Designation: A563/A563M – 23

Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric)[1]

This standard is issued under the fixed designation A563/A563M; 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 U.S. Department of Defense.

1. Scope*

1.1 This specification[2] covers chemical, mechanical, and dimensional requirements for eleven 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 Terms used in this specification are defined in Terminology F1789 unless otherwise defined herein.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

A194/A194M Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

A307 Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength

A354 Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners

A394 Specification for Steel Transmission Tower Bolts, Zinc-Coated and Bare

A449 Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use

A751 Test Methods and Practices for Chemical Analysis of Steel Products

B695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

F606/F606M Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets

F812 Specification for Surface Discontinuities of Nuts, Inch and Metric Series

F1136/F1136M Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners

F1470 Practice for Fastener Sampling for Specified Mechanical Properties and Performance Inspection

F1554 Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

F1789 Terminology for F16 Mechanical Fasteners

F1941/F1941M Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric

F2329/F2329M Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

F2833 Specification for Corrosion Protective Fastener Coatings with Zinc Rich Base Coat and Aluminum Organic/Inorganic Type

F3019/F3019M Specification for Chromium Free Zinc-Flake Composite, with or without Integral Lubricant, Corrosion Protective Coatings for Fasteners

F3125/F3125M Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile

[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, Studs and Nuts.

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

Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength
F3148 Specification for High Strength Structural Bolt Assemblies, Steel and Alloy Steel, Heat Treated, 144ksi Minimum Tensile Strength, Inch Dimensions
F3393 Specification for Zinc-Flake Coating Systems for Fasteners
G101 Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels

2.2 *ASME Standards:*[4]
ASME B1.1 Unified Screw Threads
ASME B18.2.2 Square and Hex Nuts
ASME B18.2.6 Fasteners for Use in Structural Applications
ASME B18.2.6M Metric Fasteners for Use in Structural Applications
ASME B1.13M Metric Screw Threads-M Profile

2.3 *SAE Standard:*[5]
SAE J995 Mechanical and Material Requirements for Steel Nuts

3. Ordering Information

3.1 Orders for nuts under this specification shall include the following:

3.1.1 Quantity (number of nuts),

3.1.2 Nominal size and thread series of nuts,

3.1.3 Style of nut (for example, heavy hex),

3.1.4 Grade of nut,

3.1.5 *Coatings or finishes*—If other than plain finish, specify the coating process or finish required, see 4.4 and Annex A1.

3.1.6 ASTM designation and year of issue, and

3.1.7 Any special observation or inspection requirements shall be specified at the time of inquiry and at the time of order. See 11.2.

3.1.8 Supplementary or special requirements.

NOTE 2—An example of an ordering description follows: 1000 7/8-9 heavy hex nuts, Grade DH, hot-dip zinc-coated, and lubricated, ASTM A563/A563M–XX.

4. Materials and Manufacture

4.1 Steel for nuts shall be made by the open-hearth, basic-oxygen, or electric-furnace process except that steel for Grades A and B nuts may be made by the acid-bessemer process.

4.2 *Manufacturing Method:*

4.2.1 Nuts may be made cold or hot by forming, pressing, or punching or may be machined from bar stock.

4.2.2 Threads shall be formed by tapping or machining.

4.3 *Heat Treatment:*

4.3.1 Grades DH, DH3, 10S, and 10S3 nuts shall be heat treated by quenching in a liquid medium from a temperature above the transformation temperature and tempering at a temperature of at least 800 °F or 425 °C.

4.3.2 Grades C, C3, and D nuts made of any steel permitted for these grades may be heat treated by quenching in a liquid medium from a temperature above the transformation temperature and tempering at a temperature of at least 800 °F or 425 °C.

4.4 *Coatings and Other Finishes:*

4.4.1 Permitted coatings, including supplementary lubrication and nut overtap requirements are provided in Annex A1.

4.4.2 When coated fasteners are required, the purchaser shall specify the process and any additional special requirements.

