FF-R-556D
July 17, 1981
SUPERSEDING
Fed. Spec.
FF-R-556C
November 20, 1970

FEDERAL SPECIFICATION

RIVET, SOLID, SMALL; RIVET, SPLIT, SMALL; RIVET TUBULAR, SMALL; FLAT WASHER (BURR); AND CAP, RIVET; GENERAL PURPOSE

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal Agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers solid, split, and tubular rivets in inch and metric sizes having shanks up to 1/2 inch or 10.0 millimeter in diameter, flat washers (burrs), and rivet caps for general purpose and aircraft application.

1.2 Classification.

1.2.1 Rivets. The rivets covered by this specification shall be of the following types, classes and grades as specified (see 6.2):

Type I - Belt (type) solid rivets.
- Class 1 - Straight shank.
  - Grade A - Copper.
  - Grade F - Brass.
- Class 2 - Tapered shank.
  - Grade A - Copper.
  - Grade F - Brass.

Type IV - Tinners' flat-head solid rivets.
- Grade A - Copper.
- Grade B - Aluminum.
- Grade C - Corrosion-resisting steel.
- Grade D - Nickel-copper alloy (monel).
- Grade E - Steel.
- Grade F - Brass.

Type VI - Pan-head solid rivets.
- Grade A - Copper.
- Grade B - Aluminum.
- Grade C - Corrosion-resisting steel.
- Grade D - Nickel-Copper alloy (monel).
- Grade E - Steel.
- Grade F - Brass.

Type X - Flat countersunk-head (90°) solid rivets.
- Grade A - Copper.
- Grade B - Aluminum.
- Grade C - Corrosion-resisting steel.
- Grade E - Steel.
- Grade F - Brass.

Type XI - Split rivets.
- Class 1 - Oval-head.
  - Grade E - Steel.
  - Grade F - Brass.
- Class 2 - Flat countersunk-head.
  - Grade E - Steel.
  - Grade F - Brass.

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Type XII - Tubular rivets.
  Class 1 - Flat-head.
    Grade E - Steel.
    Grade F - Brass.
  Class 2 - Flat countersunk-head (90° approx.)
    Grade E - Steel.
    Grade F - Brass.
  Class 3 - Oval-head.
    Grade A - Copper.
    Grade B - Aluminum.
    Grade C - Corrosion-resisting steel.
    Grade D - Nickel-copper alloy (monel).
    Grade E - Steel.
    Grade F - Brass.

Type XIII - Countersunk-head (150°) tubular rivets.
  Grade A - Copper.
  Grade B - Aluminum.
  Grade D - Nickel-copper alloy (monel).
  Grade E - Steel.
  Grade F - Brass.

Type XIV - Universal head solid rivets.
  Grade A - Copper.
  Grade B - Aluminum.
  Grade C - Corrosion-resisting steel.
  Grade D - Nickel-copper alloy (monel).
  Grade E - Steel.
  Grade F - Brass.

Type XV - Countersunk-head (100°) solid rivets.
  Grade A - Copper.
  Grade B - Aluminum.
  Grade C - Corrosion-resisting steel.
  Grade D - Nickel-copper alloy (monel).
  Grade E - Steel.
  Grade F - Brass.

Type XVI - Oval head for safety chain.
  Grade F - Brass.

1.2.2 Rivet caps. Rivet caps shall be of the following types and grades as specified (see 6.2).

Type I - For use with split rivets.
  Grade E - Steel.
  Grade F - Brass.

Type II - For use with tubular rivets.
  Grade E - Steel.
  Grade F - Brass.

1.2.3 Flat washers (burrs). Flat washers (burrs) shall be of the following grade as specified (see 6.2).

  Grade A - Copper.
  Grade F - Brass.

