

MIL-P-23469B(SHIPS)

31 May 1967

SUPERSEDING

MIL-P-23469A(SHIPS)

13 June 1966

(See 6.8)

MILITARY SPECIFICATION

PINS AND COLLARS, SWAGE-LOCKING (LOCKPINS)

GENERAL SPECIFICATION FOR

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 suitable for installation without bucking more than manual restraint on the head.

1.2 Classification. -

1.2.1 Pins and collars shall be the types and classes specified in the applicable specification sheet (see 6.2).

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 the specification to the extent specified herein.

STANDARDS

FEDERAL

FED-STD-151 Metals; Test Methods.

MILITARY

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

(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 document forms 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.

OFFICIAL CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules.

(Application for copies should be addressed to Official Classification Committee, 1 Park Avenue at 33rd Street, New York, N. Y. 10016.)

3. REQUIREMENTS

3.1 Materials. - The materials used shall be such as to produce pins and collars in compliance with the requirements of this specification and as specified in the applicable specification sheet. Pins and collars shall be of aluminum alloy, corrosion resistant steel, carbon steel, or alloy steel.

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3.1.1 Aluminum alloy. - Aluminum alloy pins and collars shall be fabricated from an alloy having the chemical composition specified in table I.

3.1.2 Corrosion resistant steel. - Corrosion resistant steel pins and collars shall be fabricated from one of the alloys having a chemical composition specified in table I (at the manufacturer's option).

3.1.3 Carbon steel. - Pins and collars shall be fabricated from an alloy having the chemical composition specified in table I (at the manufacturer's option).

3.1.4 Alloy steel. - Collars shall be fabricated from an alloy having the chemical composition specified in table I.

TABLE I
CHEMICAL COMPOSITION

ALUMINUM ALLOY												
DESIGNATION	SI	Fe	Cu	Mn	Mg	Cr	Zn	Ti	OTHERS		AI	USAGE
									EACH	TOTAL		
6061	0.10 0.20	0.7	0.15 0.40	0.15	0.8 1.2	0.15 0.35	0.25	0.15	0.05	0.15	REMAINDER	PINS AND COLLARS
CORROSION RESISTANT STEEL												
DESIGNATION	C MAX.	Mn MAX.	P MAX.	S MAX.	SI	Cr	NI	MO	Zn	AI	USAGE	
AISI 304	.08	2.00	.045	.030 MAX.	1.00	18.00 20.00	8.00 12.00				PINS	
AISI 305	.12	2.00	.045	.030 MAX.	1.00	17.00 19.00	10.00 13.00				PINS AND COLLARS	
CRS #10	.08	2.00	.045	.030 MAX.	1.00	15.00 17.00	17.00 19.00				REMAINDER	PINS AND COLLARS
AISI 430F	.12	1.25	.060	.150 MAX.	1.00	14.00 18.00			0.600, 0.60		COLLARS	

DESIGNATION	C	Mn	CARBON STEEL:		Si	B min.	Fe	USAGE
			P MAX.	S MAX.				
C1006	.08 MAX.	.45 .40	.040	.050				COLLARS
C1008	.10 MAX.	.45 .40	.040	.050				REMAINDER
C1015	.12 .18	.60 .90	.040	.050				PINS
C1020	.15 .20	.60 .90	.040	.050				
C1041	.26 .34	1.35 1.65	.040	.050				
C10B18	.15 .20	.80 1.10	.040	.050	.15 .30	.0005		
C10B23	.20 .25	.80 1.10	.040	.050	.15 .30	.0005		


ALLOY STEEL										
DESIGNATION	C MAX.	Mn	P MAX.	S MAX.	SI	Cu	Cr	NI MAX.	Fe	USAGE
ASTM A242	.12	.20 1.00	.15	.050	.20 .90	.25 .55	.30 1.25	1.00	REMAINDER	COLLARS

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

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Table II - Pin and collar identification.

CLASSIFICATION	MATERIAL	PIN AND COLLAR IDENTIFICATION	
		TYPES & CLASSES	IDENTIFICATION
PIN	ALUM	TYPE I, CLASS 1	GRIP NUMBER AND MANUFACTURER'S SYMBOL
		TYPE II, CLASS 1	MANUFACTURER'S SYMBOL
	CRES	TYPE I, CLASS 2	TRIANGLE, GRIP NUMBER AND MANUFACTURER'S SYMBOL
		TYPE II, CLASS 2	TRIANGLE AND MANUFACTURER'S SYMBOL
	CARBON STEEL	TYPE I, CLASS 3	GRIP NUMBER AND MANUFACTURER'S SYMBOL
		TYPE II, CLASS 3	3 RADIAL BARS 120° APART AND MANUFACTURER'S SYMBOL
CRES-CAD	TYPE II, CLASS 4	TRIANGLE AND MANUFACTURER'S SYMBOL	
COLLAR	ALUM	TYPE I, II, III, IV & V, class 1	MANUFACTURER'S SYMBOL
	CRES	TYPE I, II, III, IV & V, class 2	TRIANGLE AND MANUFACTURER'S SYMBOL
	CARBON STEEL	TYPE I, II & III, CLASS 3	MANUFACTURER'S SYMBOL
	ALLOY STEEL	TYPE II, IV & V, class 4	MANUFACTURER'S SYMBOL

 CARBON STEEL TYPE I FOR 1/2" DIAMETER AND UP HAVE THREE BARS 120° APART AND MANUFACTURER'S SYMBOL

3.2 Surface finish. - Surface finish shall be as specified in the applicable specification sheet.

3.2.1 Lubricant treatment. - All collars shall be coated with cetyl alcohol resulting from immersion in a trichlorethylene solution of cetyl alcohol. All pins shall be supplied without lubricant.

3.3 Style, dimensions, and form. - Pins and collars shall be of the style, dimensions, and form as specified in the applicable specification sheet.