4.4.3 Hot-dip zinc coated nuts shall be installed with hot-dip zinc coated bolts. Hot-dip zinc coated nuts and bolts shall be coated per F2329/F2329M.

4.4.4 Mechanically deposited zinc coated nuts shall be installed with mechanically deposited zinc coated bolts. Mechanically deposited zinc coated nuts and bolts shall be coated per B695.

4.4.5 Hot-dip and mechanically deposited zinc and Zn/Al coating overtap allowances are specified in 7.3.

4.5 *Lubricant:*

4.5.1 Hot-dip and mechanically deposited zinc-coated Grade DH and 10S nuts shall be provided with an additional lubricant which shall be clean and dry to the touch (see Supplementary Requirement S1 to specify lubrication requirements for plain finish nuts).

4.5.2 See Supplementary Requirement S2 for option to specify a dye in the lubricant.

5. Chemical Composition

5.1 Grades A, B, C, D, DH, 8S, and 10S shall conform to the chemical composition specified in Table 1.

5.2 Grades C3, DH3, 8S3, and 10S3 shall be weathering steel and conform to the chemical composition specified in Table 1. Compositions A or B may be used for grades C3 and 8S3. Optionally, a chemical composition based on a corrosion index may be used provided the steel meets the chemical requirements in Table 1 column headed "Based on Corrosion Index". When certifying based on the corrosion index the steel shall have a corrosion index of 6 or greater, as calculated from the heat analysis, and as described in Guide G101, using the predictive method based on the data of Larabee and Coburn, or the predictive method based on the data of Townsend. See Guide G101 for methods of estimating the atmospheric corrosion resistance of low alloy steels.

5.3 If performed, product analysis made on finished nuts representing each lot shall be within 10 % of the value required of the heat analysis. For example heat analysis C 0.30-0.52 = product analysis C 0.27-0.57.

5.4 Resulfurized or rephosphorized steel, or both, are not subject to rejection based on product analysis for sulfur or phosphorus.

5.5 Application of heats of steel to which bismuth, selenium, tellurium, or lead has been intentionally added shall not be permitted.

[4] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

[5] Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, http://www.sae.org.

TABLE 1 Chemical Requirements[A]

Nut Grade	A, B, C, 8S	C3, 8S3			D	DH, 10S	DH3, 10S3	
Heat Analysis	Composition %	Composition A %	Composition B %	Based on Corrosion Index[C]	Composition %		Composition %	Based on Corrosion Index[C]
Carbon	0.55 max	0.33-0.40	0.38-0.48	0.30-0.53	0.55 max	0.20-0.55	0.20-0.53	0.30-0.53
Manganese	[B]	0.90-1.20	0.70-0.90	0.60 min	0.30 min	0.60 min	0.40 min	0.60 min
Phosphorus, max	0.12	0.035	0.035	0.035	0.04	0.04	0.035	0.035
Sulfur, max	0.15[D]	0.040	0.040	0.040	0.05[E]	0.05[E]	0.040	0.040
Silicon	[B]	0.15-0.35	0.30-0.50	[B]	[B]	[B]	[B]	[B]
Copper	[B]	0.25-0.45	0.20-0.40	0.20-0.60	[B]	[B]	0.20 min	0.20-0.60
Nickel	[B]	0.25-0.45	0.50-0.80	0.20[F] min	[B]	[B]	0.20[F] min	0.20[F] min
Chromium	[B]	0.45-0.65	0.50-0.75	0.45 min	[B]	[B]	0.45 min	0.45 min
Vanadium	[B]	[B]	[B]	[B]	[B]	[B]	[B]	[B]
Molybdenum	[B]	[B]	0.06 max	0.10[F] min	[B]	[B]	0.15[F] min	0.10[F] min
Titanium	[B]	[B]	[B]	[B]	[B]	[B]	[B]	[B]

[A] Based on heat analysis. See 5.3 for product analysis requirements.
[B] Not specified.
[C] See 5.2.
[D] For Grades A, B, and 8S a sulfur content of 0.23 % max is acceptable with the purchasers approval.
[E] For Grades D, DH, and 10S a sulfur content of 0.05 – 0.15 % is acceptable provided the manganese is 1.35 % min.
[F] Either Nickel or Molybdenum must be present in the amount specified.