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2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein for inch and metric sizes until replacement metric documents are available for metric sizes:

Federal Specifications:

QQ-A-430 - Aluminum Alloy Rod and Wire; for Rivets and Cold Heading.
QQ-B-613 - Brass, Leaded and Nonleaded; Flat Products (Plate, Bar, Sheet, and Strip).
QQ-C-576 - Copper Flat Products with Slit, Slit and Edge-Rolled, Sheared, Sawed, or Machined Edges, (Plate, Bar, Sheet, and Strip).
QQ-N-281 - Nickel-Copper-Alloy Bar, Plate, Rod, Sheet, Strip, Wire, Forgings, and Structural and Special Shaped Sections.
QQ-N-290 - Nickel Plating (Electrodeposited).
QQ-P-416 - Plating, Cadmium (Electrodeposited).
QQ-W-321 - Wire, Copper Alloy.
QQ-W-343 - Wire, Electrical (Uninsulated).
QQ-Z-325 - Zinc Coating, Electrodeposited, Requirements for.
PPP-H-1581 - Hardware (Fasteners and Related Items), Packaging and Packing for Shipment and Storage of

Federal Standards:

FED. STD. NO. 66 - Steel; Chemical Composition and Hardenability.
FED. STD. NO. 151 - Metals; Test Methods.

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards and Commercial Item Descriptions. The Index, which includes cumulative bimontly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification, other Federal Specifications, and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston; New York; Washington, DC; Philadelphia; Atlanta; Chicago; Kansas City, MO; Fort Worth; Houston; Denver; San Francisco; Los Angeles; and Seattle, WA.

(Federal Government activities may obtain copies of Federal specifications, standards, and commercial item descriptions, and the Index of Federal Specifications, Standards and Commercial Item Descriptions from established distribution points in their agencies.)

Military Specifications:

MIL-F-495 - Finish, Chemical, Black, for Copper Alloys.
MIL-C-5541 - Chemical Films and Chemical Film Materials for Aluminum and Aluminum Alloys.
MIL-H-6088 - Heat Treatment of Aluminum Alloys.
MIL-A-8625 - Anodic Coatings, for Aluminum and Aluminum Alloys.
MIL-T-10727 - Tin Plating; Electrodeposited or Hot-Dipped, for Ferrous and Nonferrous Metals.
MIL-C-13924 - Coating, Oxide, Black, for Ferrous Metals.
MIL-C-81562 - Coating, Cadmium and Zinc (Mechanically Deposited).
MIL-P-81728 - Plating, Tine-Lead (Electrodeposited).

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Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-1312 - Fasteners, Test Methods.
DS51403 - Rivet, Tubular, Round and Flat Type Head, Metric.
DS51404 - Rivet, Solid, Universal Head, Brass, Metric.
DS51405 - Rivet, Solid, Universal Head, Carbon Steel, Metric.
DS51406 - Rivet, Solid, Countersunk 100° Precision Head, Carbon Steel, Metric.
DS51407 - Rivet, Solid, Universal Head, Copper, Metric.
DS51408 - Rivet, solid, Countersunk 100° Precision Head, Copper, Metric.
MS9318 - Rivet, Solid - 100° Flush Head, AMS7233.
MS9319 - Rivet, Solid - Universal Head AMS7233.
MS9403 - Rivet, Solid - Universal Head, AMS5737.
MS9460 - Rivet, Solid - 100° Flush Head, AMS7235.
MS16535 - Rivet, Tubular Oval Head.
MS16536 - Rivet, Tubular 150° Flat Countersunk Head.
MS17312 - Rivet for Safety Chain, Type II, Class 6, No. 0.
MS20427 - Rivet, Solid - 100° Countersunk Head, Carbon Steel, Corrosion-Resistant Steel, Monel and Copper.
MS20613 - Rivet, Solid-Universal Head, Steel, Carbon, and Steel, Corrosion-Resistant.
MS20615 - Rivet, Solid-Universal Head, Brass, Copper and Nickel-Copper Alloy.
MS35684 - Rivet, Split-Oval Head, Steel.
MS35685 - Rivet, Split-Oval Head, Brass.
MS35743 - Rivet, Solid - Small, Pan Head, Steel, Annealed.
MS35744 - Rivet, Solid - Small, Countersunk Head, Steel, Annealed.
MS35745 - Rivet, Solid - Belt.
MS51924 - Caps, Rivet.
MS51931 - Rivet, Solid - Tinner's.
MS51936 - Washer, Flat (Burr).
MS51942 - Rivet, Tubular - Flat Head.
MS51945 - Rivet, Solid - 90° Countersunk Head Brass or Copper.
AN123151 thru AN123300 Rivet - Universal Head, High Temperature, AMS7229.
AN123301 thru AN123450 Rivet - Universal Head, High Temperature, AMS7232.
AN123451 thru AN123600 Rivet - Countersunk Head, High Temperature, AMS7229.
AN123601 thru AN123750 Rivet - Countersunk Head, High Temperature, AMS7232.
AN124951 thru AN125100 Rivet - 100° Countersunk Head, Corrosion Resistant Steel.
AN125401 thru AN125550 Rivet - Universal Head, Corrosion Resistant Steel.
AN125551 thru AN125700 Rivet - Universal Head, Mild Steel.

