FF-T-791b
May 2, 1967
SUPERSEDING
Fed. Spec. FF-T-791a
July 16, 1953
(See 6.4)

FEDERAL SPECIFICATION

TURNBUCKLE

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

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers swaged welded, cast or forged turnbuckles with and without jam nuts.

1.2 Classification.

1.2.1 Types. Turnbuckles covered by this specification shall be furnished in the following types and forms, as specified (see 6.1):

Type I —Open turnbuckle bodies (see 3.9.1).

Form:
1—Forged.
2—Spread.
3—Resistance welded.
4—Arc or gas welded.

Type II —Pipe turnbuckle bodies (see 3.9.2).

Type III—Rigging turnbuckle bodies (see 3.9.3).

1.2.2 Classes. Turnbuckles covered by this specification shall be furnished in the following classes, as specified (see 6.1):

1—Turnbuckle, body only without end pulls, heads not drilled.
2—Turnbuckle, body only without end pulls, heads threaded right and left hand.
3—Turnbuckle with stub and stub end pulls, complete.
4—Turnbuckle with eye and eye end pulls, complete.
5—Turnbuckle with hook and hook end pulls, complete.
6—Turnbuckle with hook and eye end pulls, complete.
7—Turnbuckle with jaw and jaw end pulls, complete.
8—Turnbuckle with jaw and eye end pulls, complete.

1.2.3 Sizes. Turnbuckles covered by this specification shall be of the sizes listed in tables I and II, as specified (see 3.3 and 6.1).

2. APPLICABLE DOCUMENTS

2.1 Specifications and standards. The following specifications and standards, of the issues in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

Federal Specifications:

FF-N-836 —Nut, Plain: (Hexagon, Square, Cap and Welding) Nut, Slotted, and Castellated, Hexagon.
QQ-Z-325 —Zinc Coating, Electrodeposited, Requirements for.
PPP-B-576—Boxes, Wood, Cleated, Veneer, Paper Overlaid.

PPP-B-585—Boxes, Wood, Wirebound.
PPP-B-591—Boxes, Fiberboard, Wood-Cleated.
PPP-B-601—Boxes, Wood, Cleated-Plywood.
PPP-B-621—Boxes, Wood, Nailed and Lock-Corner.
PPP-B-636—Box, Fiberboard.
PPP-B-640—Boxes, Fiberboard, Corrugated, Triple-Wall.

Federal Standards:

Fed. Std. No. 66—Steel: Chemical Composition and Hardenability.
Fed. Std. No. 123—Marking for Domestic Shipment (Civilian Agencies).

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

(Single copies of this specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Washington, D.C., Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, Los Angeles, and Seattle, Wash.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Specifications:

MIL-P-116 —Preservation, Methods of.
MIL-R-908 —Rods, Welding, Steel and Cast Iron (For Gas Welding).
MIL-E-18038—Electrodes, Welding, Mineral Covered, Low Hydrogen, Medium and High Tensile Steel as Welded or Stress-Relieved Weld Applications.

Military Standards:

MIL-STD-129—Marking for Shipment and Storage.
MIL-STD-147—Palletized Unit Loads (40 in. x 48 in., 4-Way Partial and 4-Way Pallets).

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

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

National Bureau of Standards (NBS) Handbook:

H-28—Screw-Thread Standards for Federal Services.

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

American Society for Testing and Materials (ASTM) Publication:

A-153—Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.

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

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Material. Unless otherwise specified (see 6.1), turnbuckle and end pulls shall be made from steel of a grade which will meet the requirements of table I. For materials used for welded turnbuckle bodies, eye and jaw end pulls, the carbon shall be 0.25 percent maximum, sulphur 0.05 percent maximum, and phosphorus 0.05 percent maximum.