5.6 Chemical analyses shall be performed in accordance with Test Methods, Practices, and Terminology A751.

6. Mechanical Properties

6.1 *Hardness:*

6.1.1 Nuts shall conform to the hardness in Table 2.

6.2 *Proof Load:*

6.2.1 Nuts of each grade, except those listed in 6.2.3, shall withstand the proof load stress specified for the grade, size, style, thread series, and surface finish of the nut in Table 3, Table 4, and Table 5.

6.2.2 Nuts overtapped to accommodate coating thickness in accordance with 7.3 shall be proof load tested after coating and overtapping.[6]

6.2.3 Proof load testing shall be performed by the manufacturer on all grades having a specified proof load up to 160 000 lbf or 705 kN. Unless Supplementary Requirement S5 is invoked in the purchase order or contract, nuts having specified proof load greater than 160 000 lbf or 705 kN shall be proof load tested or cross-sectional hardness tested by the manufacturer in accordance with Test Methods F606/F606M. In all cases, proof load testing shall take precedence over hardness testing in the event a conflict exists relative to minimum strength.

7. Dimensions

7.1 Unless otherwise specified, nuts shall be plain (uncoated). Inch nuts shall conform to the dimensions specified in ASME B18.2.2. Heavy Hex Inch Nuts for use in structural applications in Grades C, C3, D, DH, and DH3 shall conform to the dimensions specified in ASME B18.2.6. Metric structural nuts shall conform to the dimensions specified in ASME B18.2.6M.

7.2 Hex-slotted nuts over 1½ to 2 in. inclusive shall have dimensions conforming to ASME B18.2.2 calculated using the formulas for the 1¼ through 1½-in. size range in Appendix A (Formulas for Nut Dimensions) of ASME B18.2.2.

7.3 *Threads: Nuts Hot Dip and mechanically Zinc Coated and Zn/Al Coated:*

7.3.1 Nuts to be used on bolts with Class 2A threads before hot-dip zinc coating, and then hot-dip zinc coated in accordance with Specification F2329/F2329M, shall be overtapped after coating, to the minimum and maximum thread dimensions in Table 6. The major and minor diameters shall also be

[6] Rotational capacity test procedures, nut rotations, and acceptance criteria are a function of the bolt with which the nuts will be used. When required, they are covered by the applicable bolt specification.

TABLE 2 Hardness Requirements

Grade of Nut	Nominal Nut Size	Hardness			
		Brinell		Rockwell	
		min	max	min	max
A	#6(0.138) to 4 in.	116	302	B68	C32
B	#6(0.138) to 1 ½ in.	121	302	B69	C32
C and C3	½ to 4 in.	143	352	B78	C38
D	¼ to 4 in.	159	352	B84	C38
DH	#6(0.138) to 4 in.	248	352	C24	C38
DH3	½ to 4 in.	248	352	C24	C38
		Vickers		Rockwell	
		min	max	min	max
8S and 8S3	M12 to M36	188	372	B89	C38
10S and 10S3	M12 to M36	272	372	C26	C38