(Copies of Military specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply:

American National Standards Institute Inc. (ANSI) Standards:

ANSI B4.2 - Preferred Metric Limits and Fits.
ANSI B18.1.1 - Small Solid Rivets.
ANSI B18.7 - General Purpose Semi-Tubular Rivets, Full Tubular Rivets, Split Rivets and Rivet Caps.

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

American Society for Testing and Materials (ASTM) Standards:

ASTM A380 - Cleaning and Descaling Stainless Steel Parts, Equipment and Systems.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race St. Philadelphia, PA. 19103.)

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Society of Automotive Engineers (SAE):

Aerospace Materials Specification:

AMS2400 Cadmium Plating.
AMS5737 Steel, Corrosion and Heat Resistant.
AMS7225 Rivets, Steel.
AMS7228 Rivets, Steel, Corrosion-Resistant.
AMS7229 Rivets, Steel, Corrosion and Heat Resistant.
AMS7232 Rivets, Alloy, Corrosion and Heat Resistant.
AMS7233 Rivets, Solid, Alloy, Corrosion-Resistant.
AMS7235 Rivets, Steel, Corrosion and Heat Resistant.
J492 - Rivets and Riveting.

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

3. REQUIREMENTS

3.1 Material. Recycled and reclaimed materials shall be used to the maximum extent practicable. Unless otherwise specified (see 6.2), the rivets, flat washer (burrs), and caps shall be manufactured from the materials specified herein. When specified (see 6.2), the rivets, flat washer (burrs), and caps shall conform to the material specification set forth in the contract or order.

3.1.1 Rivets.

3.1.1.1 Copper. Unless otherwise specified, grade A rivets shall be made from wire conforming to the requirements of QQ-W-343, type S. Rivets of DS51407, DS51408, MS16535, MS16536, MS20427, MS20615, MS35745, and MS51945, shall be made in accordance with the applicable material specification of the standard.

3.1.1.2 Aluminum. Unless otherwise specified, grade B rivets shall be made from aluminum wire conforming to the requirements of QQ-A-430. Rivets of MS16535 and MS16536 shall be made in accordance with the applicable material specification of the standard.

3.1.1.3 Corrosion-resisting steel. Unless otherwsie specified, grade C rivets shall be made from corrosion-resistant steel wire conforming to the requirements of FED. STD. NO. 66, 300 series, AMS5737, AMS7228, AMS7229, AMS7232, AMS7233, or AMS7235. Rivets of the following standards shall be made in accordance with the applicable material specification of the standard.

MS9403	AN123151 thru AN123300
MS9460	AN123301 thru AN123450
MS20427	AN123451 thru AN123600
MS20613	AN123601 thru AN123750
	AN124951 thru AN125100
	AN125401 thru AN125550

3.1.1.4 Nickel-copper alloy (monel). Unless otherwise specified, grade D rivets shall be made from a nickel-copper alloy conforming to the requirement of QQ-N-281, class A, "O" temper. Rivets of MS9318, MS9319, MS16535, MS16536, MS20427, and MS20615 shall be made in accordance with the applicable material specification of the standard.

3.1.1.5 Steel. Unless otherwise specified, grade E rivets shall be made from wire conforming to the requirements of FED. STD. NO. 66 composition 1005 thru 1022 or AMS7225. Rivets of the following military standards shall be made in accordance with the applicable material specification of the standard.

DS51405	MS35743
DS51406	MS35744
MS16535	MS51931
MS16536	MS51942
MS20427	AN125551 thru AN125700
MS20613	
MS35684	

3.1.1.6 Brass. Unless otherwise specified, grade F rivets shall be made from wire conforming to the requirements of QQ-W-321 composition 260 or 270, quarter hard. Rivets of DS51404, MS16535, MS16536, MS17312, MS20615, MS35685, MS51924, MS51942, and MS51945 shall be made in accordance with the applicable material specification of the standard.

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3.1.2 Rivet caps.