TABLE I. Breaking strength of turnbuckles (complete with end pulls)

Size, nominal outside diameter of thread	Strength breaking, minimum				Recommended working loads			
	Type 1, form 1		All others		Type 1, form 1		All others	
	Jaw, eye, or stub end pulls	Hook end pulls	Jaw, eye, or stub end pulls	Hook end pulls	Jaw, eye, or stub end pulls	Hook end pulls	Jaw, eye, or stub end pulls	Hook end pulls
Inches	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
1/4	2,500	1,500	1,550	1,050	500	300	310	210
5/16	3,500	2,500	2,700	1,650	700	500	540	330
3/8	5,200	3,500	4,100	2,300	1,040	700	820	460
1/2	9,000	5,200	7,550	3,700	1,800	1,040	1,500	740
5/8	13,500	8,000	12,100	5,400	2,700	1,600	2,400	1,080
3/4	20,000	10,000	18,100	7,500	4,000	2,000	3,600	1,500
7/8	29,000	12,000	25,100	10,000	5,800	2,400	5,000	2,000
1	38,000	14,500	33,100	12,800	7,600	2,900	6,600	2,560
1 1/4	60,000	23,000	53,600	20,600	12,000	4,600	10,700	4,120
1 3/8	72,000	29,000	63,400	24,300	14,400	5,800	12,600	4,860
1 1/2	85,000	36,000	77,700	29,300	17,000	7,200	15,500	5,860
1 3/4	115,000	--	105,000	--	23,000	--	21,000	--
2	150,000	--	138,000	--	30,000	--	27,600	--
2 1/4	197,000	--	181,000	--	39,400	--	36,200	--
2 1/2	242,000	--	223,000	--	48,400	--	44,600	--
2 3/4	304,000	--	277,000	--	60,800	--	55,400	--
3	350,000	--	337,000	--	70,000	--	67,400	--
3 1/4	400,000	--	400,000	--	80,000	--	80,000	--
3 1/2	475,000	--	475,000	--	95,000	--	95,000	--
3 3/4	550,000	--	550,000	--	110,000	--	110,000	--
4	635,000	--	635,000	--	127,000	--	127,000	--

3.2 Construction.

3.2.1 Forged. Each forged turnbuckle body and each forged end pull shall be forged at elevated temperature to final shape and size.

3.2.2 Spread. For each spread turnbuckle body, one piece of material shall be cut lengthwise from near one end to the other end by any suitable means, such as an oxy-acetylene cutting torch; the resulting reins then shall be spread apart at elevated temperatures to final shape and size.

3.2.3 Resistance welded. Each resistance-welded turnbuckle body shall be fabricated by joining two formed pieces of material by either the flash or upset welding process. The welds shall be parallel to the long axis of the piece. The surfaces to be joined shall be held in intimate contact by external forces, an electric current passed through the surfaces, and the weld consolidated by the forces.

3.2.4 Arc or gas welded. The welds shall be either electric arc or oxy-acetylene welds at the option of the contractor.

3.2.4.1 All arc-welded bodies, eyes, and jaws shall be welded with type MIL-7015, MIL-7016, MIL-8015 or MIL-8016 electrodes of MIL-E-18038.

3.2.4.2 All gas-welded bodies, eyes, and jaws shall be welded with class 1, type A welding rods of MIL-R-908.

3.3 Size. Turnbuckles covered by this specification shall be furnished in the sizes shown in tables II and III, as specified (see 6.1). The size of turnbuckle bodies and turnbuckles shall be the nominal major diameter of the threads in the heads and the clear opening between heads (which is approximately equal to the take up); thus, for a 3/4- by 6-inch turnbuckle body, the heads shall be threaded for a 3/4-inch nominal major-diameter end pull, and the clear opening between heads shall be 6 inches. The difference

between the actual clear opening in the turnbuckle body and the nominal value given in either table II or III for the size specified shall not exceed 5 percent of the nominal value.

3.4 Length of head. The length of the heads of the turnbuckle bodies shall be not less than 1½ times the nominal outside diameter of the end pull for sizes up to 1¼ inches, and 1¼ times for sizes 1¼ inches and above.

3.5 Thread. Turnbuckle bodies and end pulls shall be threaded after fabrication to final size and shape. The threads in the heads of the turnbuckle bodies and on the end pulls shall comply with NBS H28 (see 6.1). Unified threads in the coarse (UNC) and fine (UNF) standard series should be used. If neither is specified, the threads will be in the UNC series. If the standard diameter-pitch combinations are not suitable, the UNS threads with dimensions in accordance with NBS H28 should be used. Threads on the finished turnbuckle shall be not looser than class 1A/1B fit. If coated turnbuckles are specified, the male threads on the end pulls may be under-cut, as necessary, so that after coating they will properly mate (not looser than class 1A/1B fit) with the standard size female threads of the turnbuckle bodies. The thread in one head of each turnbuckle body shall be right-hand and in the other head, left-hand. The threads on the end pulls shall be right-hand on one end pull and left-hand on the other. The length of the thread on the two end pulls shall be great enough so that the ends of the end pulls can be brought into contact with each other at the middle of the body length when jam nuts are not used.

