

Standard Specification for

Carbon and Alloy Steel Nuts

AASHTO Designation: M 291-09

ASTM Designation: A 563-07



AASHTO M 291-09 is identical to ASTM A 563-07 except for the following provisions:

1. All references to the ASTM standards contained in ASTM A 563-07, listed in the following table, shall be replaced with the corresponding AASHTO standard:

<i>Referenced Standards</i>	
ASTM	AASHTO
F 2329	M 232M/M 232
A 194/A 194M	M 292M/M 292
A 325	M 164
A 490M	M 253
A 709/A 709M	M 270M/M 270
B 695	M 298

2. Replace Section 3.1.7 of ASTM A 563-07 with the following:
3.1.7 AASHTO designation and year of issue, and
3. Replace Note 3 of ASTM A 563-07 with the following:
Note 3—An example of an ordering description follows: 1000 $\frac{7}{8}$ –9 heavy hex nuts, Grade C, hot-dip zinc-coated, AASHTO M 291-____.
4. Sections 5.4 and 5.5 of ASTM A 563-07 are not included in AASHTO M 291-09.
5. Replace the last row in Table 3 of ASTM A 563-07 with the following:

DH ^D	$\frac{1}{4}$ to $1\frac{1}{2}$	hex thick	175	150	248	352	C24	C38
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6. Add a last sentence to Footnote A in Table 3 of ASTM A 563-07 as follows:
“When M 292 zinc-coated inch series nuts are supplied, the zinc coating, overtapping, lubrication, and rotational capacity testing shall be in accordance with M 291.”
7. Add a last sentence to Footnote B in Table 3 of ASTM A 563-07 as follows:
“When M 292 zinc-coated inch series nuts are supplied, the zinc coating, overtapping, lubrication, and rotational capacity testing shall be in accordance with M 291.”
8. Add the following subsection to Section 10 of ASTM A 563-07.
10.2 The proof load should be determined at a free running cross head speed not exceeding 1.0 in./min and shall be maintained for 10 seconds before releasing the load.
9. Replace Section 15.2.1.1 of ASTM A 563-07 with the following:
15.2.1.1 AASHTO designation and grade,
10. Replace Section 16.1 of ASTM A 563-07 with the following:
16.1 The party responsible for the fastener shall be the organization that supplies the fastener to the purchaser. The responsible party shall supply test reports, certified by the manufacturer, that indicate the fasteners were manufactured, sampled, tested, and inspected in accordance with this specification and meet all of its requirements.

11. Add the following Subsection S1.2 to ASTM A 563-07:

S1.2 Zinc-coated bolts and zinc-coated lubricated nuts shall be capable of conforming to the test requirement in Section S1.2.1. After this tightening test, the assembly shall show no signs of failure.

S1.2.1 A zinc-coated bolt shall be placed in a steel joint and assembled with a zinc-coated washer and a zinc-coated nut. The joint shall be one or more flat structural steel plates with a total thickness, including the washer, such that three to five full threads of the bolt are located between the bearing surfaces of the bolt head and nut. The hole in the joint shall have the same nominal diameter as the hole in the washer. The initial tightening of the nut shall produce a load in the bolt not less than 10 percent of the specified proof load. After this initial tightening, the nut position shall be marked relative to the bolt and the rotation shown in Table 1 shall be applied. During rotation the bolt head shall be restrained from turning.

12. Add Table S1.1 to immediately follow Section S1 of ASTM A 563-07.

Table S1.1—Rational Capacity Test for Zinc-Coated Nuts

Bolt Length, in.	Nominal Nut Rotation, Deg (Turn)
Up to and including 4 × dia	300 (⁵ / ₆)
Over 4 × dia but exceeding 8 × dia	360 (1)
Over 8 × dia	420 (1 ¹ / ₆)

13. Replace top row (A 563 Grade and ANSI Nut Style), row 3 (Grade of Bolt: A 325 Type 1) and row 4 (Grade of Bolt: A 325 Type 3) in Table X1.1 of ASTM A 563-07 with the following:

