

INCH-POUND

MIL-P-23469C(SH)
19 February 1988
 SUPERSEDING
 MIL-P-23469B(SHIPS)
 31 May 1967
 (See 6.9)

MILITARY SPECIFICATION

PIN-RIVET, GROOVED AND COLLAR, GROOVED PIN-RIVET,
 SWAGE-LOCKED (LOCKPIN)
 GENERAL SPECIFICATION FOR

This specification is approved for use within the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers metal fasteners of the pull-tool type, each comprising a headed, grooved pin secured by a collar swaged into the grooves, and for installation without bucking more than manual restraint on the head.

1.2 Classification. Pin and collar shall be of the following types and classes as specified (see 6.2).

1.2.1 Pins.

- Type I - Six locking grooves.
- Type II - Multiple locking grooves.
- Type III - Wide grip range, multiple locking grooves.

1.2.2 Collars.

- Type I - Regular height.
- Type II - Flanged.
- Type III - Low-profile.
- Type IV - Flanged (for use with type III pins).

1.2.3 Materials.

- Class 1 - Aluminum.
- Class 2 - Corrosion-resistant steel.
- Class 3 - Carbon steel.
- Class 5 - High-strength carbon steel.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standard. The following specifications and standard form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

- PPP-F-320 - Fiberboard, Corrugated and Solid, Sheet Stock (Container Grade) and Cut Shapes.
- PPP-H-1581 - Hardware (Fasteners and Related Items), Packaging of.

MILITARY

- MIL-L-19140 - Lumber and Plywood, Fire Retardant Treated.

STANDARD

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

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

(See supplement 1 for list of associated specifications.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DoDISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A 325 - Standard Specification for High-Strength Bolts for Structural Steel Joints. (DoD adopted)
- A 380 - Standard Practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems. (DoD adopted)
- A 580 - Specification for Anodic Oxide Coatings on Aluminum. (DoD adopted)
- B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel. (DoD adopted)

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ASTM (Continued)

- B 695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
- E 8 - Standard Methods of Tension Testing of Metallic Materials. (DoD adopted)
- E 527 - Standard Practice for Numbering Metals and Alloys (UNS). (DoD adopted)

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

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

- J 1086 - Numbering Metals and Alloys, SAE and ASTM Recommended Practice (ASTM E 527).

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

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the applicable specification sheet, the latter shall govern.

3.2 Materials. The materials used shall be such as to produce pins and collars in accordance with the requirements of this specification and as specified in the applicable specification sheet. Pins and collars shall be of aluminum alloy (ALUM), corrosion resistant steel (CRES) or carbon steel (C.S.) as listed in table I.

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TABLE I. Material chemical composition requirements.

Pin and collar materials ^{1/}	Class	Unified numbering system designation
ALUM 6061	1	A96061
CRES 304 CRES 305 CRES 384 CRES 430F	2	S30400 S30500 S38400 S43020
C.S. 1006 C.S. 1008	3	G10060 G10080
C.S. 1035 C.S. 1038 C.S. 1541	5	G10350 G10380 G15410

^{1/} Chemical compositions of the materials listed shall meet the requirements for the corresponding Unified Numbering System designations as specified in ASTM E 527 and SAE J 1086.

3.2.1 Protective coating or treatment. Carbon and alloy steel pins shall be coated in accordance with ASTM B 695, type 1, class 12, or ASTM B 633, type II Fe/Zn 13. Aluminum pins shall be anodized in accordance with ASTM B 580, type D and corrosion-resistant steel pins shall be passivated in accordance with ASTM A 380.

3.3 Material identification marking. Pins and collars of aluminum alloy, corrosion resistant steel, or carbon steel shall be marked as specified in table II.

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TABLE II. Pin and collar identification.

Classification	Material	Types and classes	Identification
Pin	ALUM	Type I, class 1 Type II, class 1, Type III, class 1	Grip number, manufacturer's symbol Manufacturer's symbol
	CRES	Type I, class 2 Type II, class 2	Triangle, grip number and manufacturer's symbol Triangle and manufacturer's symbol
	C.S.	Type I, class 3 Type I, class 5 Type II, class 5 Type III, class 3	Grip number and manufacturer's symbol Grip number, 3 radial bars 120 degrees apart and manufacturer's symbol 3 radial bars 120 degrees apart and manufacturer's symbol Manufacturer's symbol
Collar	ALUM	Type I, II, III and IV, class 1	Manufacturer's symbol
	CRES	Type I, II, and III, class 2	Triangle and manufacturer's symbol
	C.S.	Type I, II, III and IV, class 3 Type I and II, class 5	Manufacturer's symbol Manufacturer's symbol and 3 radial bars 120 degrees apart

3.3.1 Recovered materials. Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3.4 Surface finish. Surface finish shall be as specified in the applicable specification sheet (see 3.1).

3.4.1 Lubricant treatment. Aluminum collars shall be coated with a paraffin base wax. Steel collars shall be coated with a hydrogenated sperm oil derivative or equivalent. Pins shall be supplied without lubricant.

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3.5 Style, dimensions, and form. Pins and collars shall be of the style, dimensions, and form as specified in the applicable specification sheet (see 3.1).

3.6 Pin strength. Pins shall sustain loads specified in table III, as applicable, when driven with collars meeting the requirements of this specification, using installation tooling (see 6.4).

TABLE III. Pin and collar strength.

Minimum shear and tensile for ALUM, CRES and C.S. (Pounds)								
	Shear	Tensile			Shear		Tensile	Shear
Nominal size pin (inch)	ALUM Class 1	ALUM ^{1/} Class 1	CRES ^{2/} Class 2	C.S. ^{3/4/} Class 3 ^{5/}	CRES Class 2	C.S. Class 3 ^{5/}	C.S. ^{4/} high strength Class 5	C.S. high strength Class 5
3/16 type I type III	775	530	1455 --	1650 1650	2000 --	1725 1725	2200 --	2430 --
1/4 type I type III	1375	975	2750 --	3000 3000	3550 --	3050 2593	3700 --	4300 --
5/16 type I type III	2125	1550	4250 --	4600 4600	5525 --	4725 4016	6000 --	6700 --
3/8 type I type III	3050	2400	6100 --	6500 6500	7950 --	6825 5801	9300 --	9600 --
1/2 type II type III	5300 --	4900 --	17050 --	17050 12000	13900 --	14400 7500	-- --	-- --
5/8 type II type III	8300 --	7670 --	27100 --	27100 19000	21000 --	22500 11600	-- --	-- --
3/4 type II type III	11900 --	11040 --	40100 --	40100 27600	30300 --	32400 17000	-- --	-- --
7/8 type II	16200	15030	55450	55450	42000	43400	--	--
1 type II	21200	19640	72700	72700	55000	56500	--	--

^{1/} As installed with regular or flange ALUM collar.