3.4 Pin strength. - Pins shall be capable of sustaining loads specified in table III, as applicable, when driven with collars meeting the requirements of this specification, using suitable installation tooling (see 6.5). A load within the limits of table IV, shall be required to separate the pintail from the body, using a fixture similar to figure 1.

3.5 Collar strength. - The swage locking collars when driven with suitable installation tooling (see 6.5) shall conform to the dimensional requirements of figure 2. When the collars are driven onto a suitable pin which meets the requirements of this specification, the pin and collar assembly shall have a tensile strength meeting the requirements of table III.

3.6 Workmanship. - The product shall be in conformance with high grade fastener manufacturing practices. Swage locking pins shall not contain imperfections which equal or exceed the limitations specified in 3.6.1 through 3.6.3 and 3.6.4 for collars.

3.6.1 Cracks. - Swage locking pins shall be free of cracks in any direction and location. A crack is defined as a clean crystalline break passing through the grain boundary. Swage locking pins shall not possess more than three openings (see figure 3).

3.6.2 Swage locking pins may possess longitudinal seams, bursts, nick, or gouges which do not exceed the tolerances specified in table V. Seams up to the depths indicated which have been rolled beneath the annular rings or grooves shall not be cause for rejection.

3.6.3 Head Shank Junction. - Only longitudinal seams of the depth permitted in table V, the bearing surface shall be allowable for head to shank junction. Slight tool marks or undercuts shall be allowable, provided they flare into the shank with no sharp V notch grooves, gouges, or corners.

3.6.4 Defects on Swage Locking Collars. - Swage locking collars shall not have burrs, chamfers, etc. which exceed the limits specified in figure 4.

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TABLE III - PIN AND COLLAR STRENGTH

MINIMUM SHEAR & TENSILE, IN POUNDS, FOR ALUM, CRES & CARBON STEEL				
NOMINAL SIZE	SHEAR ⁴	TENSILE		
	ALUM	ALUM ¹	CRES ²	CARBON STEEL ³
3/16	775	530	1455	1650
1/4	1375	975	2750	3000
5/16	2125	1550	4250	4600
3/8	3050	2400	6100	6500
1/2	5300	5000	17050	17050
5/8	8300	7670	27100	27100
3/4	11900	11040	40700	40100
7/8	16200	15030	55450	55450
1"	21200	19640	72700	72700

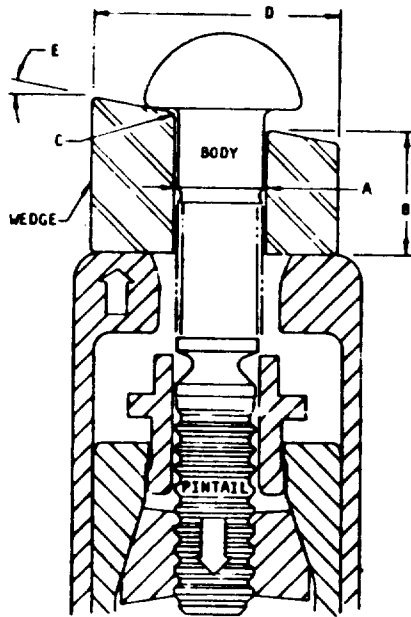
¹ AS INSTALLED WITH REGULAR OR FLANGE ALUM COLLAR.
² AS INSTALLED WITH REGULAR OR FLANGE CRES COLLAR.
³ AS INSTALLED WITH REGULAR OR FLANGE CARBON STEEL COLLAR.
⁴ FOR CRES AND CARBON STEEL SEE 6.6 AND TABLE IX.

TABLE IV

PINBREAK LOADS						
NOMINAL SIZE	ALUMINUM ALLOY		CORROSION RESISTANT STEEL		CARBON STEEL	
	CLASS 1		CLASS 2 ¹		CLASS 3	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
3/16	850	1150	1800	2150	1950	2280
1/4	1500	2000	2200	2800	2200	2800
5/16	2400	3000	5200	5800	4600	5800
3/8	3500	4300	6100	7100	5200	5800
1/2	4400	6300	13000	18000	12000	17500
5/8	8250	11200	20000	26000	22000	30000
3/4	9150	12300	25000	32000	27000	35000
7/8	13450	18200	40000	50000	38000	50500
1"	20000	27000	55000	70000	57000	74000

¹ ALSO CORROSION RESISTANT STEEL - CADMIUM PLATING, CLASS 4 FOR 1/2 THRU 1" DIAMETER.

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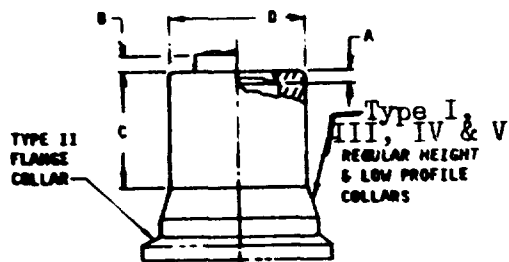
PIN NOMINAL SIZE	A DIA.	B	C RAD.	D DIA.	E
	+ .001 - .000	± .005	+ .005 - .000	+ .000 - .010	± 1/4°
TYPE I	3/16	.196	.375	.020	.875 5°
	1/4	.260	.500	.020	
	5/16	.324	.625	.025	
	3/8	.387	.750	.025	
TYPE II	1/2	.530	.250	.031	2.125 10°
	5/8	.675	.312	.063	
	3/4	.800	.375	.063	
	7/8	.938	.438	.063	
1"	1.063	.500	.063		

PINBREAK LOAD FIXTURE

FIGURE 1

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NOMINAL SIZE	A MAX.	B MAX.	C MIN.		D DIA. MAX.
			TYPE I TYPE II TYPE IV	TYPE III TYPE V	
3/16	5/64	1/8	11/64	3/32	.276
1/4	5/64	5/32	1/4	9/64	.364
5/16	9/64	7/32	9/32	11/64	.454
3/8	1/8	9/32	11/32	13/64	.552
1/2	1/16	3/8	13/32	17/64	.729
5/8 ALUMINUM COLLARS			9/16	25/64	.910
5/8 ALL STEEL			5/8	29/64	.910
3/4			21/32	29/64	1.106
7/8			3/4	1/2	1.276
1"			7/8	19/32	1.460