TABLE II. Turnbuckle bodies, classes 1 and 2 and turnbuckles class 3

Thread, nominal outside diameter	Size: Clear opening between head, inches								
	4	4½	6	9	12	18	24	36	48
Inches									
¼	X								
5/16		X							
⅜			X						
½			X	X	X				
⅝			X	X	X	X			
¾			X	X	X	X	X		
⅞			X		X	X	X		
1			X		X	X	X	X	
1¼			X		X	X	X	X	
1⅜			X						
1½			X		X	X	X	X	X
1¾			X			X	X	X	X
2			X				X	X	X
2¼			X				X	X	X
2½			X				X	X	X
2¾			X						X
3			X						X
3½			X						X
4			X						X

3.6 Breaking strength. The breaking strength of turnbuckles, equipped with end pulls, shall be not less than the value given in table I for the required size, type, and form of end pull specified.

3.7 Bending strength of end pulls. End pulls shall be capable of bending through an angle of 90° around a pin twice the nominal major diameter of the end pull without either crack or rupture. End pulls for classes 4, 5, 6, 7, and 8 shall be capable of supporting a load equal to one half of the specified breaking strength without permanent deformation.

3.8 Finish.

3.8.1 Surface condition. Turnbuckle bodies and end pulls shall be finished by grinding the flash and excess weld metal smooth, where required, and the loose scale removed.

TABLE III. Turnbuckles, classes 4, 5, 6, 7, and 8

Thread, nominal outside diameter	Size: Clear opening between heads, inches								
	4	4½	6	9	12	18	24	36	48
Inches									
¼	X								
5/16		X							
⅜			X						
½			X	X	X				
⅝			X	X	X	X			
¾			X	X	X	X	X		
⅞					X	X	X		
1					X	X	X	X	
1¼					X	X	X	X	
1½					X	X	X	X	X
1¾						X	X	X	X
2							X	X	X
2¼							X	X	X
2½							X	X	X

3.8.2 Turnbuckles shall be furnished self-colored, black, or zinc-coated, as specified. (See 6.1).

3.8.2.1 Zinc coating. If zinc-coated turnbuckles are specified the coating may be applied by the hot-dip (galvanizing) process or the electrodeposition process at the manufacturers' option. If the hot-dip process is used the coating shall be applied in conformance with ASTM A 153, and shall be adherent, smooth, and free from injurious lumps, blisters, dross, or flux. If the electrodeposition process is used it shall conform to class 2 (0.0005 inch thick) type II in accordance with QQ–Z–325. Coating shall be done on the end pulls after threading; coating for turnbuckle bodies shall be done after tapping.

3.9 Turnbuckle bodies, types.

3.9.1 Type I, open. Type I, open turnbuckles, shall be form 1-forged, form 2-spread, form 3-resistance welded, or form 4-arc or gas welded, as specified (see 6.1).

3.9.1.1 Form 1, forged. Forged turnbuckle bodies shall be similar to figure 1. The shape of the head of the turnbuckle body shall be either round or hexagonal.