3.1.2.1 Steel. Unless otherwise specified, grade E rivet caps shall be made from carbon steel or strip in accordance with the chemical composition limits of FED. STD. NO. 66 composition 1006 thru 1023. Rivet cap of MS51924 shall be made in accordance with the applicable material specification of the standard.

3.1.2.2 Brass. Unless otherwise specified, grade F rivet caps shall be made from wire conforming to the requirements of QQ-W-321 composition 260 or 270, quarter hard. Rivet cap of MS51924 shall be made in accordance with the applicable material specification of the standard.

3.1.3 Flat washers (burrs). Flat washers (burrs) of MS51936 shall be in accordance with the applicable material specified.

3.1.3.1 Copper. Unless otherwise specified in the contract or order (see 6.2), grade A flat washers (burrs) used with type I, class 1 and class 2 rivets shall be cold rolled half-hard to spring temper conforming to QQ-C-576.

3.1.3.2 Brass. Unless otherwise specified in the contract or order (see 6.2), grade F flat washers (burrs) shall be made from material conforming to QQ-B-613, composition II, half-hard. Rivet tubular of DS51403 shall be made in accordance with the applicable material specification of the standard.

3.2 Heat treatment.

3.2.1 Grade E (steel). Hardness of Grade E rivets shall not exceed 60HRB for types IV, VI, and X through XV. For other types, the hardness shall be as specified in the applicable document (see 6.2).

3.2.2 Grade B (aluminum). Heat treatment of grade B rivets 2017-T4, 2024-T4 and 2117-T4 and annealing of 1000°F rivets shall conform to MIL-H-6088.

3.3 Protective finish. Unless otherwise specified in the contract or order (see 6.2), rivets, rivet caps, and flat washers (burrs) shall be uncoated, plated, coated, or treated as indicated in 3.3.1 to 3.3.8 inclusive.

3.3.1 Zinc plating. Zinc plating shall be in accordance with QQ-Z-325, type II, class 2 (13 µm thick), MIL-C-81562, type II, class 2 (13 µm thick).

3.3.2 Cadmium plating. Cadmium plating shall be in accordance with QQ-P-416, type II, class 2 (7.6 µm thick), AMS2400, or MIL-C-81562, type II, class 2 (7.6 µm thick) as specified in the applicable document.

3.3.3 Passivation. Grade C rivets shall be passivated in accordance with ANSI/ASTM A380-78 or as specified in the applicable document.

3.3.4 Anodizing and chemical treatment. Grade B rivets shall be anodized in accordance with MIL-A-8625 or given a chemical film in accordance with MIL-C-5541.

3.3.5 Oxide and black chemical finishes. Oxide and black chemical finishes shall be applied to rivets, flat washers (burrs) and rivet caps in accordance with MIL-F-495 or MIL-C-13924 as specified in the contract or order.

3.3.6 Tin plating. Grade E rivets shall be tin plated in accordance with MIL-T-10727 as specified in the contract or order. Rivets of MS51931 shall be tinned as specified.

3.3.7 Nickel plating. Nickel plating shall be applied to types XII and XIII, grade F rivets in accordance with QQ-N-290, class 1, grade F (10.2 µm thick). Rivets of MS16535 and MS16536 shall be nickel plated as specified.

3.3.8 Bright copper. Grade A rivets and flat washers (burrs) shall be furnished with a natural bright copper finish.

3.4 Shear strength. Unless otherwise specified, shear strength of rod or wire (see 6.2) shall meet the requirements in table I. For metric sizes the actual test requirements for individual diameters for double shear, derived from table I are shown in table II.

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TABLE I. Mechanical properties

Material	Material specification	Minimum shear strength psi	Minimum shear strength MPa	Minimum tensile strength psi	Minimum tensile strength MPa
Copper	QQ-W-343 (Type "S")	24,000	165	35,000	241
Aluminum	QQ-A-430				
	1100-F	None required	None required	None required	
	2017-T4	33,000	228	55,000	379
	2024-T4	37,000	255	62,000	428
	2117-T4	26,000	179	38,000	262
	5056-H32	24,000	165	44,000	303
Corrosion resistant steel (CRES)	FED. STD. NO.66 (Composition 304 and 305, condition A)	48,000	331	84,000	579
	AMS5737	90,000	621	140,000	965
	AMS7233	49,000	338	Not specified	
	AMS7235	90,000	621	Not specified	
	FED. STD. NO.66 (Series 300, Condition A)	65,000 to 85,000	1/ 448 to 586 2/	75,000 to 115,000	3/ 517 to 793 4/
Nickel-Copper Alloy (Monel)	QQ-N-281 (Class A, "O" temper)	49,000	338	80,000	552
Steel	FED. STD. NO.66 Steel numbers 1005 thru 1022 and condition, as required)	32,000	221	43,000	297
Brass	QQ-W-321 (Composition 260 or 270, quarter hard)	35,000	241	62,000	428

