

MIL-B-45912A  
8 August 1969  

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SUPERSEDING  
MIL-B-45912  
13 September 1966

## MILITARY SPECIFICATION

### BOLT, SELF-LOCKING, HEXAGON HEAD, STEEL

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification covers one type of steel, hexagon head, self-locking bolt.

1.2 Classification. The bolt shall be furnished in the following compositions:

Composition A - SAE Grade 5  
Composition B - SAE Grade 8

#### 2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

#### SPECIFICATIONS

##### Federal

QQ-P-416 - Plating, Cadmium (Electrodeposited)

##### Military

MIL-H-3982 - Hardware (Fasteners and Related Items),  
Packaging and Packing for Shipment and Storage  
of

MIL-P-16232 - Phosphate Coatings, Heavy, Manganese or Zinc  
Base (for Ferrous Metals)

FSC 5306

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## STANDARDS

### Military

- MIL-STD-105 - Sampling Procedures and Tables for Inspection  
by Attributes
- MS35763 - Bolt, Self-Locking, Hexagon Head, Steel, Grade  
5, UNC-2A and UNF-2A
- MS35764 - Bolt, Self-Locking, Hexagon Head, Steel, Grade  
8, UNC-2A and UNF-2A

(Copies of specifications, standards, drawings, and publications required by suppliers 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 otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

#### National Bureau of Standards Handbook:

H28 - Part I - Screw Thread Standards for Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.)

#### Society of Automotive Engineers (SAE) Standard:

SAE - J429 - Mechanical and Quality Requirements  
for Externally Threaded Fasteners.

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 485 Lexington Avenue, New York, New York 10017.)

## 3. REQUIREMENTS

3.1 Material. The bolts shall conform to the material composition of SAE Grade 5 or SAE Grade 8 in accordance with SAE J429.

Composition A - SAE Grade 5 (MS35763)  
Composition B - SAE Grade 8 (MS35764)

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3.2 Design. The bolts shall conform to the design, dimensions, and tolerances specified on MS35763 or MS35764 and in Figure 1.

3.3 Protective finish. The bolts shall be cadmium plated or phosphate coated as specified on the applicable Military Standard. Cadmium plating shall conform to the requirements of Type II, class 3 of QQ-P-416. Phosphate coating shall conform to the requirements of Type Z, class 2 of MIL-P-16232.

3.3.1 Hydrogen embrittlement. Cadmium plated, Grade 8 bolts shall be subjected to an embrittlement relief treatment in accordance with QQ-P-416 as soon as possible after plating to minimize the resulting embrittlement.

3.4 Mechanical properties. The mechanical properties of the bolts shall meet the requirements as specified in Table I (see 4.4.3 and 4.4.4).

TABLE I

MECHANICAL PROPERTIES			
Composition	Properties	BOLT SIZE - INCHES	
		Up to 1" Inclusive	Over 1"
A	Tensile Strength PSI Min	120,000	105,000
	Proof Load PSI	85,000	74,000
	Hardness Rockwell C Range	25-34	19-30
B	Tensile Strength PSI Min	150,000	150,000
	Proof Load PSI	120,000	120,000
	Hardness Rockwell C Range	32-38	32-38

3.5 Threads. Threads shall be UNC or UNF, class 2A, as specified on the applicable Military standard and in accordance with Handbook H-28, Part 1.

### 3.6 Head.

3.6.1 Head Taper. The taper of the head (angle between one side or sides of the head and the axis of the fastener) shall not exceed 2 degrees, with the specified width across the flats being the largest dimension.

3.6.2 Bearing surface. The bearing surface of the head shall be at right angles to the axis of the body within 2 degrees for bolt sizes up to and including one inch and within 1 degree

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for bolt sizes larger than one inch. The bearing surface of the head shall be concentric with the axis of the body within 3 percent of the maximum width across the flats. The diameter of bearing surface shall be equal to 95 percent of maximum width across flats within plus or minus 5 percent.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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 supplies and services conform to prescribed requirements.

#### 4.2 Sampling.

4.2.1 Lot size. A lot shall consist of all bolts of the same size, composition, protective finish and thread produced under essentially the same conditions and submitted for inspection at one time.

4.2.2 Sampling for examination. A random sample of bolts shall be taken from each lot in accordance with Inspection Level II of MIL-STD-105. The Acceptable Quality Levels (AQL) shall be as specified in Table III.

4.2.3 Sampling for tests. A random sample of bolts shall be taken from each lot in accordance with Table II. Any bolt which fails to pass any of the test shall be a defective and cause for rejection of the entire lot represented.

TABLE II

SAMPLE SIZE AND ACCEPTANCE - REJECTION NUMBER FOR TEST

<u>Lot Size</u>	<u>Sample Size</u>	<u>AC</u>	<u>RE</u>
2 - 50	2	0	1
51 - 500	3	0	1
501 - 35000	5	0	1
35000 - over	8	0	1

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4.2.4 Sampling for packaging and packing. Sampling for inspection of Section 5 requirements shall be as specified in MIL-H-3982.