DIMENSIONAL REQUIREMENTS FOR INSTALLED FASTENER

FIGURE 2

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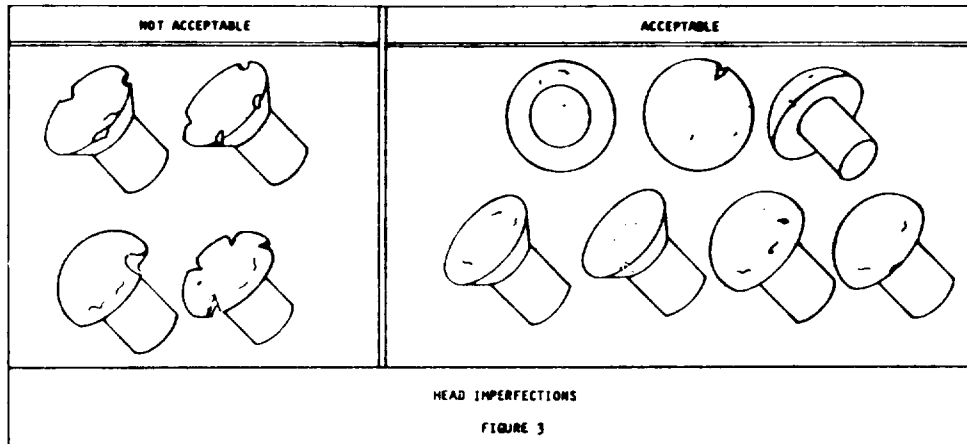


TABLE V

LIMITS FOR BEAM DEPTH (THESE ARE BASED ON ALLOWABLE MAXIMUM BEAM DEPTH ON COMMERCIALY AVAILABLE WIRE)			
MAXIMUM DEPTH IN INCHES			
PIN SIZE DIAMETER	5/16" AND UNDER	3/8"	1/2" AND OVER
BEARING SURFACE	0.008	0.009	0.012
PERIPHERY	0.032	0.036	0.048
OTHER SURFACES	0.016	0.018	0.024

4. QUALITY ASSURANCE PROVISIONS

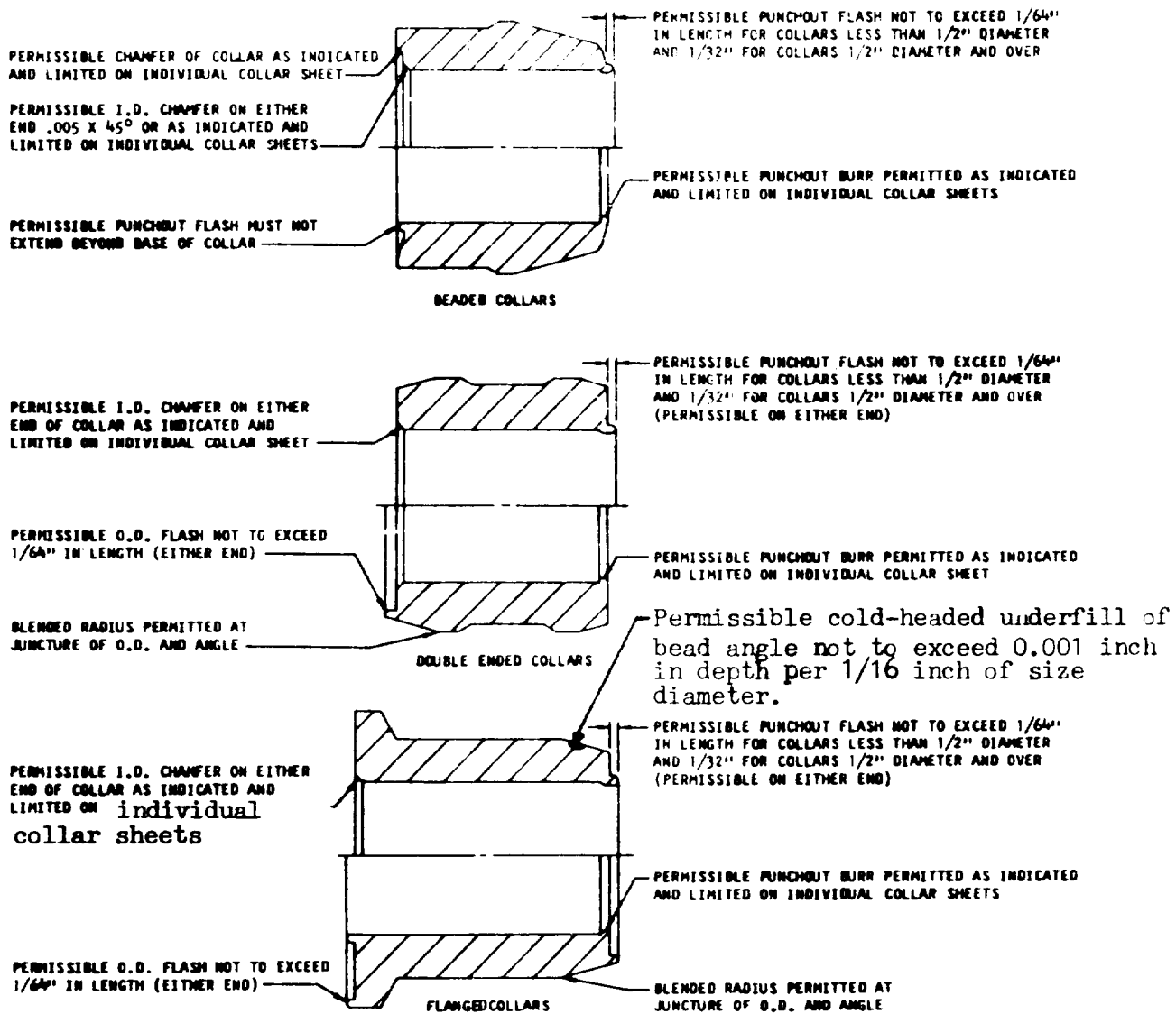
4.1 **Responsibility for inspection.** - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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 **Inspection lot.** - For the purpose of examination and tests, a lot shall be homogeneous; that is, consisting of pins or collars of one material, class, of the same nominal size, length and from the same production run, as indicated on the manufacturer's packing carton, and offered for examination at one time.