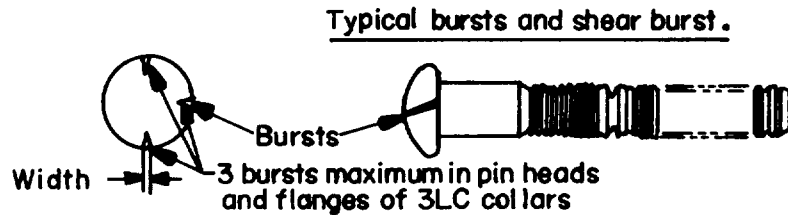
^{2/} As installed with regular or flange CRES collar.

^{3/} As installed with regular or flange C.S. collar.

^{4/} Comparable to ASTM A 325 high strength bolts in 1/2- through 1-inch diameters.

^{5/} Strength data for nominal diameters 1/2 through 1 inch are based on class 5 material.

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Crack or burst in pin head. A crack or burst is an abrupt interruption of the periphery of a pin head caused by separation of metal. Cracks or bursts do not adversely affect structural strength, corrosion resistance, or any other functional dependability feature of the product. From an appearance stand-point, a pin with a crack having a width of opening in excess of that shown in the table, as measured at the periphery of the head, shall be defective. Typical bursts are shown above.

Shear burst. A shear burst is an open break in the metal, occurring most frequently at the periphery of products having circular or flanged heads and are generally located at approximately 45 degrees to the product axis. Typical discontinuities of this type are shown below. No burst shall extend into minimum bearing area of pins.

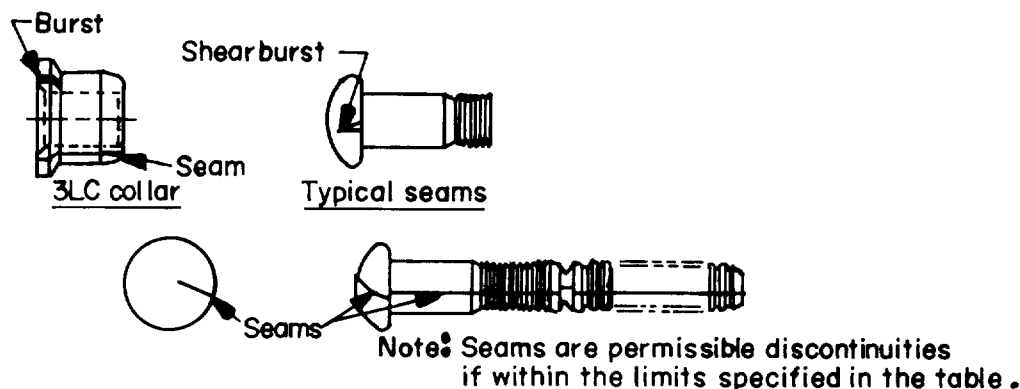
Swage-locking pins and collars may possess longitudinal seams, bursts, nicks or gouges which do not exceed the tolerance specified. Seams up to the depths indicated which have been rolled beneath the annular rings or grooves in pins shall not be cause for rejection.

Nom pin dia	Maximum head burst and crack width	Max seam	
		width	depth
0.187	0.029	0.005	0.007
.250	.033	.005	.008
.312	.056	.006	.009
.375	.039	.006	.010
.500	.045	.010	.012
.625	.051	.010	.013
.750	.058	.010	.023
.875	.064	.010	.026
1.000	.070	.010	.030
1.125	.076	.010	.034

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FIGURE 2. Typical bursts, shear burst, and seams.

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Seams. Seams are generally inherent in the raw material from which fasteners are manufactured. They are narrow, generally straight or smooth-curved line discontinuities, aligning longitudinally on the seam or thread. Seams may extend into the tops of the heads of circular head products as well as being present at the periphery of the head. Typical seams are shown above.

Seams. Seams in the shanks of bolts shall not exceed (a) an open width at the surface of 0.005 inch for sizes 3/16 to 7/16 inch, inclusive, and 0.010 inch for sizes 1/2 inch and larger, and (b) a depth as shown in the table. Seams extending into the heads and flanges of fasteners which do not open beyond the limits specified for bursts are acceptable.

Typical quench cracks

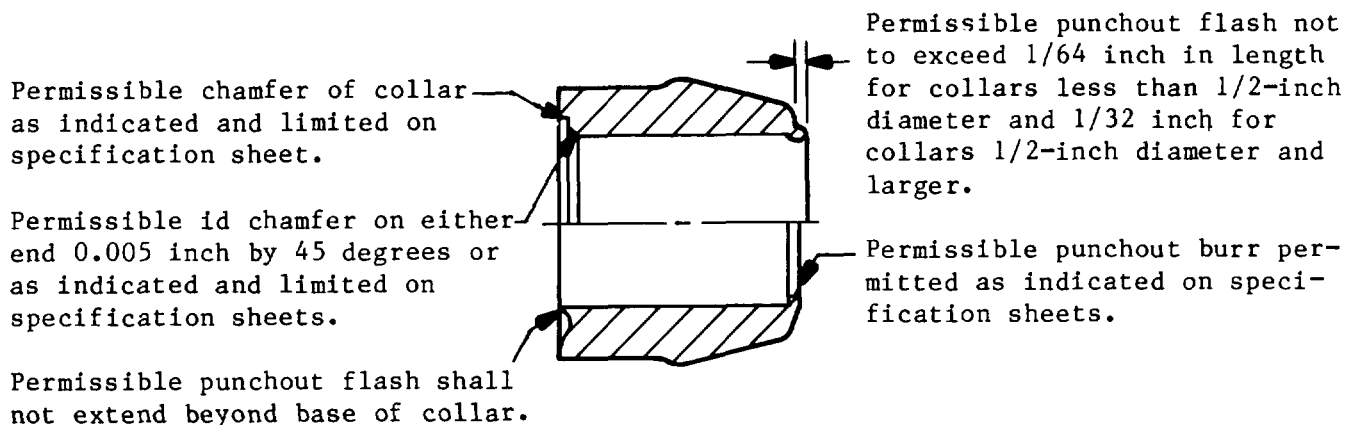
Note: Quench cracks of any depth or length or in any location are not permissible discontinuities.