1/ See table II column A

2/ See table II column B

3/ See table III column A

4/ See table III column B

TABLE II. – Shear strength requirements

Rivet diameter nom (mm)	Rivet diameter min (mm) 1/	Double shear strength min values (newtons) 1/													
										Corrosion resistance steel					
		Aluminum alloy 5056-H32	Aluminum alloy 2117-T4	Aluminum alloy 2017-T4	Aluminum alloy 2024-T4	Steel FED. STD NO 66 1005 thru 1022	Copper QQ-W-343 Type S	Brass QQ-W-321 Comp 260 or 270 Quarter hard	Nickel-copper alloy (monel) QQ-N-281, Class A, O Temper	FED. STD. NO 66 Comp 304 and 305, Condition A	AMS5737	AMS7233	AMS7235	FED. STD NO 66 300 series, Condition A, A	FED. STD NO 66 300 series, Condition A, B
1.6	1.52	600	654	835	925	802	600	875	1227	1202	2254	1227	2254	1628	2127
2.0	1.92	955	1042	1331	1476	1280	955	1395	1957	1917	3596	1957	3596	2594	3393
2.5	2.42	1518	1657	2116	2345	2033	1518	2217	3109	3044	5712	3109	5712	4121	5390
3.0	2.92	2210	2410	3080	3415	2960	2210	3228	4527	4433	8318	4527	8318	6001	7849
3.5	3.40	2988	3259	4164	4617	4001	2988	4364	6120	5993	11244	6120	11244	8111	10609
4.0	3.90	3932	4289	5481	6077	5266	3932	5743	8055	7888	14798	8055	14798	10678	13964
5.0	4.90	6210	6775	8657	9597	8316	6210	9071	12722	12458	23373	12722	23373	16862	22056
6.0	5.90	9007	9826	12555	13919	12064	9007	13155	18450	18068	33898	18450	33898	24455	31987
8.0	7.87	16066	17512	22377	24809	21501	16068	23447	32884	32203	60417	32884	60417	43586	57012
10.0	9.87	25249	27544	35195	39021	33816	25249	36878	51721	50650	95027	51721	95027	68564	89671

1/ Rivet shank tolerance based on d-11 of ANSI B4 2. If a different tolerance is used the shear strength values must be changed accordingly.

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3.5 Tensile strength. For 2017-T4, 2024-T4, and 2117-T4 aluminum rivets smaller than 3/32 inch or 2.5 millimeter in diameter or in nonstandard sizes for which a shear test jig is not available, a sample of wire or rod, from which the rivets were made and which has been treated with the lot of rivets that it represents, shall conform to the tensile properties of QQ-A-430 after heat treatment. No tension test is required for 1100-F rivets. For metric sizes the wire or rod from which rivets are made shall conform to the minimum tensile strength of the material specified on the appropriate rivet standard. Tensile strength shall be calculated on rivet minimum shank diameters. Refer to table III for tension load values calculated from the tensile strength of rivet materials as shown in table I.