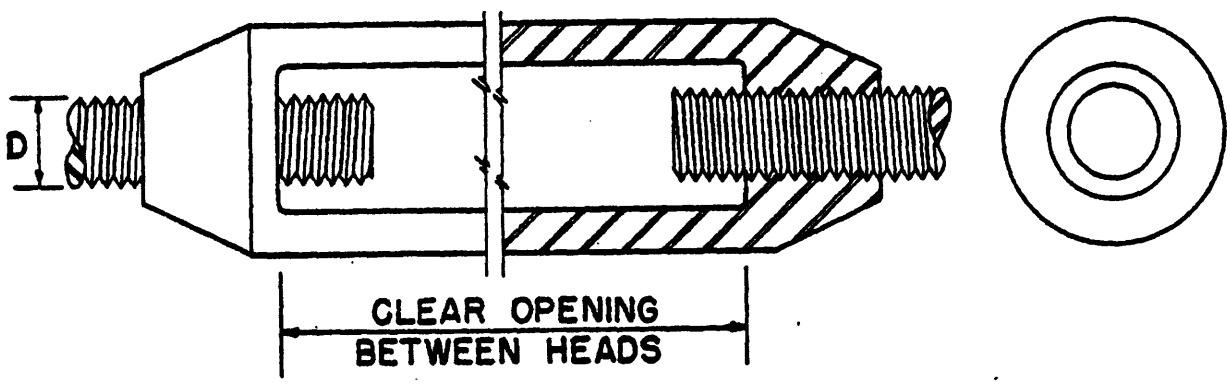

FIGURE 1. Type I, form 1, open turnbuckle body, forged.

3.9.1.2 Form 2, spread. Spread turnbuckle bodies shall be similar to figure 2. The shape of the cross section of the material shall be at the option of the contractor.

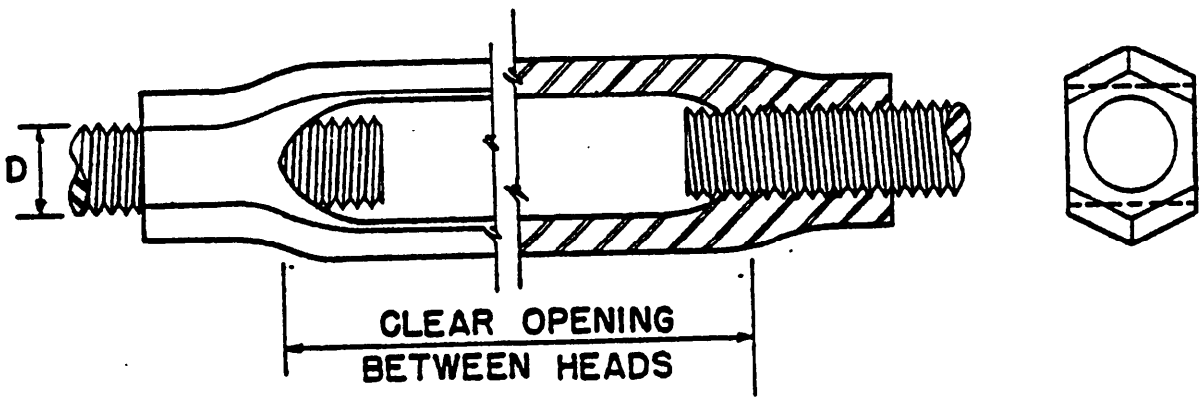

FIGURE 2. Type I, form 2, open turnbuckle, spread.

3.9.1.3 Form 3, resistance welded. Resistance-welded turnbuckle bodies shall be similar to figure 3. The shape of the cross section of the pieces shall be at the option of the contractor.

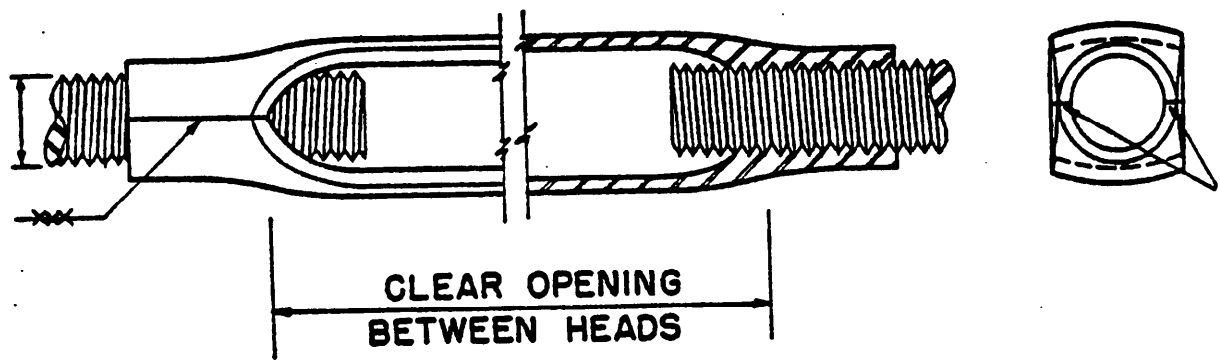

FIGURE 3. Type I, form 3, open turnbuckle body, resistance welded.