4.3 Sampling. -

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

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FABRICATION CHARACTERISTICS AS DEPICTED ARE INHERENT TO THE METHOD OF MANUFACTURE AND PROCESSES AND DO NOT AFFECT THE SINGING OF THE COLLAR OR STRENGTH REQUIREMENTS OF THE INSTALLED FASTENER AS GOVERNED BY PROCUREMENT SPECIFICATION MIL-P-23469.

ILLUSTRATION DEPICTING TYPICAL FABRICATION CHARACTERISTICS PERMISSIBLE ON I.D.'S O.D.'S AND ENDS OF MIL-P-23469/1 COLLARS

FIGURE 4

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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 VI.

Table VI - 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 activity concerned.

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

Table VII - Sampling for tensile, shear and push-out tests.

<u>Test</u>	<u>Lot size</u>	<u>Sample size</u>	<u>Acceptance number</u>	<u>Reject number</u>
Tensile	all lots	20	0	1
Shear and Structure	under 500	2	0	1
	500 and over	5	0	1

4.3.3.3 Protective coating tests. - Sampling and testing of metallic coated pins and collars, anodically treated pins and collars, passivated pins and collars, shall be as required by the applicable coating or surface treatment specification.

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4.4 Inspection. - Each of the samples selected in accordance with 4.3.1 and 4.3.2 shall be examined for compliance with this specification. Visual examination shall consist of examination for conformance with 3.6 through 3.6.4, and all other requirements not involving test or measurement. Examination for dimensions shall consist of gaging or checking by suitable measuring instruments for conformity with the applicable specification sheets. The toleranced dimensions which shall be assured are specified in table VIII

Table VIII - Toleranced dimensions

<u>Component</u>	<u>Dimensions</u>
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 5, 6, and 7 based on the minimum rated grip of the pin being tested. Tests shall be in accordance with applicable methods specified in FED-STD-151, except that the rate of loading shall not exceed 250 pounds per minute.

4.5.1 Fasteners having a grip length less than 2D (twice the shank diameter) shall be tested by the push-out method shown on figure 7. Fasteners having a grip length 2D or greater may be tested by either the push-out method (figure 7) or tensile method shown on figures 5 and 6. In the event of conflict the results of 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 8. The shear load applied shall equal or exceed the values specified in table III, as applicable.

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.

5. PREPARATION FOR DELIVERY

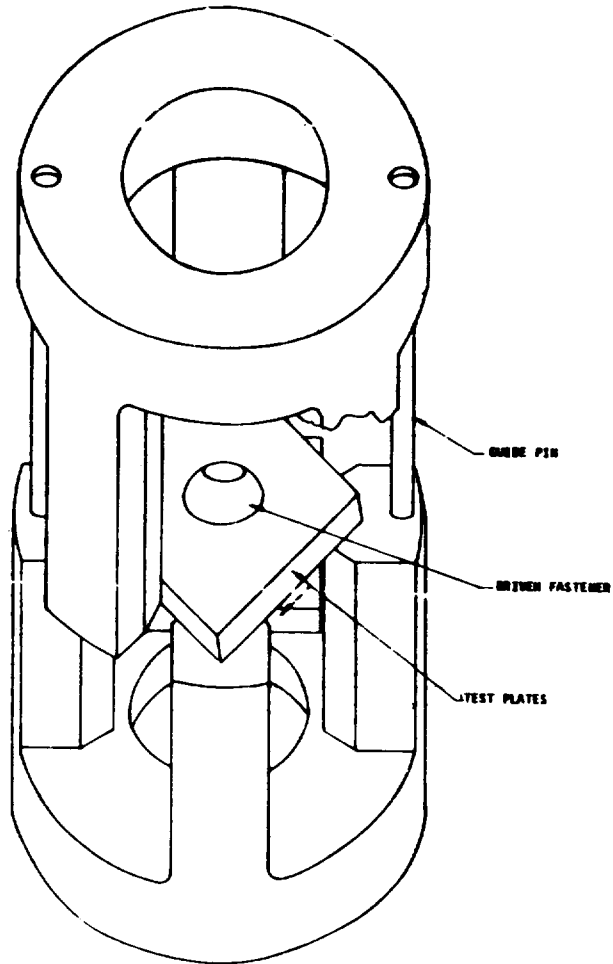
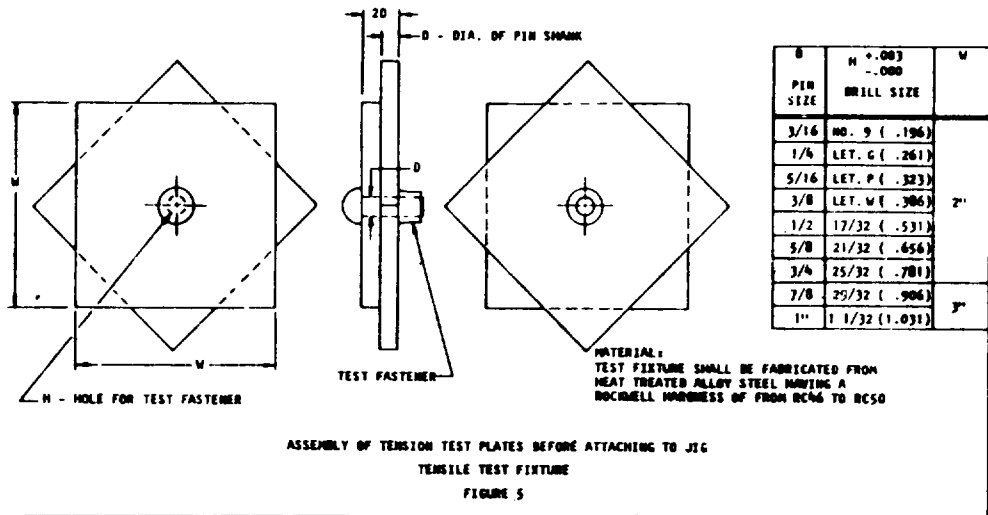
5.1 Domestic shipment and early equipment installation. -

