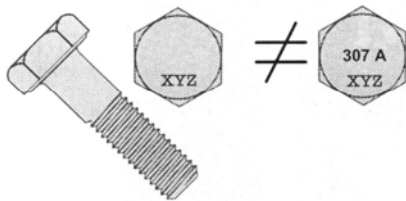


Grade 2 and 307 A Are NOT Equal

by Joe Greenslade

Many fastener suppliers erroneously think that ASTM A307 and SAE Grade 2 are equivalent parts and can be interchanged without consulting the customer who orders Grade 2 hex head bolts. This practice can lead to customer problems and even legal problems.



This confusion is easy to understand. Both grades have many things in common. They are both made to the same dimensional standard, ASME B18.2.1; they are both made of low carbon steel; and they have very similar hardness. Also, in the size range 7/8 inch through 1-1/2 inch, both standards have the same tensile strength requirement of 60,000 PSI.

The significant difference between SAE J429, Grade 2, and ASTM A307, Grade A, is the ultimate tensile strength rating for bolts between 1/4 inch and 3/4 inch diameters. SAE J429, Grade 2, has a tensile strength requirement of 74,000 PSI and the ASTM A307 Grade A only has a tensile strength requirement of 60,000 PSI. This means that SAE bolts have a 23% higher strength requirement than the ASTM bolts in the 1/4 through 3/4 diameter range.

The following chart shows the difference in the ultimate tensile strength requirements for both grades expressed in the total pounds of force that each grade must withstand before breaking and the strength difference between the two grades.

I recently served as an expert witness in a case involving broken 9/16 inch diameter bolts. The reason the bolts failed was that they were improperly manufactured. However, the case was greatly complicated by the fact that the customer's order read Grade 2, but the supplier decided to order 307 Grade A because the 307 A bolts were more readily available.

Fastener suppliers should never make product substitutions of any type without getting approval from the customer, preferably in writing, before making the substitution. Even then the supplier could be unknowingly assuming liability. If a bolt supplier suggests the substitution of an ASTM A 307 Grade A bolt for an SAE Grade 2 bolt in the size range of 1/4 to 3/4 inch diameter the end user may erroneously assume they are bolts of equal strength because of the supplier's recommendation. If the bolts fail in the application, the supplier could be legally pursued because they recommended a bolt having 23% less strength than what the customer originally requested. ■

TABLE 1. Ultimate Tensile Strength Chart
(Pounds Force)

Size	SAE J429 Grade 2	ASTM A 307	Difference
1/4-20	2350	1,900	450
5/16-18	3,900	3,100	800
3/8-16	5,750	4,650	1,100
7/16-14	7,850	6,350	1,500
1/2-13	10,500	8,500	2,000
9/16-12	13,500	11,000	2,500
5/8-11	16,700	13,550	3,150
3/4-10	24,700	20,050	4,650
7/8-9	27,700	27,700	0
1-8	36,400	36,350	*50
1 1/8-7	45,800	45,800	0
1 1/4-7	58,100	58,150	*-50
1 3/8-7	69,300	69,300	0
1 1/2-6	84,300	84,300	0

*Note: The 50 pound difference is due to rounding. In the range 7/8 through 1-1/2 both grades are rated at 60,000 PSI.



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Mr. Greenslade holds twelve U.S. patents on various fastener related products. He has authored over 136 trade journal articles on fastener applications, manufacturing and quality issues. He is one of the fastener industry's most frequent speakers at trade association meetings and conferences. He is the youngest person ever inducted to the Fastener Industry Hall of Fame.

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