Quench cracks. A crack is a clean (crystalline) fracture passing through or across the grain boundaries without inclusion of foreign elements. Cracks are normally caused by overstressing the metal during forging or other forming operation, or during heat treatment. Where parts are subjected to significant reheating, cracks are usually discolored or scale. They usually traverse an irregular and erratic course on the surface of the fastener.

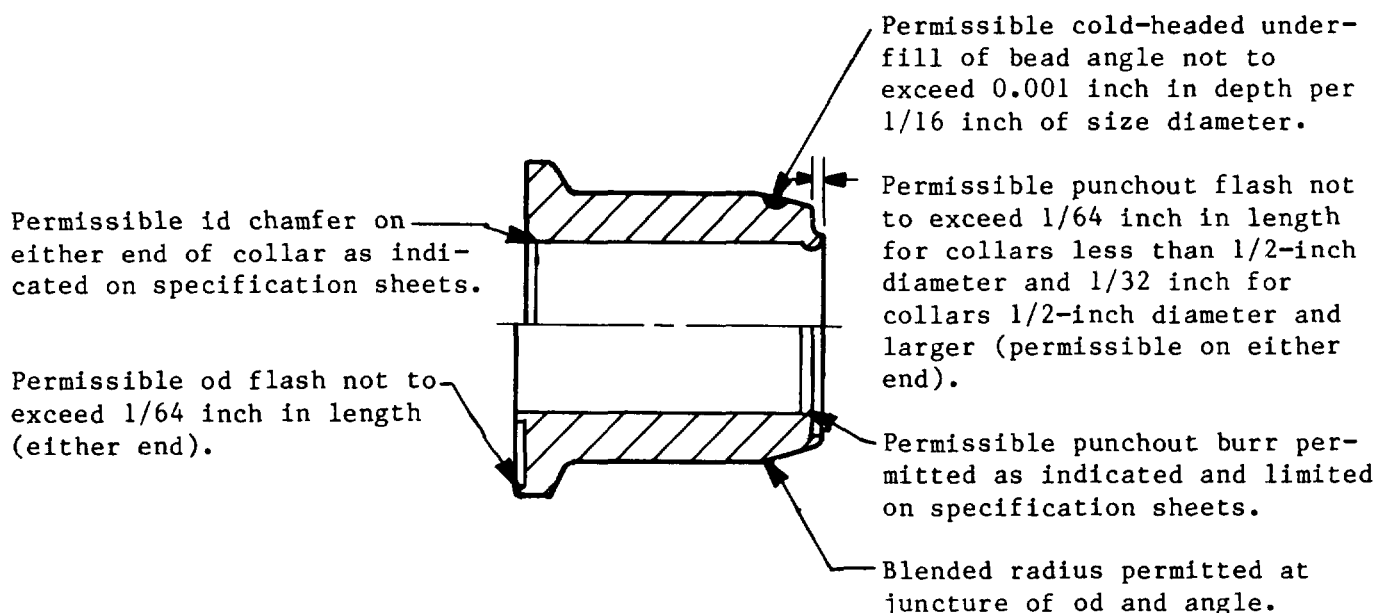
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FIGURE 2. Typical bursts, shear burst, and seams. - Continued

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Beaded collars



Flanged collars

Fabrication characteristics as depicted are inherent to the method of manufacture and processes do not effect the swaging of the collar or strength of the installed fastener as specified herein.

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FIGURE 3. Typical fabrication characteristics permissible on inside diameters, outside diameters and ends of collars in accordance with MIL-P-23469/1.

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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 purchase 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 supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Inspection lot. For the purpose of examination and tests, a lot shall consist of pins or collars of one material and class, same nominal size and length, from the same production run and offered for examination at one time.

4.3 Sampling.

4.3.1 Acceptable quality level. Lot testing shall be based on an acceptable quality level (AQL) of 1.5 percent defective for critical non-conforming characteristics, 4 percent defective for major non-conforming quality characteristics, and a 6.5 percent defective for minor non-conforming quality characteristics. Determination of lot quality shall be by means of sampling inspection in accordance with MIL-STD-105 and Industrial Fastener Institute (IFI) commercial standards.

4.3.2 Sampling for visual and dimensional examination. Samples shall be selected at random from each lot of pins or collars in accordance with MIL-STD-105, using sample inspection levels as indicated after each characteristic specified in table IV.

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TABLE IV. Classification of defects.

Categories	Defects
Critical:	None defined.
Major:	
101	Locking groove size and form (S-1).
102	Break-off groove size and form (S-1).
103	Shank or body diameter (S-1).
104	Grip length (S-1).
105	Head angle (S-1).
106	Radius under head (S-1).
107	Squareness between head and shank (brazier and button head) (S-1).
108	Eccentricity of head and shank (S-1).
109	Surface finish, plating (S-2).
110	Vendor's identification when commercially applicable (S-1).
111	Collar height (S-1).
112	Collar diameter (inside and outside) (S-1).
Minor:	
201	Pulling end serrations (S-1).
202	Straightness of shank (S-1).
203	Head height (brazier and button head) (S-1).
204	Collar angles, outside diameter shape (S-1).
205	Overall length (S-1).
206	Burrs and tool marks (S-1).
207	Surface roughness (S-1).
208	Head diameter (S-1).
209	Head imperfections (S-1).

4.3.3 Sampling for tests.

4.3.3.1 Material. Mill chemical certifications on all material shall be kept on file and available to the contracting activity.

