



ASTM A449

Scope - This specification covers bolts, threaded rod, and anchors in diameters ranging from 1/4" through 3" (inclusive). It is a medium strength bolt manufactured from medium carbon or alloy steel that develops its mechanical values through a heat-treating process. It is intended for general engineering applications.

Grades	TYPE 1	Medium carbon, carbon boron, or medium carbon alloy steel
	TYPE 3	Weathering steel

Mechanical Properties	Markings		Size	Tensile, ksi	Yield, ksi	Elong. %	RA %	Hardness
	Type 1 A449	Type 3 A449	1/4 to 1	120 min	92 min	14 min	35 min	C25-C34
			1-1/8 to 1-1/2	105 min	81 min	14 min	35 min	C19-C30
1-5/8 to 3			90 min	58 min	14 min	35 min	B183-B235	

Chemical Properties	Type 1 Bolts						
	Element	Carbon Steel	Carbon Boron Steel	Alloy Steel	Ally Boron Steel		
	Carbon	0.30 - 0.52	0.30 - 0.52	0.30 - 0.52	0.30 - 0.52		
	Manganese, min	0.6	0.6	0.6	0.6		
	Phosphorus, max	0.04	0.04	0.035	0.035		
	Sulfur, max	0.05	0.05	0.04	0.04		
	Silicon	0.15 - 0.30	0.10 - 0.30	0.15 - 0.35	0.15 - 0.35		
	Boron		0.0005 - 0.003		0.0005 - 0.003		
	Type 3 Bolts, Class*						
	Element	A	B	C	D	E	F
	Carbon	0.33-0.40	0.38-0.48	0.15-0.25	0.15-0.25	0.20-0.25	0.20-0.25
	Manganese	0.90-1.20	0.70-0.90	0.80-1.35	0.40-1.20	0.60-1.00	0.90-1.20
	Phosphorus	0.035 max	0.06-0.12	0.035 max	0.035 max	0.035	0.035
	Sulfur, max	0.04	0.04	0.04	0.04	0.04	0.04
	Silicon	0.15-0.35	0.30-0.50	0.15-0.35	0.25-0.50	0.15-0.35	0.15-0.35
	Copper	0.25-0.45	0.20-0.40	0.20-0.50	0.30-0.50	0.30-0.60	0.20-0.40
	Nickel	0.25-0.45	0.50-0.80	0.25-0.50	0.50-0.80	0.30-0.60	0.20-0.40
	Chromium	0.45-0.65	0.50-0.75	0.30-0.50	0.50-1.00	0.60-0.90	0.45-0.65
Vanadium			0.20 min				
Molybdenum		0.06 max		0.10 max			
Titanium				0.05 max			
* Selection of a class shall be at the option of the manufacturer							

Recommended Mating Materials	Nuts			Washers
	Plain		Galvanized	
	1/4 to 1-1/2	1-5/8 to 3	1/4 to 3	
	A563B Hex	A563A Heavy Hex	A563DH Heavy Hex	
				F436