TABLE 3 Proof Load Requirements

Grade of Nut	Nominal Nut Size, in.	Proof Load Stress, ksi[A,G]			
		Non-Overtapped[B]	Overtapped[B]	Non-Overtapped[B]	Overtapped[B]
		Square		Heavy Square	
A	¼ to 1 ½	90	68	100	75
B[F]	¼ to 1	105	79	133	100
B[F]	1 ⅛ to 1 ½	92	70	116	87
DH	¼ to 1 ½	132	100	165	123
		Hex		Heavy Hex	
A	¼ to 4	90	68	100	75
B[F]	¼ to 1	120	90	133	100
B[F]	1 ⅛ to 1 ½	105	79	116	87
C[C]	½ to 4	130	. . .	144	. . .
C3	½ to 4	. . .	. . .	144	. . .
D[C]	¼ to 4	135	. . .	150	. . .
DH[D]	¼ to 4	150	115	175	150[E]
DH3	¼ to 4	150	. . .	175	150[E]
		Hex Thick			
A	¼ to 1 ½	100	75		
B[F]	¼ to 1	133	100		
B[F]	1 ⅛ to 1 ½	116	87		
DH[D]	¼ to 1 ½	175	150		
		Hex Flange			
A	#6 to ¾	90	68		
B[F]	#6 to ¾	120	90		
DH[D]	#6 to ¾	150	115		
		Nuts with UNF, 12 UN, and Finer Pitch Threads			
		Proof Load Stress, ksi[G]			
Grade of Nut	Nominal Nut Size, in.	Non-Overtapped[B]	Overtapped[B]	Non-Overtapped[B]	Overtapped[B]
		Square		Heavy Square	
A	¼ to 1 ½	80	60	90	68
B[F]	¼ to 1	96	72	116	87
B[F]	1 ⅛ to 1 ½	84	63	105	78
DH[D]	¼ to 1 ½	132	99	165	123
		Hex		Heavy Hex	
A	¼ to 4	80	60	90	68
B[F]	¼ to 1	109	82	120	90
B[F]	1 ⅛ to 1 ½	94	70	105	79
C[C]	½ to 4	. . .	. . .	. . .	. . .
D[C]	¼ to 4	135	. . .	150	. . .
DH[D]	¼ to 4	150	115	175	150
		Hex Thick			
A	¼ to 1 ½	90	68		
B[F]	¼ to 1	120	90		
B[F]	1 ⅛ to 1 ½	105	70		
DH[D]	¼ to 1 ½	175	150		
		Hex Flange			
A	#6 to ¾	80	60		
B[F]	#6 to ¾	109	82		
DH[D]	#6 to ¾	150	115		
		Proof Load Stress, MPa[A]			
Grade of Nut	Nominal Nut Size, metric	Non-Overtapped[B]	Overtapped[B]		
		Heavy Hex			
8S and 8S3	M12 to M36	1075	. . .		
10S and 10S3	M12 to M36	1245	1165[E]		

[A] To determine nut proof load in pounds or Newtons, multiply the appropriate nut proof load stress by the tensile stress area of the thread. Stress areas for UNC, UNF, and 8 UN thread series are given in Table 4. Stress areas for metric threads are given in Table 5.

[B] Non-overtapped nuts are nuts intended for use with externally threaded fasteners which have a plain (nonplated or noncoated) finish or have a plating or coating of insufficient thickness to necessitate overtapping the nut thread per the galvanized requirements in Table 6 to provide assemblability. Overtapped nuts are nuts intended for use with externally threaded fasteners which are hot-dip zinc-coated per 7.3.1, mechanically zinc-coated per 7.3.2, or have a plating or coating of sufficient thickness to necessitate overtapping the nut thread per the galvanized requirements in Table 6 to provide assemblability.

[C] Nuts made in accordance to the requirements of Specification A194/A194M, Grade 2 or Grade 2H, and marked with their grade symbol are acceptable equivalents for Grades C heavy hex and hex and D nuts. When A194/A194M zinc-coated inch series nuts are supplied, the zinc coating, overtapping, and lubrication shall be in accordance with the requirements of this specification. Rotational Capacity test procedures, nut rotations, and acceptance criteria are a function of the bolt with which the nuts will be used. When required, testing for the assembly in which the nut is used shall be in accordance with the applicable bolt specification.