4.3.3.2 Shear, tensile and push-out test samples shall be selected at random in accordance with table V.

TABLE V. Sampling for tensile, shear and push-out tests.

Test	Lot size	Sample size	Acceptance number	Reject number
Tensile	All lots	20	0	1
Shear and structure	Under 500	2	0	1
	500 and over	5	0	1

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4.3.3.3 Protective coating tests. Sampling and testing of metallic coated pins and collars, anodically treated pins and collars, and passivated pins and collars shall be as specified in the applicable specification sheets (see 3.1).

4.4 Inspection. Each of the samples selected in accordance with 4.3.1 and 4.3.2 shall be examined for conformance with this specification. Visual examination shall consist of examination for conformance with 3.8 and all other requirements not involving test or measurement. Examination for dimensions shall consist of gauging or checking by measuring instruments for conformance with the applicable specification sheets. The toleranced dimensions shall be as specified in table VI.

TABLE VI. Toleranced dimensions.

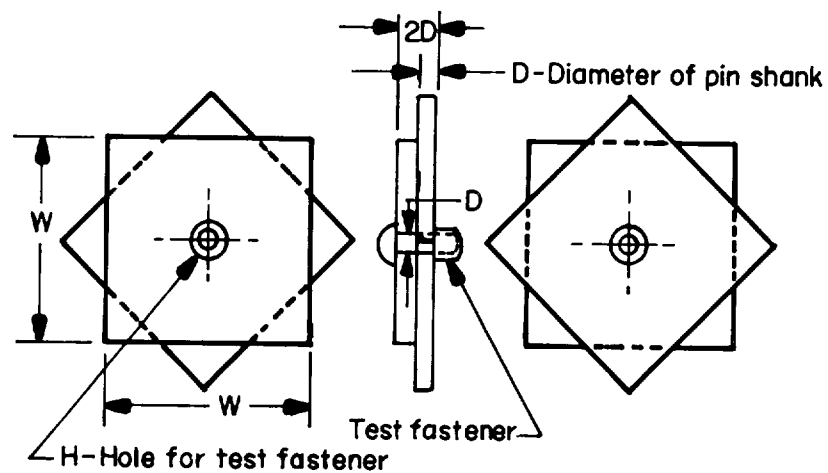
Component	Dimensions
Pins	Body diameter Height of head Maximum length, grip plus reference Grooving (piece-to-piece uniformity in same lot) Grip length as specified in contract or order Straightness and concentricity
Collars	Inside diameter Collar length Burr length Bead diameter (micrometer reading) Total indicator reading (T.I.R.)

4.5 Tensile strength. The tensile strength (holding load of as-driven assemblies) shall be determined by the fixture shown on figures 4, 5, and 6 based on the minimum rated grip of the pin being tested. Tests shall be in accordance with ASTM E 8, except that the rate of loading shall not exceed 2,500 pounds per minute.

4.5.1 Fasteners having a grip length less than twice the shank diameter (2D) shall be tested by the push-out method shown on figure 6. Fasteners having a grip length 2D or greater shall be tested by either the push-out method (see figure 6) or tensile method shown on figures 4 and 5. In the event of a conflict between the results of the two tests, the tensile test method shall govern.

4.6 Shear strength (aluminum alloy). Shear strength tests of aluminum alloy pins shall be performed in a fixture similar to the fixture shown on figure 7. The shear load applied shall equal or exceed the values specified in table III, as applicable.

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D Pin size (inch)	+0.003 H -0.000 Drill size (inch)	W (inches)
3/16	No. 9 (0.196)	2
1/4	Letter G (.261)	
5/16	Letter P (.323)	
3/8	Letter W (.386)	
1/2	17/32 (.531)	
5/8	21/32 (.656)	
3/4	25/32 (.781)	
7/8	29/32 (.906)	3
1	1-1/32 (1.031)	

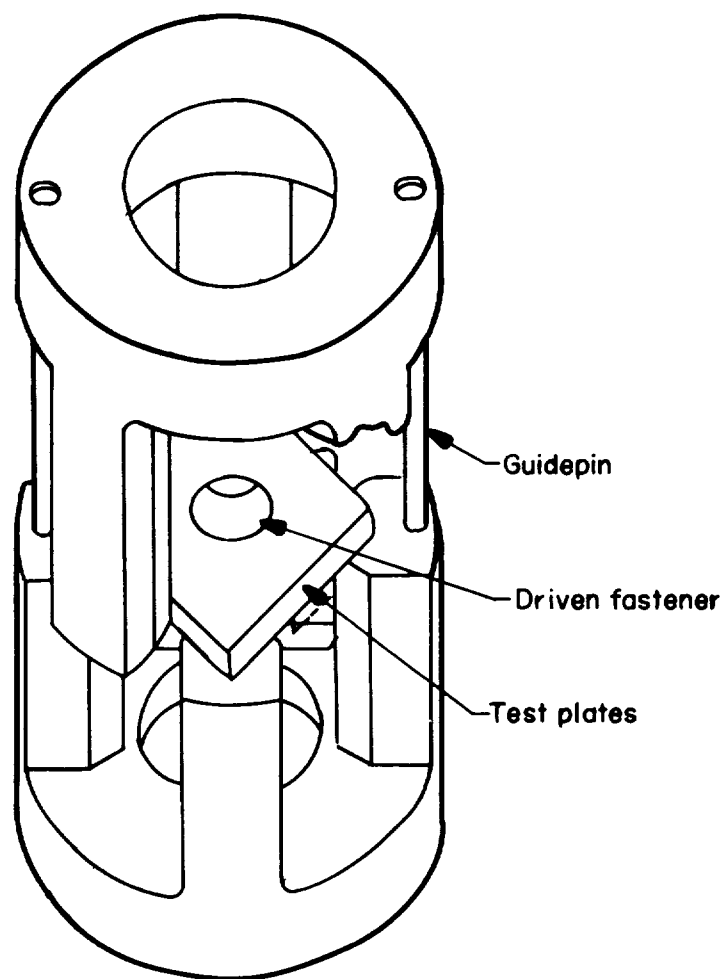
Material:

Test fixture shall be fabricated from heat treated alloy steel having a Rockwell hardness of from RC46 to RC50.