5.1.1 Pins and collars. -

5.1.1.1 Preservation and packaging. - Preservation and packaging shall be sufficient to afford adequate protection against corrosion, deterioration and physical damage during shipment from the supply source to the using activity and until early installation and may conform to the suppliers commercial practice when such meets these requirements.

5.1.1.2 Packing. - Packing shall be accomplished in a manner which will insure acceptance by common carrier at the lowest rate and will afford protection against physical or mechanical damage during direct shipment from the supply source to the using activity for early installation. The shipping containers or method of packing shall conform to the Uniform Freight Classification Rules and Regulations or other carrier regulations as applicable to the mode of transportation and may conform to the suppliers commercial practice when such meets these requirements.

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TENSILE FIXTURE
FIGURE 6

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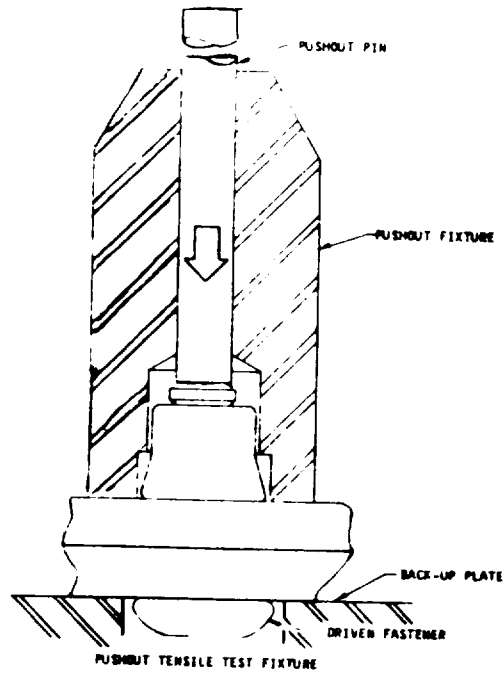
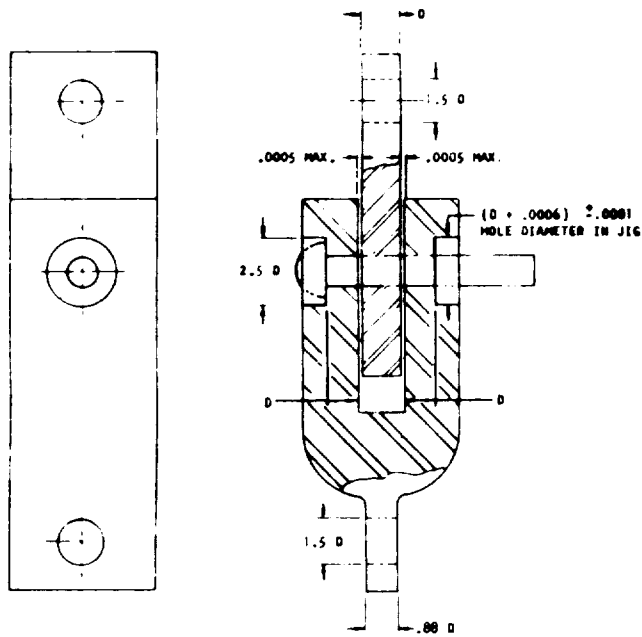


FIGURE 7



D = MAXIMUM PIN DIAMETER
JIG MATERIAL: ALLOY STEEL 180,000 PSI MINIMUM TENSILE STRENGTH

PUSHOUT TENSILE TEST FIXTURE

FIGURE 8

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5.1.1.3 Marking. - Shipment marking information shall be provided on interior packages and exterior shipping containers in accordance with the contractor's commercial practice. The information shall include nomenclature, Federal stock number or manufacturer's part number, contract or order number, contractor's name and destination.

5.2 Domestic shipment and storage or overseas shipment. - The requirements and levels of preservation, packaging, packing, and marking for shipment shall be as specified by the procuring activity (see 6.2).

(5.2.1 The following provides various levels of protection during domestic shipment and storage or overseas shipment, which may be required when procurement is made (see 6.2).

5.2.1.1 Preservation, packaging, packing and marking. - Pins of like class, size, and grip length, and collars of like size and class shall be preserved and packaged Level A or C as specified (see 6.2); packed Level A or B as specified (see 6.2), and marked in accordance with MIL-P-3987. Additional preservative is not required for parts treated with cetyl alcohol).

6. NOTES

6.1 Intended use. - Swage locking pins and collars are designed to 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 9 for pin and collar detail reference.

Fasteners conforming to this specification are intended to be capable of pulling joint surfaces together to minimize gaps.

6.2 Ordering data. - Procurement 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).
- (d) Quantity expressed in terms of pieces of each item.
- (e) Preservation, packaging, packing, and marking required, if other than specified in 5.1 (see 5.2).

6.3 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.

6.4 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 IX. Collars customarily used with the pins are listed to the right of each group of pins.

