The American Society for Testing and Materials is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

ASTM A449 Quenched and tempered steel bolts and studs for general use.

ASTM A449 covers headed bolts, rods, and anchor bolts in diameters ranging from 1/4″ through 3″ inclusive. It is a medium strength bolt manufactured from a medium carbon or alloy steel that develops its mechanical values through a heat treating process. It is intended for general engineering applications.

ASTM A449 is virtually identical in chemistry and strength to ASTM A325 and SAE J429 grade 5. However, A449 is more flexible in the sense that it covers a larger diameter range and is not restricted by a specific configuration.

A449 Types

TYPE 1	Plain carbon steel, carbon boron steel, alloy steel, or alloy boron steel.
TYPE 2	Withdrawn 2003
TYPE 3	Weathering steel.

A449 Mechanical Properties

Size	Tensile, ksi	Yield, ksi	Elong. %, min	RA %, min
1⁄4 - 1	120 min	92min	14	35
1 1⁄8 - 1 1⁄2	105min	81min	14	35
1 5⁄8 - 3	90min	58min	14	35

A449 Chemical Properties

		Type 1 Bolts		
Element	Carbon Steel	Carbon Boron Steel	Alloy Steel	Alloy Boron Steel
Carbon	0.30 - 0.52%	0.30 - 0.52%	0.30 - 0.52%	0.30 - 0.52%
Manganese, min	0.60%	0.60%	0.60%	0.60%
Phosphorus, max	0.040%	0.040%	0.035%	0.035%
Sulfur, max	0.050%	0.050%	0.040%	0.040%
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%
Alloying Elements			*	*

* Steel, as defined by the American Iron and Steel Institute, shall be considered to be alloy when the maximum range given for the content of alloying elements exceeds one of more of the following limits: Manganese, 1.65%, silicon, 0.60%, copper, 0.60%, or in which a definite range or a minimum quantity of any of the following elements is specified or required within the limits of the recognized field of constructional alloy steels: aluminum, chromium up to 3.99%, cobalt, columbium, molybdenum, nickel, titanium, tungsten, vanadium, zirconium or any other alloying elements added to obtain a desired alloying effect.

Type 3 Bolts, Class *

Element	A	S	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	0.040%	0.040%	0.040%	0.040%	0.040%	0.040%

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%	0.25 - 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			0.020% min			
Molybdenum		0.06% max		0.10% max		
Titanium				0.05% max		
* Selection of a class shall be at the option of the manufacturer						

A449 Recommended Hardware

Nuts			Washers
Plain		Galvanized	
1/4 - 1-1/2	1-5/8 - 3	1/4 - 3	
A563B Hex	A563A Heavy Hex	A563DH Heavy Hex	F436
Note: Nuts of other grades having proof load stresses greater than the specified grade are suitable. The ASTM A563 Nut Compatibility Chart has a complete list of specifications			