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FIGURE 4. Assembly of test plates before attaching to jig tensile test fixture.

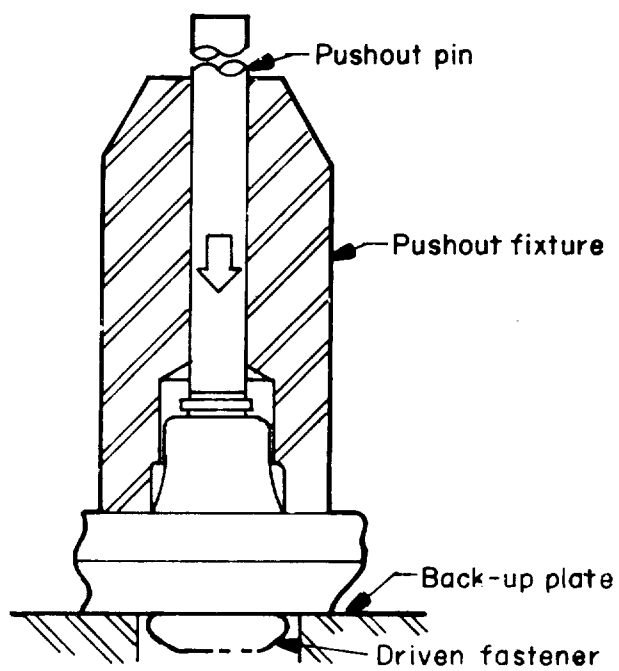
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FIGURE 5. Tensile fixture.

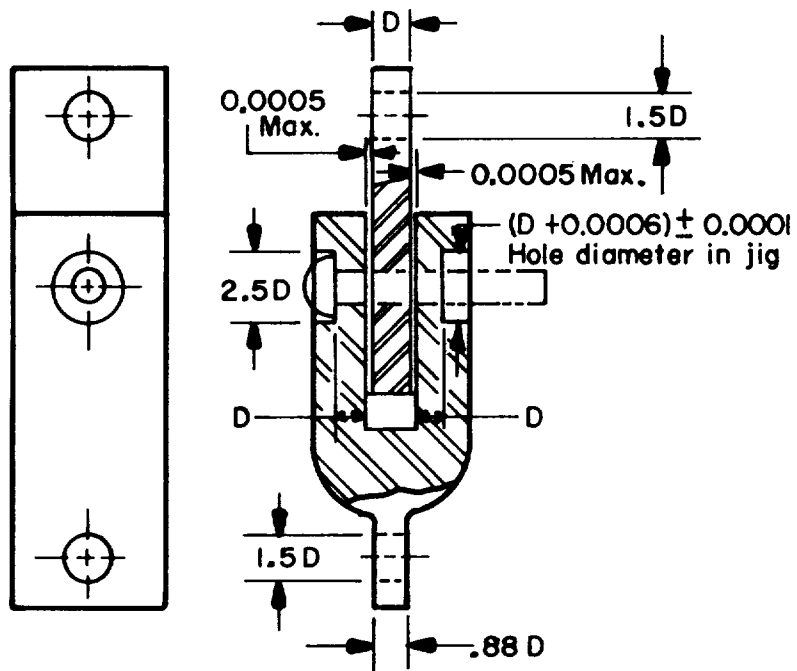
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FIGURE 6. Push-out tensile test fixture.

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D= Maximum pin diameter
 Jig material: Alloy steel 180,000 lb/in² minimum
 tensile strength.

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FIGURE 7. Shear test fixture.

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4.7 Rejected lots. Prior to resubmitting a rejected lot for examination, the contractor shall rework or reinspect the lot for the deficiencies noted and remove all non-conforming pieces. Samples shall be selected from the resubmitted lots in accordance with 4.3 as applicable. The samples shall be inspected for the deficiency for which rejection was originally made.

4.8 Inspection of packaging. Sample packages and packs, and the inspection of the preservation, packing and marking for shipment, stowage and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.7.)

5.1 Preservation, packing, and marking. Fasteners (pins and collars) shall be preserved level A, B, or commercial (level C), packed level A, B, or commercial (level C) as specified (see 6.2), and marked including bar coding and other ordering data options required in accordance with PPP-H-1581. In addition, for Navy acquisitions, the following applies:

(a) Navy fire-retardant requirements.

- (1) Lumber and plywood. Unless otherwise specified (see 6.2), all lumber and plywood including laminated veneer material used in shipping container and pallet construction, members, blocking, bracing, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

Level A and B	- Type II - weather resistant.
	Category I - general use.
Level C	- Type I - non-weather resistant.
	Category I - general use.

- (2) Fiberboard. Unless otherwise specified (see 6.2), fiberboard used in the construction of class-domestic, non-weather resistant fiberboard, and cleated fiberboard boxes shall meet the flame spread index and specific optic density requirements of PPP-F-320 and amendments thereto.

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6. NOTES

6.1 Intended use. Swage-locking pins and collars provide permanent, uniform high shear and tensile strength fastening for structural joints in hull structure, shipboard superstructure, ordnance, launchers, vehicles, ground support equipment, building assembly and structural steel erection, of which the following are typical examples:

- (a) Superstructure connections, deckhouse attachment, joiner doors, lockers, ladders, vents, air ducts, and general shipboard maintenance.
- (b) Structure fastenings: gunwale angles, shear strake, crack arrestors, bilge strakes, bilge keel, deck straps, bulwarks, access plates, smoke stacks.
- (c) Gun shields, davits, life boats, loading and landing equipment, missile and rocket launcher equipment.
- (d) Storage tanks, structural steel erection, prefab building assembly, and industrial cranes.

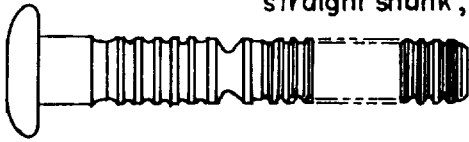
Classes of pins and collars should be as deemed necessary to effect proper joining and sealing by the use of suitable head contour in relation to the construction or design criteria (see figure 8 for pin and collar detail). Fasteners conforming to this specification are intended to pull joint surfaces together to minimize gaps.