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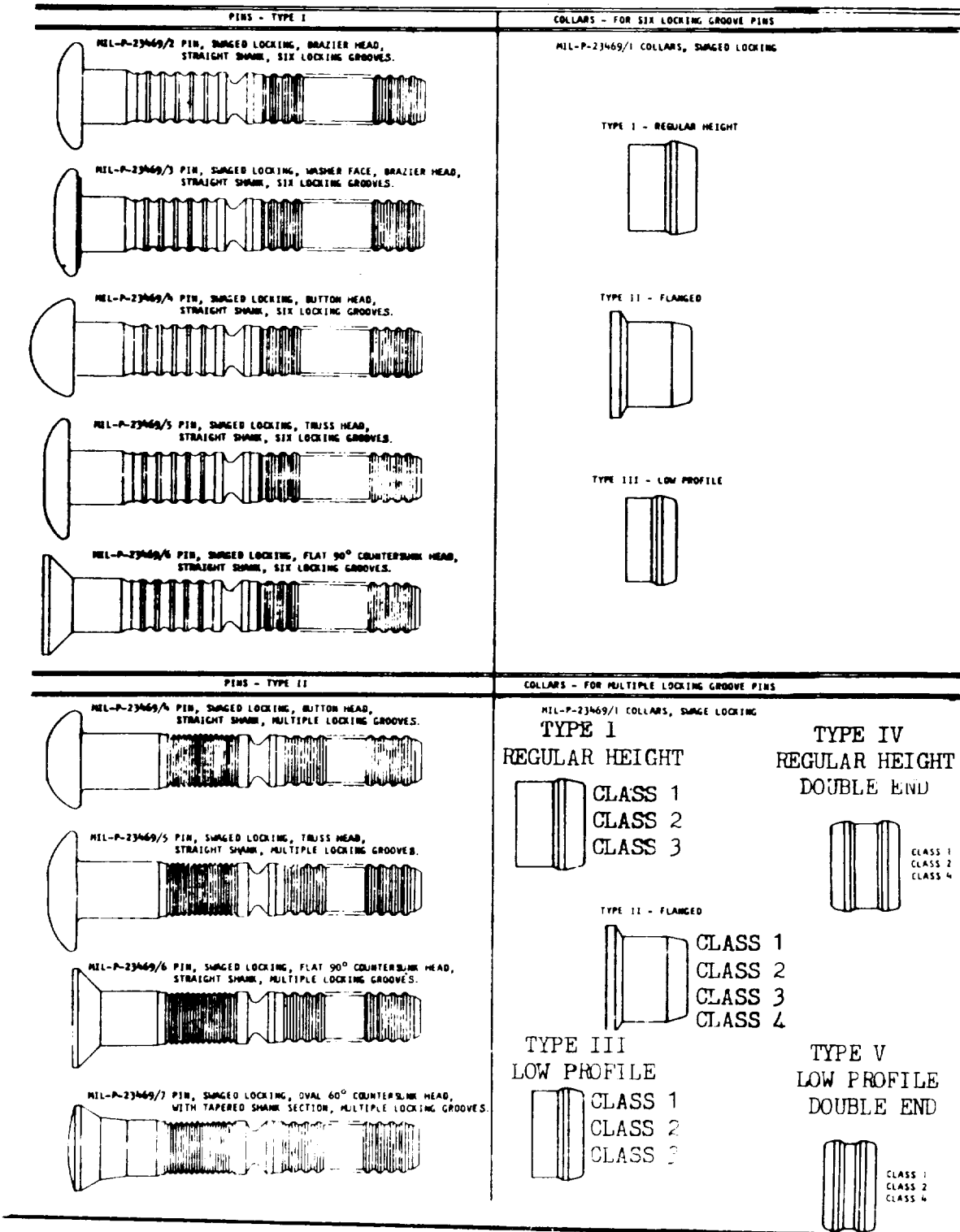