TABLE III. Tensile strength requirements

Rivet diameter nom (mm)	Rivet diameter min (mm) 1/	Tensile strength min values (newtons) 1/													
										Corrosion resistance steel					
		Aluminum alloy 5056-H32	Aluminum alloy 2117-T4	Aluminum alloy 2017-T4	Aluminum alloy 2024-T4	Steel FED STD NO 66 1005 thru 1022	Copper QQ-W-343 Type S	Brass QQ-W-343 Comp. 260 or 270 Quarter hard	Nickel-copper alloy (monel) QQ-N-281, Class A, O Temper	FED STD NO 66 Comp. 304 and 305, Condition A	AMS5737	AMS7233	AMS7235	FED STD NO 66 300 series, Condition A, A	FED STD NO 66 300 series, Condition A, B
1.6	1.52	550	476	688	776	539	437	776	1002	1051	1751			938	1439
2.0	1.92	877	759	1097	1239	860	698	1239	1590	1676	2794			1497	2296
2.5	2.42	1393	1205	1743	1968	1366	1108	1968	2539	2663	4438			2378	3647
3.0	2.92	2029	1755	2538	2866	1989	1614	2866	3697	3878	6463			3462	5311
3.5	3.40	2743	2372	3431	3875	2689	2182	3875	4997	5242	8736			4680	7179
4.0	3.90	3610	3122	4516	5100	3539	2872	5100	6577	6899	11497			6160	9449
5.0	4.90	5702	4931	7132	8055	5589	4535	8055	10388	10896	18160			9729	14923
6.0	5.90	8270	7151	10344	11681	8106	6578	11681	15066	15803	26338			14110	21643
8.0	7.87	14739	12745	18436	20820	14448	11724	20820	26852	28165	46942			25150	38575
10.0	9.87	23183	20046	28998	32747	22724	18439	32747	42234	44300	73833			39556	60673

1/ Rivet shank tolerance based on d-11 of ANSI B4.2

3.6 Design and dimensions.

3.6.1 Rivets. The design, dimensions and tolerances shall be in agreement with American National Standards B18.1 and B18.7, SAE J492, and those Military standards and AN standards listed in section 2 of this specification, as applicable (see 6.2). The type I, class 2 belt rivets shall conform to figure 1.

3.6.1.1 Roundness and concentricity. Rivet heads of type XIV, grade B and type XV, grade B rivets shall not deviate from true roundness and concentricity with the shank by an amount which will produce a full indicator movement reading greater than the value specified in table IV for the corresponding rivet diameter. The reading shall be taken with the indicator touching the periphery of the head as the rivet is rotated on its shank as an axis.

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TABLE IV. Tolerances on roundness and concentricity.

Nominal diameter of rivet shank (inch)	Total variation in indicator reading on rivet head	
	Flush head (inch)	Protruding head (inch)
0.062, 0.094, 0.125 0.156, 0.187 0.250 0.312, 0.375	0.010 0.010 0.010 0.015	0.010 0.015 0.020 0.020
mm	mm	mm
1.6: 2.0: 2.5: 3.0: 3.5: 4.0: 5.0 6.0 8.0: 10.0	0.25 0.25 0.25 0.38	0.25 0.38 0.50 0.50

3.6.2 Flat washers (burrs). Unless otherwise specified in the invitation for bids (see 6.2), type I, class I and class 2 belt rivets shall be furnished with flat washers (burrs) conforming to the requirements of MS51936. The flat washers (burrs) shall be circular in shape with concentric holes.

3.6.3 Caps. When specified in the invitation for bids split and tubular rivets shall be provided with caps conforming to the requirements of MS51924.

3.7 Product identification. Product identification may be applied to the rivets, flat washers (burrs), and rivet caps, if they do not interfere with the proper use of the rivets, flat washers (burrs), or rivet caps in accordance with the applicable rivet standard.

3.8 Workmanship. Rivets must be true to form, concentric and shall drive satisfactorily with a full head free of cracks. Rivets, flat washers (burrs), and rivet caps shall be free from injurious scale, fins, rough edges, slivers, seams, and gouges.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Sampling for lot acceptance.

4.2.1 Inspection lot. A lot shall consist of all rivets, flat washers (burrs), or rivet caps of the same type, class, grade, and size manufactured under like conditions and offered for delivery at one time.

4.2.2 Sampling for visual and dimensional examination. A random sample of rivets, flat washers (burrs), or rivet caps shall be selected from each lot in accordance with MIL-STD-105, inspection level S-4. The Acceptable Quality Level (AQL) shall be as specified in table V.

4.2.3 Sampling for test.

4.2.3.1 Sampling for hardness test. Samples shall be drawn from each lot of grade E rivets in accordance with MIL-STD-105, inspection level S-2. The Acceptable Quality Level (AQL) shall be 2.5 percent defective.

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4.2.3.2 Sampling for protective finish. Sampling for test of protective finishes shall be in accordance with the applicable specifications.

4.2.3.3 Sampling for chemical analysis. For determining the chemical composition, a sample size of 2 to 5 ounces or (0.057 to 0.142 kilograms) of rivets, flat washers (burrs) or rivet caps shall be drawn from each lot presented for acceptance, or as otherwise stated in 4.4.3.