6.1.1 Comprehensive coverage not intended. This specification does not cover all the styles and sizes of codified swage-locking pins and collars commercially available. It is intended to cover only those styles and sizes which, when manufactured from the materials specified herein, are suitable for shipboard applications where specified.

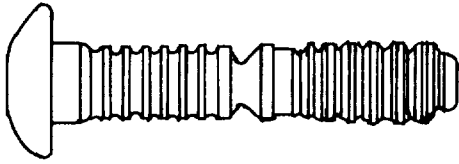
Pins, Type I.

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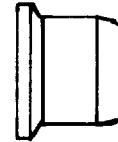
MIL-P-23469/2 Pin, swage-locking, brazier head, straight shank, six locking grooves.



Type I. Regular height.

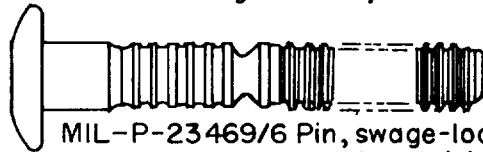


Type II. Flanged.



Seven locking grooves applicable to 5/16 inch nominal diameters of MIL-P-23469/5 and /6 also.

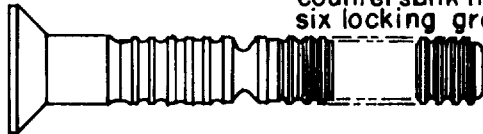
MIL-P-23469/5 Pin, swage-locking, truss head, straight shank, six locking grooves.



Type III. Low profile.



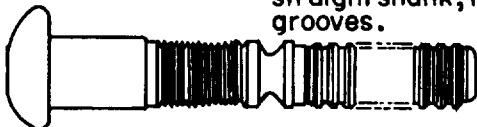
MIL-P-23469/6 Pin, swage-locking, flat 90 degree countersunk head, straight shank, six locking grooves.



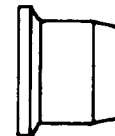
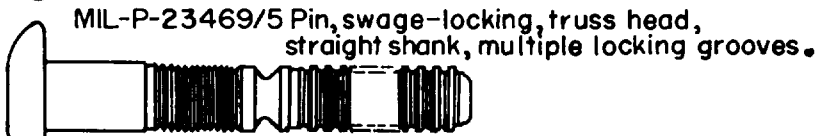
Type I. Regular height.

Pins, Type II.

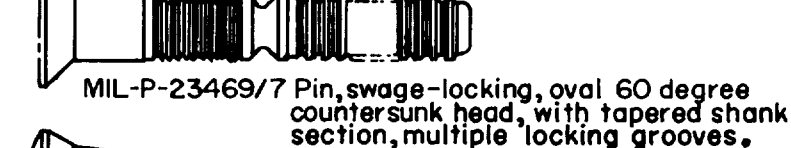
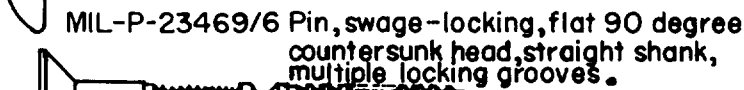
MIL-P-23469/4 Pin, swage-locking, round head, straight shank, multiple locking grooves.



Type II. Flanged.



Type III. Low profile.



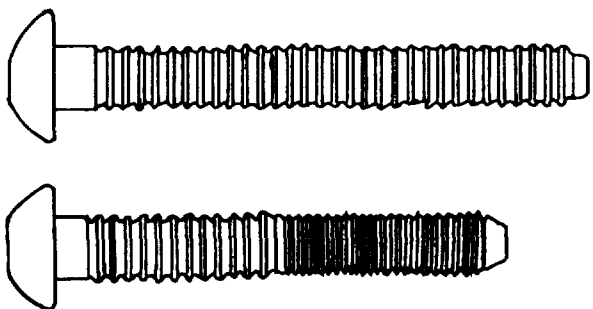
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FIGURE 8. Typical fasteners.

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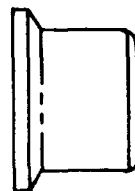
Pins, Type III.

MIL-P-23469/3 Pin, swage-locking, widegrip range,
multiple locking grooves.



MIL-P-23469/1 Collars, swage-locking.

Type IV, Flanged.



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FIGURE 8. Typical fasteners. - Continued

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6.2 Ordering data. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Title, number, and date of the applicable specification sheet.
- (c) Type, diameter, grip length and class of pin or type, diameter, and class of collar (see applicable specification sheet and 1.2).
- (d) Quantity expressed in terms of pieces of each item.
- (e) Level of preservation, packing and marking required (see 5.1).
- (f) If fire-retardant requirements are not required (see 5.1).

6.3 Cross reference. The fastener classifications given in this specification are equivalent to commercial designations in manufacturer's standards for "Lockbolts" and are listed in table VII. Collars customarily used with the pins are listed to the right of each group of pins.

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TABLE VII. Cross reference of swage-locking pin and collar classification.

	Pin	Commercial designation 1/ 2/			Collar	Commercial designation
MIL-P-23469	MIL-P-23469C				MIL-P-23469	
Class BF	M23469/2 type I class 1	C6LB-F		Class 1	M23469/1 type I class 1	LC-1
Class RF	M23469/5 type I class 1	C6LT-F		Class 3-1	M23469/1 type II class 1	3LC-1
Class 90F	M23469/6 type I class 1	C6L90-F		Class 8-1	M23469/1 type III class 1	8LC-1
Class BU	M23469/2 type I class 2	C6LB-U		Class 2-U	M23469/1 type I class 2	2LC-2CU
Class RU	M23469/5 type I class 2	C6LT-U		Class 3-U	M23469/1 type II class 2	3LC-2CU
Class 90U	M23469/6 type I class 2	C6L90-U		Class 8-U	M23469/1 type III class 2	8LC-2CU
Class BR	M23469/3 type III class 3	HGPB-R		Class RU	M23469/1 type IV class 3	HGC-R
Class TR	M23469/3 type III class 3	HGPT-R				
Class 90R	M23469/3 type III class 3	HGP90-R				
Class 98TR	M23469/3 type III class 3	HGP98T-R				
Class BRG	M23469/2 type I class 3	C6LB-R		Class 2-RG	M23469/1 type I class 3	2LC-R
Class 90RG	M23469/5 type I class 3	C6LT-R		Class 3-RG	M23469/1 type II class 3	3LC-2R
Class 12 OBRG	M23469/6 type I class 3	C6L90-R		Class 8-RG	M23469/1 type III class 3	8LC-2R
Class 12 OTRG	M23469/2 type I class 5	C12OLB-R		Class 2-120RG	M23469/1 type I class 5	2LC120-R
Class 12 O90RG	M23469/5 type I class 5	C12OLT-R		Class 3-120RG	M23469/1 type II class 5	3LC120-R
	M23469/6 type I class 5					
	M23469/4 type II class 1	C50LR-F				
	M23469/5 type II class 1	C50LT-F				
	M23469/6 type II class 1	C50L90-F				
	M23469/7 type II class 1	C50L60-F				
	M23469/4 type II class 2	C50LR-U				
	M23469/5 type II class 2	C50LT-U				
	M23469/6 type II class 2	C50L90-U				
	M23469/7 type II class 2	C50L60-U				