FIGURE 9 - TYPICAL FASTENERS

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TABLE IX

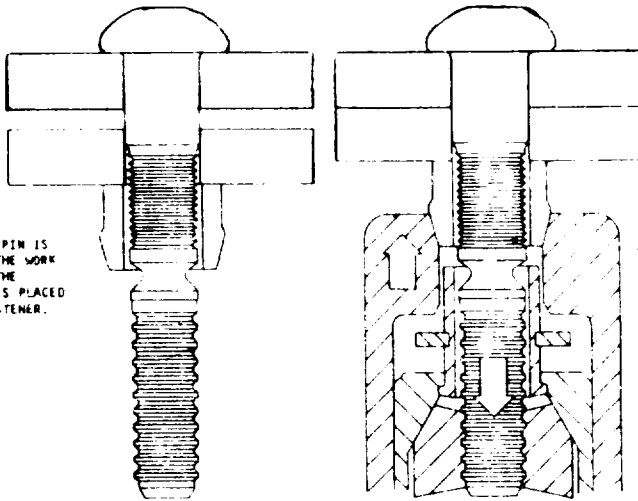
CROSS REFERENCE OF SWAGE-LOCKING PIN AND COLLAR CLASSIFICATION											
PIN				COLLAR							
MIL-P-23469	MIL-P-23469A			COMMERCIAL DESIGNATION	MIL-P-23469	MIL-P-23469A			COMMERCIAL DESIGNATION		
CLASS BF	M23469/2	TYPE I	CLASS 1	C6LB-F	CLASS I	M23469/1	TYPE I	CLASS 1	LC-I		
CLASS RF	M23469/4	TYPE I	CLASS 1	C6LR-F	CLASS 3-I	M23469/1	TYPE II	CLASS 1	3LC-I		
CLASS 90F	M23469/5	TYPE I	CLASS 1	C6LT-F	CLASS 8-I	M23469/1	TYPE III	CLASS 1	8LC-I		
	M23469/6	TYPE I	CLASS 1	C6L90-F							
CLASS BU	M23469/2	TYPE I	CLASS 2	C6LB-U	CLASS 2-U	M23469/1	TYPE I	CLASS 2	2LC-2CU		
CLASS RU	M23469/4	TYPE I	CLASS 2	C6LR-U	CLASS 3-U	M23469/1	TYPE II	CLASS 2	3LC-2CU		
CLASS 90U	M23469/5	TYPE I	CLASS 2	C6LT-U	CLASS 8-U	M23469/1	TYPE III	CLASS 2	8LC-2CU		
	M23469/6	TYPE I	CLASS 2	C6L90-U							
CLASS 37LBU	M23469/3	TYPE I	CLASS 2	C37LB-U							
CLASS BR	DISCONTINUED USE ---				CLASS 2-RG	M23469/1	TYPE I	CLASS 3	2LC-2R		
CLASS RR	CLASS BR, RR AND 90R				CLASS 3-RG	M23469/1	TYPE II	CLASS 3	3LC-2R		
CLASS 90R					CLASS 8-RG	M23469/1	TYPE III	CLASS 3	8LC-2R		
CLASS BRG	M23469/2	TYPE I	CLASS 3	C6LB-R							
CLASS RRG	M23469/4	TYPE I	CLASS 3	C6LR-R							
CLASS 90RG	M23469/5	TYPE I	CLASS 3	C6LT-R							
	M23469/6	TYPE I	CLASS 3	C6L90-R							
	M23469/4	TYPE II	CLASS 1	C50LR-F		M23469/1	TYPE I	CLASS 1	50LC-I		
	M23469/5	TYPE II	CLASS 1	C50LT-F		M23469/1	TYPE II	CLASS 1	3LC-I		
	M23469/6	TYPE II	CLASS 1	C50L90-F		M23469/1	TYPE III	CLASS 1	8LC-I		
	M23469/7	TYPE II	CLASS 1	C50L60-F		M23469/1	TYPE IV	CLASS 1	50DC-I		
						M23469/1	TYPE V	CLASS 1	50SC-I		
	M23469/4	TYPE II	CLASS 2	C50LR-U		M23469/1	TYPE I	CLASS 2	50LC-2CU		
	M23469/5	TYPE II	CLASS 2	C50LT-U		M23469/1	TYPE II	CLASS 2	3LC-2CU		
	M23469/6	TYPE II	CLASS 2	C50L90-U		M23469/1	TYPE III	CLASS 2	8LC-2CU		
	M23469/7	TYPE II	CLASS 2	C50L60-U		M23469/1	TYPE IV	CLASS 2	50DC-2CU		
						M23469/1	TYPE V	CLASS 2	50SC-2CU		
CLASS 60R	DISCONTINUED USE ---				CLASS RG	M23469/1	TYPE I	CLASS 3	LC-2R		
	CLASS 50L60-R					M23469/1	TYPE II	CLASS 3	3LC-2R		
CLASS 50R	M23469/4	TYPE II	CLASS 3	C50LR-BR		M23469/1	TYPE III	CLASS 3	8LC-2R		
	M23469/5	TYPE II	CLASS 3	C50LT-BR		M23469/1	TYPE IV	CLASS 4	50DC-CT		
	M23469/6	TYPE II	CLASS 3	C50L90-BR		M23469/1	TYPE II	CLASS 4	3LC-CT		
CLASS 50L60R	M23469/7	TYPE II	CLASS 3	C50L60-BR		M23469/1	TYPE V	CLASS 4	50SC-CT		
	M23469/7	TYPE II	CLASS 4	C50L60-U(CT)		M23469/1	TYPE I	CLASS 2	50LC-2CU		
									50DC-2CU		

△ C6L 100% INTERCHANGEABLE WITH CLP

6.5 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 10.

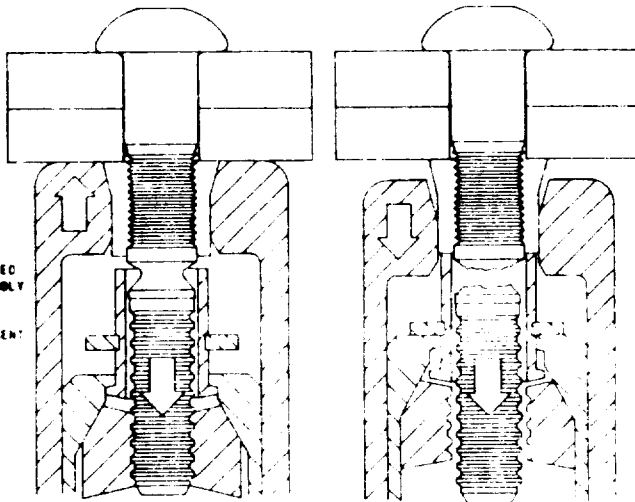
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STEP 1 - THE SWAGE LOCKING PIN IS INSERTED FROM ONE SIDE OF THE WORK THROUGH A PREPARED HOLE. THE PRECISION DESIGNED COLLAR IS PLACED OVER THE PINTAIL OF THE FASTENER.



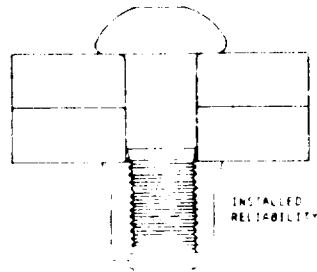
STEP 2 - AN INSTALLATION TOOL IS APPLIED OVER THE PINTAIL OF THE FASTENER WITH THE NOSE AUTOMATICALLY GRIPPING THE PULL GROOVES OF THE PINTAIL. THE TOOL PULLS THE PIN, PUSHES ON THE COLLAR, AND DRAWS THE WORK TOGETHER.

STEP 3 - AS PULL IS INCREASED THE ANVIL IN THE NOSE ASSEMBLY SWAGES THE COLLAR INTO THE LOCKING GROOVES AND THE PIN UNDER TENSION, AND A PERMANENT MECHANICAL LOCK IS FORMED.



STEP 4 - THE TOOL CONTINUES TO PULL UNTIL THE PINTAIL BREAKS OFF AT A PRE-DETERMINED LOAD AND THE PINTAIL IS EJECTED FROM THE TOOL QUIETLY AND AUTOMATICALLY WITH THE NOSE ASSEMBLY DISENGAGING FROM THE NOW LOCKED COLLAR.