[D] Nuts made in accordance with the requirements of Specification A194/A194M, Grade 2H, and marked with its grade symbol are an acceptable equivalent for Grade DH nuts. When A194/A194M zinc-coated inch series nuts are supplied, the zinc coating, overtapping, and lubrication shall be in accordance with the requirements with this specification. Rotational Capacity test procedures, nut rotations, and acceptance criteria are a function of the bolt with which the nuts will be used. When required, testing for the assembly in which the nut is used shall be in accordance with the applicable bolt specification.

[E] Grade DH and DH3 heavy hex overtapped nuts intended to be used with Specification F3125/F3125M 150 ksi bolts or equivalent shall be proof load tested at 175 ksi. Metric 10S or 10S3 heavy hex overtapped nuts intended to be used with Specification F3125/F3125M 1040 MPa bolts or equivalent shall be proof load tested at 1245 MPa. When overtapped nuts will be used with 150 ksi bolts or equivalent, proof load requirements for overtapped nuts shall be specified by the purchaser in the inquiry and purchase order.

[F] Nuts made in accordance with the requirements of SAE J995 Grade 5 and marked with its grade symbol are an acceptable equivalent for Grade B nuts.

[G] The proof load for jam nuts shall be 60 % of the full size value listed. The proof load for slotted nuts shall be 80 % of the full size value listed.

TABLE 4 Tensile Stress Areas—Inch

Nominal Size–Threads per Inch	UNC Tensile Stress Area,[A] A_s in.^{2}	Nominal Size-Threads per Inch	UNF Tensile Stress Area[A] A_s in.^{2}	Nominal Size–Threads per Inch	8 UN Tensile Stress Area,[A] A_s in.^{2}
#6–32	0.00909	#6–40	0.01015		
#8–32	0.0140	#8–36	0.01474		
#10–24	0.0175	#10–32	0.0200		
#12–24	0.0242	#12–28	0.0258		
¼ –20	0.0318	¼ –28	0.0364	...	...
5⁄16 –18	0.0524	5⁄16 –24	0.0580	...	...
⅜ –16	0.0775	⅜ –24	0.0878	...	...
7⁄16 –14	0.1063	7⁄16 –20	0.1187	...	...
½ –13	0.1419	½ –20	0.1599	...	...
9⁄16 –12	0.182	9⁄16 –18	0.203	...	...
⅝ –11	0.226	⅝ –18	0.256	...	...
¾ –10	0.334	¾ –16	0.373	...	...
⅞ –9	0.462	⅞ –14	0.509	...	...
1–8	0.606	1–12	0.663	1–8	0.606
1⅛ –7	0.763	1⅛ –12	0.856	1⅛ –8	0.790
1¼ –7	0.969	1¼ –12	1.073	1¼ –8	1.000
1⅜ –6	1.155	1⅜ –12	1.315	1⅜ –8	1.233
1½ –6	1.405	1½ –12	1.581	1½ –8	1.492
1¾ –5	1.90	...	...	1¾ –8	2.08
2–4½	2.50	...	...	2–8	2.77
2¼ –4½	3.25	...	...	2¼ –8	3.56
2½ –4	4.00	...	...	2½ –8	4.44
2¾ –4	4.93	...	...	2¾ –8	5.43
3–4	5.97	...	...	3–8	6.51
3¼ –4	7.10	...	...	3¼ –8	7.69
3½ –4	8.33	...	...	3½ –8	8.96
3¾ –4	9.66	...	...	3¾ –8	10.34
4–4	11.08	...	...	4–8	11.81

[A] A_s The inch stress area is calculated as follows:
$A_s = 0.7854\,(D - (0.9743/n))^2$
where: A_s = stress area, in.^{2}, D = nominal size, (in.), and n= threads per in.

TABLE 5 Tensile Stress Areas - Metric

Nominal size and thread pitch	Tensile stress area[A] A_s, mm^2
M12×1.75	84.3
M16×2.0	157
M20×2.5	245
M22×2.5	303
M24×3.0	353
M27×3.0	459
M30×3.5	561
M36×4.0	817

[A] A_s the metric stress area is calculated as follows:
$A_s = 0.7854\,(D - 0.9382P)^2$
where: A_s = Stress Area (mm^2), D = Nominal Nut Size (mm) , and P = thread pitch (mm)

increased by the allowance to provide the corresponding minimum and maximum major and minor diameters. When specified by the purchaser, lower overtap values are permitted as long as it is sufficient to permit free assembly with hot-dip zinc coated bolts.

