Designation: F844 – 19

Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use[1]

This standard is issued under the fixed designation F844; 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 covers round and miscellaneous shape steel plain (flat) washers furnished in an unhardened condition.

1.2 These washers are intended for general use bolt, nut, and stud applications to provide increased bearing surface, spacing, and to prevent galling.

1.3 Unless otherwise specified, washers are furnished with dimensions conforming to B18.21.1, Type A, Table 11.

1.4 Hardened washers for use with heat-treated structural bolts are covered by Specifications F436/F436M.

1.5 The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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:*[2]

A29/A29M Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought

A568/A568M Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

A751 Test Methods and Practices for Chemical Analysis of Steel Products

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

F436/F436M Specification for Hardened Steel Washers Inch and Metric Dimensions

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

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

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

2.2 *ASME Standards:*[3]

B18.21.1 Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)

B18.24 Part Identifying Number (PIN) Code System Standard for B18 Fastener Products

2.3 *Military Specification:*

DOD-P-16232 Phosphate Coating for Ferrous Metals[4]

2.4 *Federal Specification:*

QQ-P-416 Plating, Cadmium (Electrodeposited)[4]

3. Ordering Information

3.1 Orders for washers under this specification shall include:

3.1.1 Quantity (number of pieces of same item and size).

3.1.2 Name of item (steel plain washers).

3.1.3 Size (Nominal inside diameter and thickness. Include outside diameter, when required).

3.2 The following requirements are optional and may be specified when required:

3.2.1 Dimensions if other than B18.21.1, Type A.

3.2.2 Finish if other than oiled (see 4.3 through 4.3.6).

3.2.3 Chemical composition, if required (see 5.1.2).

3.2.4 Hardness, if required (see 6.2).

3.2.5 Test Reports, if required (see Section 12).

[1] This specification is under the jurisdiction of Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.06 on Steel Washers and Rivets. Current edition approved . Published December 2020. Originally approved in 1983. Last previous edition approved in 2013 as F844 – 07a(2013). DOI: 10.1520/F0844-19.

[2] 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.

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

[4] Available from DLA Document Services, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, http://quicksearch.dla.mil/

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

3.2.6 Marking, if required (see 14.1).

3.2.7 For establishment of a part identifying system, see ASME B18.24.

4. Materials and Manufacture

4.1 *Material*—Washers shall be punched from hot-rolled, hot-rolled and pickled, or cold-rolled steel; or shall be machined from bar stock or tubing; or shall be forged at the manufacturer's option.

4.2 *Burr Removal*—Washers shall be tumbled, vibrated, or otherwise processed to minimize burrs.

4.3 *Protective Finishes:*

4.3.1 *Unprotected Washers*—Unless otherwise specified, washers shall be furnished plain, with no protective finish other than oil to minimize rusting.

4.3.2 *Zinc Coatings, Hot-Dip and Mechanically Deposited:*

4.3.2.1 When zinc-coated washers are required, the purchaser shall specify the zinc-coating process, such as "hot dip," "mechanically deposited," or "no preference." When "no preference" is specified, the supplier shall furnish washers with either finish as described in 4.3.2.2 or 4.3.2.3.

4.3.2.2 When "hot-dip" is specified, the washers shall be zinc-coated by hot dipping in accordance with the requirements of Specification F2329/F2329M.

4.3.2.3 When "mechanically deposited" is specified, the washers shall be zinc-coated by mechanical deposition in accordance with the requirements of Class 55 of Specification B695.

4.3.3 *Cadmium Plating*—Cadmium plated washers shall be cadmium plated by electrodeposition and yellow chromate treated in accordance with Federal Specification QQ-P-416, Type II, Class 3.

4.3.4 *Zinc Plating, Electroplated and Mechanically Deposited:*

4.3.4.1 When zinc plated washers are required, the purchaser shall specify the zinc plating process such as "electroplating" or "mechanical plating" or "no preference". When "no preference" is specified, the supplier shall furnish washers with either finish as described in 4.3.4.2 or 4.3.4.3.

4.3.4.2 When "electroplating" is specified, the washers shall be zinc plated by electrodeposition in accordance with Specification F1941/F1941M, Fe/Zn 5A or 5AN, unless otherwise specified. See Specification F1941/F1941M for other thickness classes and finish types.

4.3.4.3 When "mechanical plating" is specified, the washers shall be zinc plated by mechanical deposition in accordance with Specification B695, Fe/Zn 5A or 5AN, unless otherwise specified. See Specification B695 for other thickness classes and finish types.

4.3.5 *Phosphate Coating*—Phosphate coated washers shall be coated in accordance with Military Specification DOD-P-16232, Type Z, Class 2.

4.3.6 *Other Coatings*—Other protective coatings shall be as specified by the purchaser in the inquiry and purchase order.

5. Chemical Composition

5.1 *Composition Limits:*

5.1.1 Washers shall be steel, and unless otherwise specified, shall have no specified chemical composition requirements.

5.1.2 When required, the purchaser shall provide specific chemical compositions in the inquiry and purchase order, and when so provided, washers shall conform to such compositions.

5.2 *Manufacturer's Analysis*—When specific chemical requirements have been specified and test reports are required, the manufacturer shall make individual analyses of randomly selected washers from the product to be shipped and report the results to the purchaser. In addition, if heat and lot identities have been maintained, the analysis of the raw material from which the fasteners have been manufactured shall, at the option of the manufacturer, be reported instead of product analysis.

5.3 *Product Analysis*—When specific chemical requirements have been specified, the purchaser reserves the right to conduct product analyses on the finished washers or request the manufacturer to conduct product analyses. The chemical composition thus determined shall conform to the specified requirements subject to the standard permissible variations for product analysis in Specification A568/A568M for washers punched from sheet; and Specification A29/A29M for washers machined from bar and tubing, or forged.

6. Mechanical Properties

6.1 Unless otherwise specified, the washers are not furnished to mechanical requirements.

6.2 When required and specified, the washers shall conform to the specified hardness.

7. Dimensions, Mass, and Permissible Variations

7.1 *Standard Dimensions*—Unless otherwise specified, washer dimensions shall be in accordance with B18.21.1, Type, A Table 11. Where narrow (N) and wide (W) washers are provided for, the narrow type shall be furnished unless otherwise specified.

7.2 *Non-Standard Dimensions*—Other washers covered by this specification are generally referred to as US standard washers, SAE washers, light steel washers, riveting washers, fender washers, machinery bushing washers, machine screw washers, and similar designations. When specified, washers shall be furnished to these types or shall be manufactured to the purchaser's drawing requirements.

7.3 *Parallelism*—Washer faces shall be parallel within 0.005 in.

7.4 *Flatness:*

7.4.1 Washer faces shall be flat within the following requirements:

Outside Diameter, inches	Out of Flat, inches, maximum
0.500 and less	0.007
0.5625 through 1.250	0.010
over 1.250	0.015

7.4.2 Flatness shall be measured by laying a flat or concave side of the washer, if there is one, on a surface plate (so it rests on its outside diameter), and measuring the maximum difference in height of the other side above the surface plate. If both