THESE FOUR STEPS REQUIRE LESS THAN TWO SECONDS TIME



4-100 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100)

FIGURE 10

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6.6 Engineering data. -

6.6.1 Shear strength. - Table X lists the values for shear strength, in pounds, for corrosion resistant and carbon steel respectively.




Table X - Minimum shear, in pounds, for CRES and carbon steel.





SHEAR		
NOMINAL SIZE	CRES	CARBON STEEL
3/16	2000	1725
1/4	3550	3050
5/16	5525	4725
3/8	7950	6825
1/2	13900	14400
5/8	21000	22500
3/4	30300	32400
7/8	42000	43400
1"	55000	56500

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6.6.2 Clamping force. - Table XI lists the values for the clamping force of installed types I, II and IV, aluminum alloy, corrosion resistant steel and carbon steel fasteners.

TABLE XI

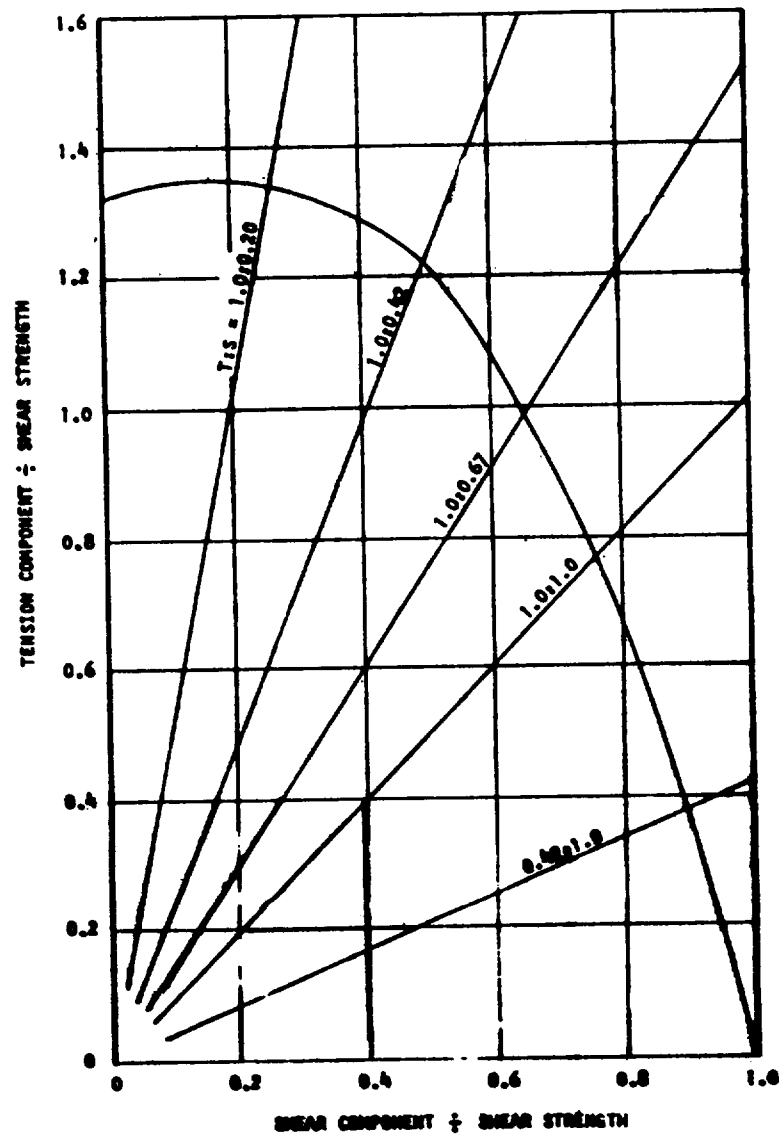
MINIMUM CLAMPING FORCE IN POUNDS FOR ALUM, CRES AND CARBON STEEL			
NOMINAL SIZE	ALUM 	CRES 	CARBON STEEL 
3/16	350	1025	1025
1/4	620	1805	1805
5/16	965	2810	2810
3/8	1380	4020	4020
1/2	4400	12050	12050
5/8	6900	19200	19200
3/4	9950	28400	28400
7/8	12300	39250	39250
1"	17650	51500	51500

 AS INSTALLED WITH REGULAR OR FLANGE ALUMINUM COLLAR.
 AS INSTALLED WITH REGULAR OR FLANGE CRES COLLAR.
 AS INSTALLED WITH REGULAR OR FLANGE CARBON STEEL COLLAR.
 COMPARABLE TO ASTM A325 HIGH STRENGTH BOLTS IN THE THRU DIA DIAMETERS.

CLAMPING FORCE IS ESTABLISHED BY INSTALLATION AND INSPECTION IN SKIDMORE - WILHELM OR EQUIVALENT TENSION TESTER.

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6.6.3 Figure 11 is a typical non-dimension interaction curve for a multiple locking groove, carbon steel fastener.



TYPICAL NON-DIMENSIONAL INTERACTION CURVE
FOR TYPE II MULTIPLE LOCKING GROOVE PINS
WITH TYPE I, CLASS 3 AND 4 COLLARS

FIGURE 11

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6.7 Patent notice. - The Government does not have a royalty-free license under the following patents, owned by the Huck Manufacturing Company, 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>
2, 531, 048	November 21, 1967
2, 531, 049	November 21, 1967
2, 754, 703	July 17, 1973
3, 057, 246	October 9, 1979

6.8 CHANGES FROM PREVIOUS ISSUE. THE EXTENT OF CHANGES (DELETIONS, ADDITIONS, ETC.) PRECLUDE THE ANNOTATION OF THE INDIVIDUAL CHANGES FROM THE PREVIOUS ISSUE OF THIS DOCUMENT.

Preparing activity:
Navy - SH
(Project 5320-N032Sh)

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
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 (as indicated on reverse hereof).		
SPECIFICATION		
ORGANIZATION (of submitter)		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> 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?		
<input type="checkbox"/> YES <input type="checkbox"/> 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)		DATE

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1 APR 63REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE
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