4.2.3.4 Sampling for shear or tensile test. When required (see 6.2), the sample size shall consist of one foot length, (305 mm) of material, cut from the same stock, used in the manufacture of the lot of rivets to be tested.

4.3 Examination of product.

4.3.1 Visual and dimensional examination. Sample rivets, flat washers (burrs), and rivet caps shall be examined to verify compliance with the requirements of this specification as stated in 4.3.2.

4.3.2 Classification of defects. Inspection shall be conducted as specified in table V:

TABLE V. Classification of defects.

Categories	Defects	Inspection method
Critical	None Defined	
Major	AQL = 2.5 percent	
101	Protective finish, when required (see 3.3)	Visual
102	Shank diameter (of rivets)(see 3.6.1)	Measure
103	Head diameter (of rivets)(see 3.6.1)	Measure
104	Length (of rivets)(see 3.6.1)	Measure
105	Depth of hole (types XII and XIII rivets)(see 3.6.1)	Measure
106	Diameter of hole (types XII and XIII rivets)(see 3.6.1)	Measure
107	Roundness and concentricity (see 3.6.1.1)	Measure
108	Flat washers (burrs) with belt rivets when applicable (see 3.6.2)	Visual
109	Outside diameter flat washers (burrs) (see 3.6.2)	Measure
110	Diameter of hole flat washers (burrs)(see 3.6.2)	Measure
111	Inside diameter (of rivet caps)(see 3.6.3)	Measure
112	Outside diameter (of rivet caps)(see 3.6.3)	Measure
113	Workmanship (see 3.8)	Visual
Minor	AQL = 6.5 percent	
201	Head height (rivets)(see 3.6.1)	Measure
202	Head radius (types VI, XI and XIII rivets)(see 3.6.1)	Measure
203	Width of slot (type XI rivets)(see 3.6.1)	Measure
204	Product identification interference (see 3.7)	Visual
205	Coating of dirt, oil, or other foreign substance (see 3.8)	Visual

4.3.3 Packaging inspection. The sampling and inspection of the preservation-packaging, packing and container marking shall be in accordance with the requirements of PPP-H-1581.

4.4 Tests.

4.4.1 Hardness tests. Tests for hardness (grade E rivets only) shall be performed in accordance with MIL-STD-1312, test no. 6 (see 3.2 and 6.2).

4.4.2 Protective coating. Protective surface finishes shall be tested in accordance with the test requirements of the applicable coating specifications (see 3.3 and 4.2.3.2). Grade E rivets shall withstand 36 continuous hours of 100 percent load strength test with no breakage due to embrittlement. Failure of any one part shall be cause for rejection of the entire lot.

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4.4.3 Chemical analysis. Unless otherwise specified by the procuring agency (see 4.2.3.3 and 6.2), chemical analysis shall be made in accordance with method 111.2 or 112.2 of FED. STD. NO. 151. The sample shall be analyzed by a Government approved laboratory. When permitted by the procuring agency (see 6.2), the metal manufacturer's certificate of conformance showing the chemical composition is acceptable.

4.4.4 Shear strength. Shear strength tests shall be made in accordance with MIL-STD-1312, test no. 13 and shall meet the minimum requirements stated in 3.4. When tests made on specimens of wire (see 4.2.3.4), the shear strength shall be calculated on the measured diameter of the wire. When tests on other types of fixtures are desired, the method shall be approved by the procuring agency. When permitted by the procuring agency (see 6.2), the metal manufacturer's certification for minimum shear is acceptable.

4.4.5 Tensile strength. The tensile strength test of rivets shall be conducted in accordance with MIL-STD-1312, test no. 8. The sample of wire or rod shall be tested in full section for sizes up to 3/8 inch or 10.0 millimeter. For larger sizes, the specimen may be a full section of the rod or a specimen conforming to MIL-STD-1312, test no. 8.

4.5 Rejection and reinspection criteria.

4.5.1 Failures in examination. Rejection and resubmission of lots shall be accomplished in accordance with MIL-STD-105.

4.5.2 Failures in hardness test. If one or more rivets of the sample fail, another like sample shall be taken and tested. If any specimen of the second sample fails to meet the requirements, the lot represented shall be rejected. After reworking the lot (by heat treatment), the lot may be resubmitted.