4.3 Examination. The sample bolts of 4.2.2 shall be examined as specified in Table III. Any bolt which contains one or more defects shall be a defective and if the number of defective bolts in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected.

TABLE III

CLASSIFICATION OF DEFECTS

<u>Categories</u>	<u>Defects</u>	<u>Inspection Method</u>
<u>Critical</u>	None	
<u>Major</u>	AQL = 1.5 Percent Defective	
101	Threads (3.5)	*SIE
102	Width across flats (3.2)	SIE
103	Undercut depth of head (3.2)	SIE
104	Slot and recess radius of head (3.2)	SIE
105	Bearing surface of head (3.6.2)	SIE
<u>Minor</u>	AQL = 4.0 Percent Defective	
201	Overall length (3.2)	SIE
202	Thread Length (3.2)	SIE
203	Head height (3.2)	SIE
204	Body diameter (3.2)	SIE
205	Head taper (3.6.1)	SIE
206	Other dimensions (3.2)	SIE
207	Protective finish (3.3)	Visual

\*SIE = Standard Inspection Equipment

4.3.1 Packaging and packing. Inspection to determine compliance with Section 5 shall be as specified in MIL-H-3982.

#### 4.4 Tests.

4.4.1 Material. The contractor shall furnish certification that the material complies with the requirements specified in 3.1.

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4.4.2 Protective finish. The contractor shall furnish certification that the protective finish conforms to the requirements of the specifications referenced in 3.3. When required by the procuring agency, the sample bolts shall be tested as specified in the protective finish specifications.

4.4.3 Proof load and tensile strength. The contractor shall furnish certification that the tensile strength and proof load of bolts conform to the requirements specified in 3.4. When required by the procuring agency, the sample bolts specified in Table II shall be tested for proof load and tensile strength. The test procedures shall be in accordance with the proof load and the wedge tensile test of SAE J429.

4.4.4 Hardness. The contractor shall furnish certification that the hardness conforms to the requirements specified in Table I. When required by the procuring agency, the sample bolts specified in Table II shall be tested for hardness (see Table I). The Rockwell hardness shall be measured at mid-radius on a transverse section taken one diameter from the point of the bolt.

## 5. PREPARATION FOR DELIVERY

5.1 The bolts shall be prepared for shipment as specified in MIL-H-3982.

5.2 The level of protection required (Levels A, B, or C) shall be as specified in the contract or order.

## 6. NOTES

6.1 Intended use. The bolt covered by this specification is intended for use when a self-locking fastener is needed or where the reduction of fatigue failure is desired. Typical applications include uses as cylinder head bolts, flywheel housing bolts, connecting rod bolts, and as bearing cap screws. The bolt may be used in tapped holes or with nuts.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification.
- b. Title, number and date of applicable Military standard(s) (see 3.2).
- c. Applicable MS part number (see 3.2).
- d. Copies and distribution of test certifications.
- e. Level of protection (see 5.2).

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6.3 Description. The bolt covered by this specification is a one piece, free-spinning type of self-locking bolt. Locking action is provided by a flexible diaphragm which is formed between the slotted segments of the upper part of the bolt head and the circular recess adjacent to the shank in the lower part of the head. This diaphragm acts as a controlled spring element when the head is wrenched against a rigid seat. When used as a bearing cap screw, the material which the head of the bolt seats should be hard enough to form a rigid seat.

6.4 This bolt is covered by U.S. Patent Number 3342236, which expires 19 September 1984. The Government does not have a royalty free license under this patent. This bolt is known as a "place" bolt under this patent.