See footnotes at end of table.

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TABLE VII. Cross reference of swage-locking pin and collar classification. - Continued

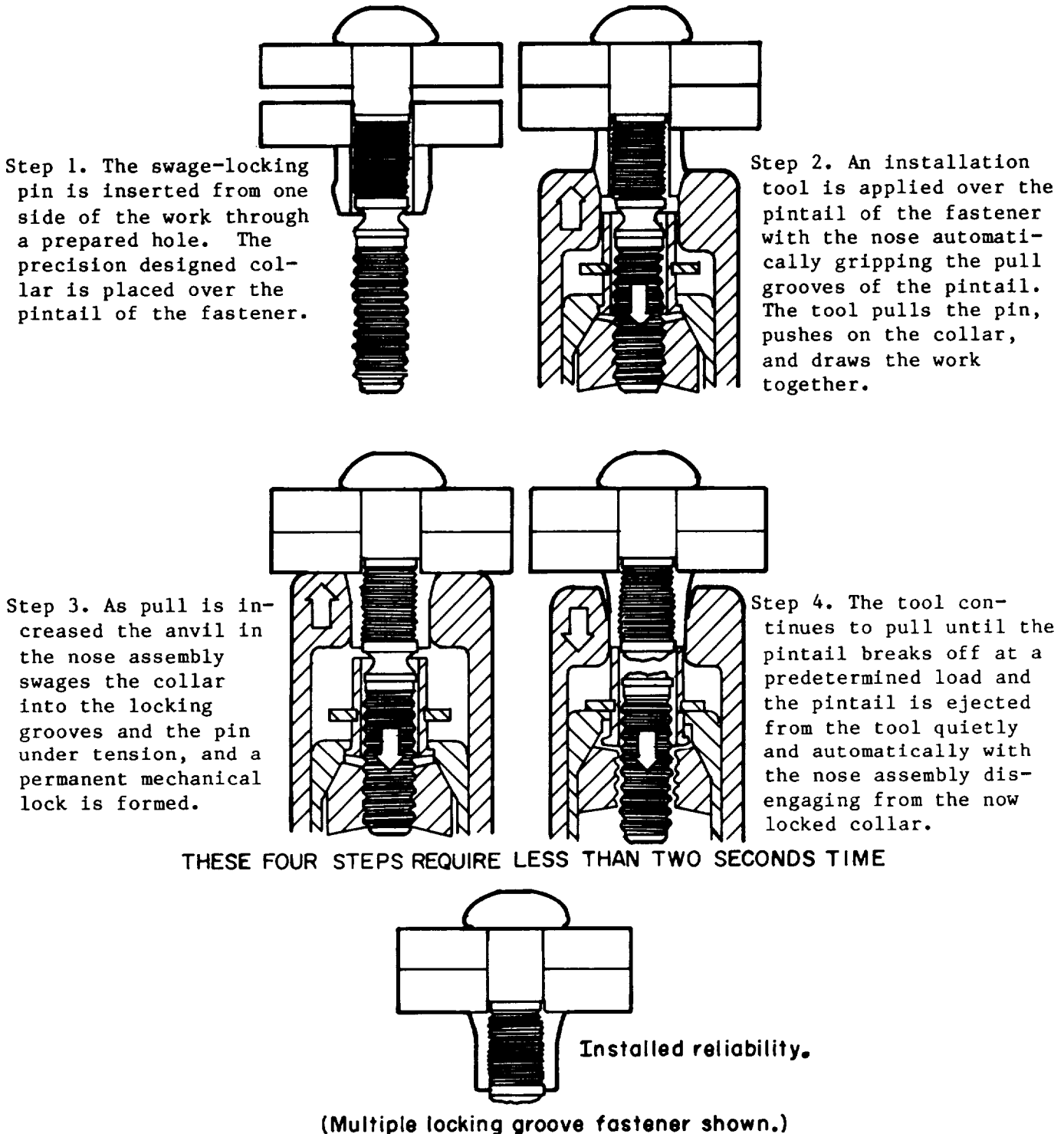
Pin		Collar			
	MIL-P-23469C	Commercial designation 1/ 2/	MIL-P-23469	MIL-P-23469C	Commercial designation
Class 60R	Discontinued use--- class 50L60-R		Class RG	M23469/1 type I class 3 M23469/1 type II class 3 M23469/1 type III class 3	LC-2R 3LC-2R 8LC-2R
Class 50R	M23469/4 type II class 3 M23469/5 type II class 3 M23469/6 type II class 3 M23469/7 type II class 3	C50LR-BR C50LT-BR C50L90-BR C50L60-BR			
Class 50L60R					
Class BE	M23469/3 type III class 1	HGPB-E	Class F	M23469/1 type IV class 1	MGC-F
Class TE	M23469/3 type III class 1	HGP90-E			
Class 90E	M23469/3 type III class 1	MGP90-E			
Class 98TE	M23469/3 type III class 1	MGP98T-E			

1/ C6L 100 percent interchangeable with CLP.

2/ HGP not 100 percent interchangeable with C6L and CLP.