7.3.2 Nuts to be used on bolts with Class 2A threads before mechanical deposited zinc coating and then mechanical deposited zinc coated in accordance with Specification B695 Class 50 and higher shall be overtapped prior to zinc coating to the minimum and maximum dimensions in Table 6. The major and minor diameters shall also be increased by the allowance to provide the corresponding minimum and maximum major and minor diameters. When specified by the purchaser, lower overtap values are permitted as long as it is sufficient to permit free assembly with mechanically deposited zinc coated bolts.

7.3.3 Zn/Al coated nuts to be used with Zn/Al coated F3125/F3125M bolts shall be overtapped prior to zinc coating to the minimum and maximum dimensions in Table 6. The major and minor diameters shall also be increased by the allowance to provide the corresponding minimum and maximum major and minor diameters. When specified by the purchaser, lower overtap values are permitted as long as it is sufficient to permit free assembly with Zn/Al coated bolts.

NOTE 3—It is the intent of this specification that coated nuts and bolts assemble freely when ordered together. It is recognized that the batch nature of the coating process and the cumulative effect of coating thickness may create intermittent assembly problems. Staying within the material limits is important for assembly strength. Users are encouraged to use the smallest nut overtap amount which permits consistent free assembly.

7.4 *Threads: Nuts With Other Coatings*

7.4.1 Nuts to be used on bolts mechanically zinc coated or on bolts hot-dip zinc-coated to a specification other than Specification F2329/F2329M, or otherwise hot-dip coated, shall be overtapped by a diametral amount sufficient to permit assembly on the coated bolt thread, unless other requirements are specified in the inquiry or purchase order.

7.4.2 When specifically permitted by the purchaser, nuts for bolts with electrodeposited coating, such as cadmium, zinc, and so forth, or with chemically applied coating may be overtapped by a diametral amount sufficient to permit assembly on the coated bolt thread.

7.4.3 The allowable overtap amount shall not exceed that specified in Table 6.

8. Testing Lot and Control

8.1 *Testing Responsibility:*

8.1.1 Each lot shall be tested by the manufacturer prior to shipment in accordance with the lot control and identification quality assurance plan in 8.2 – 8.5.

8.1.2 When supplied by a source other than the manufacturer, the responsible party shall assure all tests have been performed and the nuts conform to this specification.

8.2 Nuts shall be processed in accordance with a lot control and identification quality assurance plan. The manufacturer, secondary processors, and distributors shall identify and maintain the integrity of each production lot from raw material through all processing operations to final packing and shipment. Each lot shall be assigned a unique lot identification number, each lot shall be tested, and the lot inspection test reports retained.

8.3 Secondary processing shall maintain lot integrity and shall be traceable to the original lot at time of manufacture.

8.4 A lot shall be a quantity of uniquely identified nuts of the same nominal size produced consecutively at the initial operation from a single mill heat of material and processed at one time, by the same process, in the same manner so that statistical sampling is valid.

NOTE 4—The purpose of a lot inspection and control program is to ensure that each lot conforms to this specification and that lot integrity is maintained to the point of use. It is essential that secondary processors,