## Custodians:

Army - WC  
Navy - None  
Air Force - 82

## Preparing activity:

Army - WC

Project No. 5306-0345

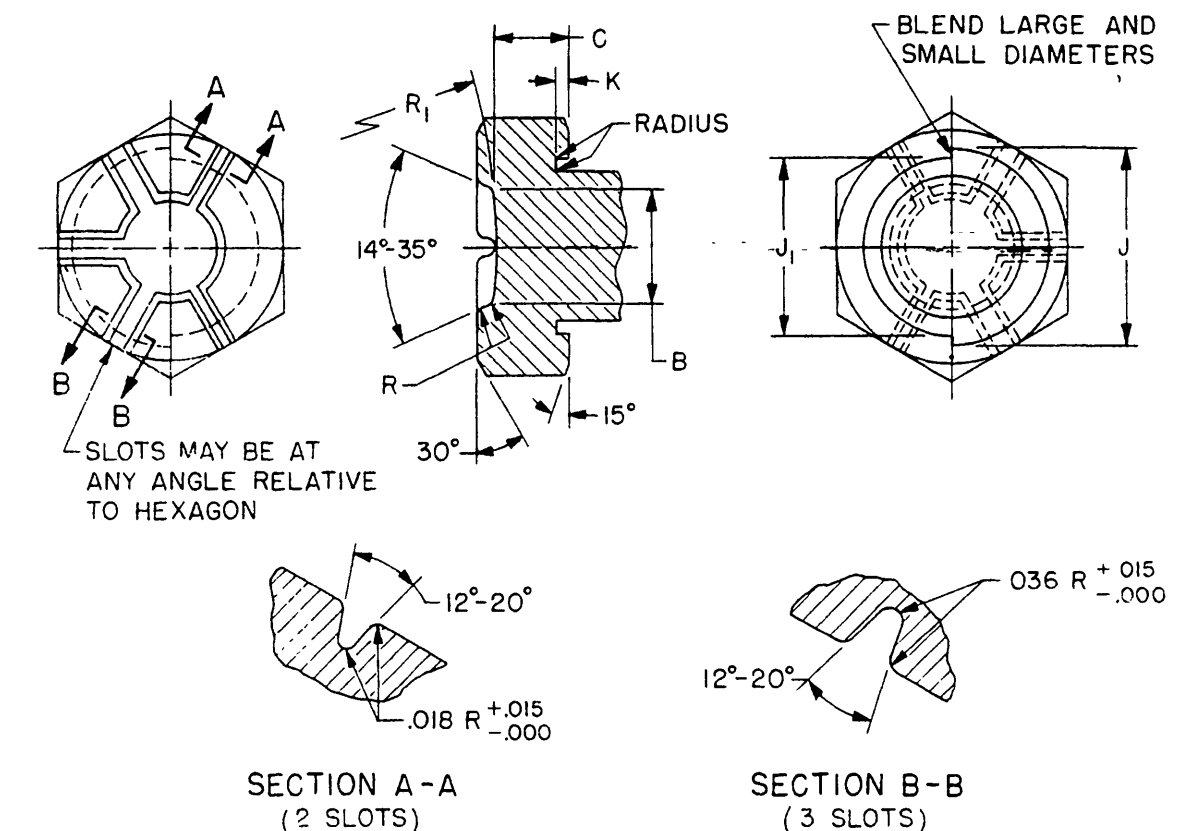
## Reviewer activities:

Army - MI, MU  
Navy - None  
Air Force - 85  
DSA - IS  
NSA

## User activities:

Army - AT, GL, ME  
Navy - AS, MC, OS, SH, YD  
Air Force - None

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NOMINAL SIZE			1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1-1/4
B	RECESS DIA	MAX	.166	.208	.250	.288	.332	.374	.416	.500	.564	.666	.834
		MIN	.146	.188	.230	.268	.312	.354	.396	.480	.564	.646	.814
C	CHECKING HEIGHT	MAX	.110	.145	.185	.205	.220	.260	.290	.335	.390	.475	.590
		MIN	.090	.125	.165	.185	.200	.240	.270	.315	.370	.455	.57
J	RECESS DIA LARGE	MAX	.317	.396	.474	.536	.630	.693	.750	.875	1.000	1.125	1.350
		MIN	.307	.386	.464	.526	.620	.683	.740	.865	.990	1.115	1.370
K	RECESS DEPTH	MAX	.007	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013
		MIN	.004	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010
J1	RECESS DIA SMALL	MAX	.312	.375	.437	.500	.562	.624	.687	.812	.937	1.062	1.312
		MIN	.302	.365	.427	.490	.552	.614	.677	.802	.927	1.052	1.302
K	RECESS DEPTH	MAX	.007	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013
		MIN	.003	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006
R	RADIUS	MAX	.031	.031	.031	.031	.031	.031	.031	.031	.062	.062	.062
		MIN	.018	.018	.018	.018	.018	.018	.018	.018	.031	.031	.031
R1	RADIUS	MAX	2.00	2.00	2.00	2.00	2.00	2.00	3.50	3.88	4.62	6.88	10.98
		MIN	1.50	1.50	1.50	1.50	1.50	1.50	3.00	3.38	4.12	6.38	19.38

## NOTE:

Wide slots in top of head located with wide recess on underside of head.  
Narrow slots in top of head located with narrow recess.

Figure 1 - Head dimensions



## SPECIFICATION ANALYSIS SHEET

Form Approved  
Budget Bureau No. 22-R255

INSTRUCTIONS: This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.

SPECIFICATION

ORGANIZATION

CITY AND STATE

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐

DIRECT GOVERNMENT CONTRACT

☐

SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

| YES | NO (If "yes", in what way?)

4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)

SUBMITTED BY (Printed or typed name and activity - Optional)

DATE

DD FORM 1426  
1 JAN 66

REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.

To detach this form, cut along this line.