industrial Fasteners Institute (IFI)** is an association of the leading North American manufacturers of bolts, nuts, screws, rivets and all types of special formed parts. Associate members include suppliers of equipment, materials and services commonly used in fastener manufacture. Whether you are a fastener maker, supplier or end-user, IFI has something of value to offer.* ***www.indfast.org***