TABLE 6 Thread Dimensions and Overtapping Allowances for Coated Nuts

	Galvanized F2329/F2329M/B695			Zn/Al Coatings F3393[B]		
Nominal Nut Size, in. and Pitch	Diametral Allowance, in.[A]	Pitch Diameter, in.		Diametral Allowance, in.[A]	Pitch Diameter, in.	
		min	max		min	max
0.250-20	0.016	0.2335	0.2384			
0.312-18	0.017	0.2934	0.2987			
0.375-16	0.017	0.3514	0.3571			
0.437-14	0.018	0.4091	0.4152			
0.500-13	0.018	0.4680	0.4745	0.009	0.4590	0.4655
0.562-12	0.020	0.5284	0.5352			
0.625-11	0.020	0.5860	0.5932	0.010	0.5760	0.5832
0.750-10	0.020	0.7050	0.7127	0.010	0.6950	0.7027
0.875-9	0.022	0.8248	0.8330	0.011	0.8138	0.8220
1.000-8	0.024	0.9428	0.9516	0.012	0.9308	0.9396
1.125-8	0.024	1.0678	1.0768			
1.125-7	0.024	1.0562	1.0656	0.012	1.0442	1.0536
1.250-8	0.024	1.1928	1.2020			
1.250-7	0.024	1.1812	1.1908	0.012	1.1692	1.1888
1.375-8	0.027	1.3208	1.3301			
1.375-6	0.027	1.2937	1.3041	0.014	1.2807	1.2911
1.500-8	0.027	1.4458	1.4553			
1.500-6	0.027	1.4187	1.4292	0.014	1.4057	1.4162
1.750-5	0.050	1.6701	1.6817			
2.000-4.5	0.050	1.9057	1.9181			
2.250-4.5	0.050	2.1557	2.1683			
2.500-4	0.050	2.3876	2.4011			
2.750-4	0.050	2.6376	2.6513			
3.000-4	0.050	2.8876	2.9015			
3.250-4	0.050	3.1376	3.1517			
3.500-4	0.050	3.3876	3.4019			
3.750-4	0.050	3.6376	3.6521			
3.750-4	0.050	3.6376	3.6521			
4.000-4	0.050	3.8876	3.9023			
Nominal Nut Size, in. and Pitch	Diametral Allowance, µm.[A]	Pitch Diameter, mm		Diametral Allowance, µm[A]	Pitch Diameter, mm	
		min	max		min	max
M12×1.75	365	11.228	11.428	230	11.093	11.293
M16×2	420	15.121	15.333	250	14.951	15.163
M20×2.5	530	18.906	19.130	250	18.626	18.850
M22×2.5	530	20.906	21.130	280	20.656	20.880
M24×3	640	23.141	22.956	300	22.351	22.616
M27×3	640	25.691	25.956	300	25.351	25.616
M30×3.5	750	28.477	28.757	350	28.077	28.357
M36×4	860	34.262	34.562	350	33.752	34.052

[A] These allowances also apply to the minimum and maximum major and minor diameters.
[B] Zn/Al allowances apply to nuts used with F3125/F3125M bolts. Guidance for other applications is provided in F3393.

distributors, and users maintain lot identification and integrity until installation.

8.5 *Number of Tests:*

8.5.1 The minimum number of tests required from each lot shall be in accordance with Practice F1470. These tests and sample numbers are for final inspection only and shall be in addition to the manufacturer's established internal quality control system and in-process inspection procedures.

8.5.2 Disposition of non-conforming product shall be in accordance with Practice F1470.

NOTE 5—Section 8.5.1 is intended to identify a statistically large number of non-conformances but does not assure 100 % freedom from non-conforming product.

9. Test Methods

9.1 Tests shall be conducted in accordance with Test Methods F606/F606M.

10. Test Report

10.1 When specified on the inquiry and purchase order, the manufacturer or supplier, whichever is the responsible party, as defined in Section 14, shall furnish the purchaser a test report that includes the following, as applicable.

10.2 *Information:*

10.2.1 Lot number.

10.2.2 Purchase order number, job number, sequence number, or other special identifiers if specified.

10.2.3 Mailing address of responsible party.

10.2.4 Title and signature of the individual assigned test report responsibility.

10.2.5 Date and ASTM standard, including revision number.

10.3 *Results*—Report results of all required tests.

10.3.1 Heat analysis, heat number, and calculated Corrosion Index for Type 3 material if not from Composition A or B.