4.5.3 Failures in the tests for the protective surface finishes. Rejected lots may be reprocessed in accordance with pertinent coating specification (see 3.3), and resubmitted.

4.5.4 Chemical analysis. Any variation between the chemical composition of the sample and the applicable material specification (see 3.1) shall be cause for rejection of the lot. Lots that fail in chemical analysis may not be resubmitted.

4.5.5 Failures in shear or tensile test. When the sample fails, the entire lot shall be rejected.

5. PREPARATION FOR DELIVERY

5.1 Packaging requirements. The requirements for packaging shall be in accordance with PPP-H-1581 (see 6.2).

6. NOTES

6.1 Intended use. This specification covers various types of small rivets having shank diameters under one-half inch or 10.0 millimeters for use as fasteners for general purpose and aircraft application. Flat washers (burrs) are flat washer type items that may be used with belt rivets.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

a. Title, number, and date of this specification.
b. Title, number, and date of Military Standard if applicable.
c. Military Standard part number if applicable.
d. Type, class, grade, and size of rivets, flat washers (burrs) or rivet caps (see 1.2 and 3.6).
e. Plating, coating, or surface treatment, when required (see 3.3).
f. Shear requirement, if different (see 3.4).
g. Sampling for shear test or tensile test when required (see 4.2.3.4).
h. Hardness test (see 3.2 and 4.4.1).
i. If certificate of conformance is acceptable for chemical analysis and/or shear test (see 4.4.3 and 4.4.4).
j. Applicable levels of packaging protection (see 5.1).
k. Tensile strength test, if required (see 4.4.5).
l. Flat washers (burrs) supplied with belt rivets, if required (see 3.1.3 and 3.6.2).

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6.3 Items procured under this specification for Military use are to be limited to the varieties delineated within this specification and on the applicable Military or AN standard. Personnel of the Military departments are requested to refer to these documents for guidance.

6.4 For general applications, the approximate length of solid rivet, when impact or squeeze riveted, required to form the head and fill the clearance space in the hole, should be in excess of the thickness of the material to be riveted by an amount equal to approximately 0.75 to 1.00 times the rivet diameter for forming countersunk heads and from 1.30 to 1.70 times the rivet diameter for forming round or pan heads.

6.5 Supersession data. This specification supersedes MIL-R-1166, dated 28 July 1949 and MIL-R-25838, dated 13 December 1965.

6.6 Definitions.

6.6.1 Metric terms and definitions. Metric terms used in this specification are defined in American Society for Testing and Materials Standard ASTM E 380, Standard for Metric Practice.

6.6.2 Quality assurance terms and definitions. Quality assurance terms used in this specification are defined in MIL-STD-109.

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Army - AR
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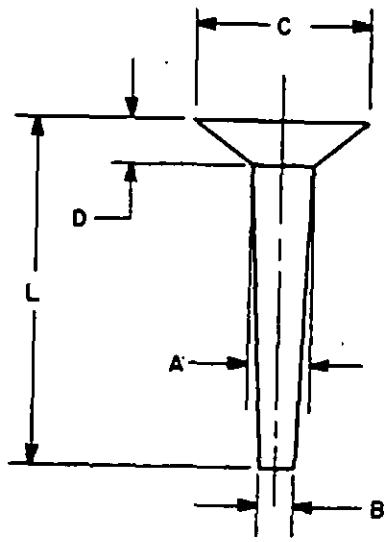

SOLID RIVETS, BELT							
Size no.	"A" Diameter		"B" Diameter		"C" Diameter	D	L
	max (inch)	min (inch)	max (inch)	min (inch)	±.010	±.005	±.010
4	.270	.260	.255	.245	.937	.110	Overall length for all size rivets to be 1/4 to 1-1/4 by 1/8 increments.
5	.250	.225	.222	.212	.905	.105	
6	.228	.205	.202	.192	.687	.090	
7	.191	.180	.175	.165	.594	.070	
8	.181	.168	.164	.154	.500	.063	
9	.161	.150	.145	.136	.469	.058	
10	.151	.138	.133	.122	.437	.055	
11	.141	.133	.127	.118	.406	.050	
12	.137	.130	.123	.114	.375	.045	
13	.118	.112	.105	.099	.344	.040	
14	.102	.098	.092	.085	.312	.030	
15	.090	.085	.084	.074	.250	.025	

FIGURE I. Belt rivet, tapered shank

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