Table X1.1—Nut and Bolt Suitability Guide

Grade of Bolt ^d	Surface Finish ^e	Nominal Size, in.	M 291 Grade and ANSI Nut Style ^a					
			Recommended ^b		Suitable ^c			
			Hex	Heavy Hex	Square	Hex	Heavy Hex	Hex Thick
M 164	Non-zinc coated	¹ / ₂ to 1 ¹ / ₂	—	C	—	—	C3, D, DH, DH3	—
Types 1 and 2	Zinc-coated	¹ / ₂ to 1 ¹ / ₂	—	DH	—	—	—	—
M 164 Type 3	Non-zinc coated	¹ / ₂ to 1 ¹ / ₂	—	C3	—	—	DH3	—

14. Replace row 11 (Grade of Bolt: A 490 Types 1 and 2) and row 12 (Grade of Bolt: A 490 Type 3) in Table X1.1 of ASTM A 563-07 with the following:

Table X1.1—Nut and Bolt Suitability Guide

Grade of Bolt ^d	Surface Finish ^e	Nominal Size, in.	M 291 Grade and ANSI Nut Style ^a					
			Recommended ^b		Suitable ^c			
			Hex	Heavy Hex	Square	Hex	Heavy Hex	Hex Thick
M 253 Type 1	Non-zinc coated	¹ / ₂ to 1 ¹ / ₂	—	DH	—	—	DH3	—
M 253 Type 3	Non-zinc coated	¹ / ₂ to 1 ¹ / ₂	—	DH3	—	—	—	—



Designation: A 563 – 07

Standard Specification for Carbons and Alloy Steel Nuts¹

This standard is issued under the fixed designation A 563; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification² covers chemical and mechanical requirements for eight grades of carbon and alloy steel nuts for general structural and mechanical uses on bolts, studs, and other externally threaded parts.

NOTE 1—See Appendix X1 for guidance on suitable application of nut grades.

1.2 The requirements for any grade of nut may, at the supplier's option, and with notice to the purchaser, be fulfilled by furnishing nuts of one of the stronger grades specified herein unless such substitution is barred in the inquiry and purchase order.

1.3 Grades C3 and DH3 nuts have atmospheric corrosion resistance and weathering characteristics comparable to that of the steels covered in Specifications A 242/A 242M, A 588/A 588M, and A 709/A 709M. The atmospheric corrosion resistance of these steels is substantially better than that of carbon steel with or without copper addition (see 5.2). When properly exposed to the atmosphere, these steels can be used bare (uncoated) for many applications.

NOTE 2—A complete metric companion to Specification A 563 has been developed—A 563M; therefore, no metric equivalents are presented in this specification.

1.4 Terms used in this specification are defined in Terminology F 1789 unless otherwise defined herein.

2. Referenced Documents

2.1 ASTM Standards:³

A 194/A 194M Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

¹ This specification is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.02 on Steel Bolts, Nuts, Rivets and Washers.

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² For ASME Boiler and Pressure Vessel Code applications see related Specification SA – 563 in Section II of that Code.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

A 242/A 242M Specification for High-Strength Low-Alloy Structural Steel

A 307 Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

A 325 Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

A 354 Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners

A 394 Specification for Steel Transmission Tower Bolts, Zinc-Coated and Bare

A 449 Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use

A 490 Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength

A 588/A 588M Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance

A 687 Specification for High-Strength Nonheaded Steel Bolts and Studs⁴

A 709/A 709M Specification for Structural Steel for Bridges

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

B 695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

D 3951 Practice for Commercial Packaging

F 606 Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets

F 812/F 812M Specification for Surface Discontinuities of Nuts, Inch and Metric Series⁵

F 1789 Terminology for F16 Mechanical Fasteners

F 2329 Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

G 101 Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels

2.2 ANSI Standards:

⁴ Withdrawn.

⁵ Withdrawn.

*A Summary of Changes section appears at the end of this standard.

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