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6.4 Drive cycle. The swage-locking pin and collar is installed with a suitable installation tool, capable of executing the driving cycle, as shown on figure 9.



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FIGURE 9. Pin and collar, swage-locking, drive cycle.

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6.5 Engineering data.

6.5.1 Clamping force. Table VIII lists the values for the clamping force of installed types I, II, III and IV, aluminum alloy, corrosion resistant steel, carbon steel, and carbon steel high strength fasteners. Clamping force is established by installation and inspection in a Skidmore-Wilhelm or equivalent tension tester.

TABLE VIII. Minimum clamping force in pounds for ALUM, CRES, and C.S.

Nominal size (inch)	ALUM <u>1/5/</u>	CRES <u>2/</u>	C.S. <u>3/ 5/</u>	C.S. high strength
3/16	(550) 350	1025	(1025) 1025	1200
1/4	(950) 620	1805	(1805) 1805	2300
5/16	(1500) 965	2810	(2810) 2810	4200
3/8	(2400) 1380	4020	(4020) 4020	5980
1/2	4400	12050	(6500) 12050	4/
5/8	6900	19200	(10200) 19200	
3/4	9950	28400	(15000) 28400	
7/8			39250	
1			51500	

1/ As installed with regular or flanged aluminum collar.

2/ As installed with regular or flanged CRES collar.

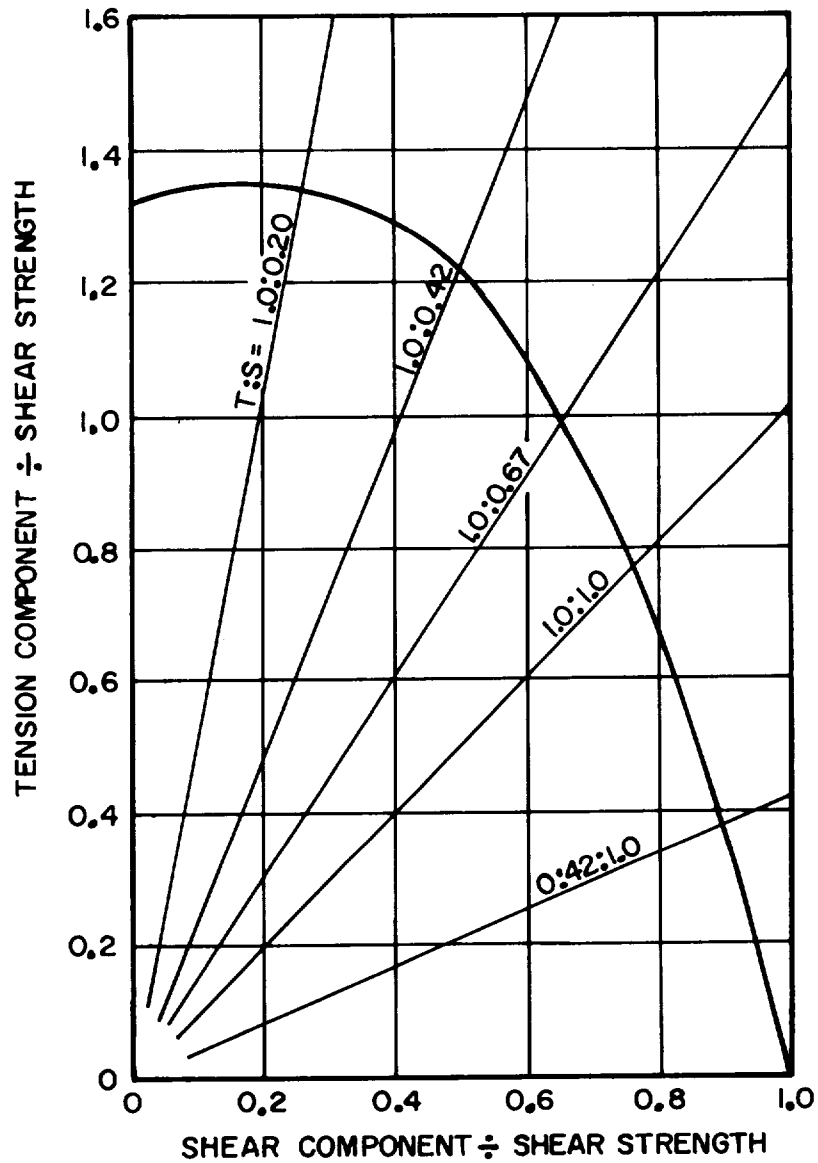
3/ As installed with regular or flanged C.S. collar.

4/ Comparable to ASTM A 325 high strength bolts in 1/2 through 1 inch diameter.

5/ Figures in parentheses apply to type III fasteners.

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6.5.2 Figure 10 shows a typical non-dimensional interaction curve for a multiple locking groove, carbon steel fastener.



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FIGURE 10. Typical non-dimensional interaction curve for type II multiple locking groove pins with type I, class 3 and 4 collars.

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6.6 Patent notice. The Government does not have a royalty-free license under the following patents, owned by the Huck Manufacturing Company, subsidiary of Federal-Mogul Corporation, for the benefit of manufacturers of the items called for in this specification and related detailed specification sheets, either for the Government or for use in equipment to be delivered to the Government:

<u>Patent number</u>	<u>Expiration date</u>
4,208,943	June 24, 1997
4,342,529	August 3, 1999

6.7 Sub-contracted material and parts. The packaging requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.8 Subject term (key word) listing.

Headed
Metal fasteners
Pull joint surfaces
Tensile strength fastening

6.9 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Preparing activity:
Navy - SH
(Project 5320-N024)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL*(See Instructions - Reverse Side)*1. DOCUMENT NUMBER
MIL-P-23469C(SH), /1-172. DOCUMENT TITLE PIN-RIVET, GROOVED AND COLLAR, GROOVED PIN-RIVET,
SWAGE-LOCKED (LOCKPIN) GENERAL SPECIFICATION FOR

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

 VENDOR USER MANUFACTURER OTHER (Specify): _____

b. ADDRESS (Street, City, State, ZIP Code)

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

8. DATE OF SUBMISSION (YYMMDD)