3.9.1.4 Form 4, arc or gas welded. Arc-or gas-welded turnbuckle bodies shall be fabricated by joining four pieces of material by welds similar to figure 4, and shall comply with the dimensional requirement given in table IV for the size specified. The faces of the welds shall not be concave but may be somewhat convex.

3.9.2 Type II, pipe. Pipe turnbuckle bodies shall be forged, swaged, spun, drawn, or upset in way of the threaded ends, and shall be similar to figure 5. Holes in body shall be ¼ inch in diameter for sizes up to and including ⅝ inch; holes in body for sizes larger than ⅝ inch shall be ½ inch in diameter.

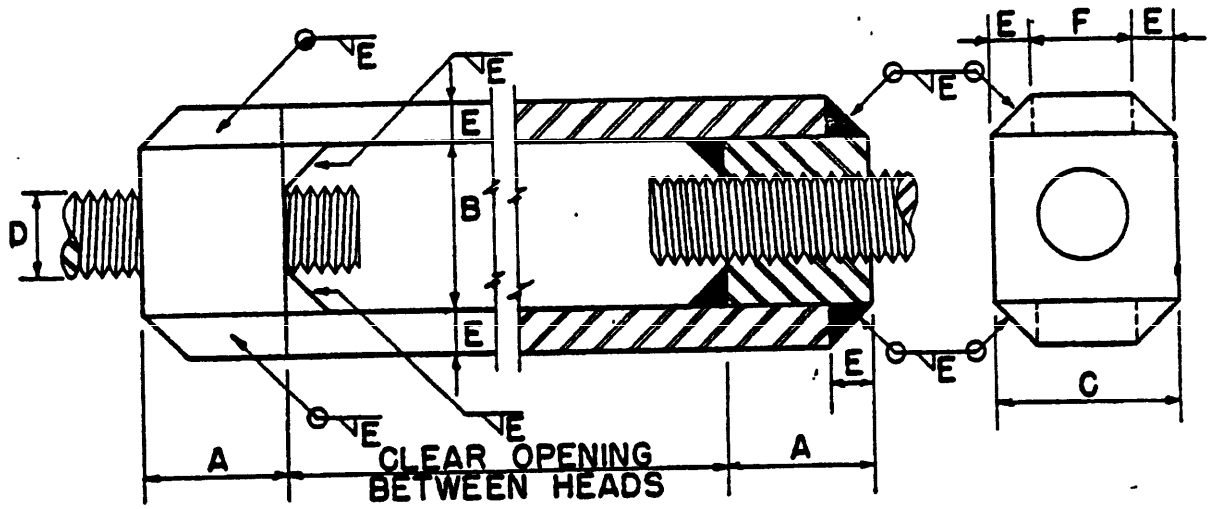

FIGURE 4. Type I, form 4, open turnbuckle body, arc or gas welded.

TABLE IV. Type I, form 4, dimensions of open turnbuckle bodies fabricated by arc or gas welding

Size, nominal D	Head			Rein		Size of all fillet welds, minimum
	Length, minimum A	Thickness, minimum B	Width, minimum C	Thickness, minimum E	Width, minimum F	
Inches	Inches	Inches	Inches	Inches	Inches	Inches
1/4	7/16	1/2	9/16	1/8	5/16	1/8
5/16	5/8	11/16	13/16	3/16	7/16	3/16
3/8	11/16	3/4	7/8	3/16	1/2	3/16
1/2	7/8	1	1 1/8	1/4	5/8	1/4
5/8	1 1/8	1 1/4	1 7/16	5/16	13/16	5/16
3/4	1 3/8	1 1/2	1 3/4	3/8	1	3/8
7/8	1 9/16	1 3/4	2	7/16	1 1/8	7/16
1	1 3/4	2	2 1/4	1/2	1 1/4	1/2
1 1/4	2 1/8	2 1/2	2 3/4	5/8	1 1/2	5/8
1 3/8	2 3/8	2 3/4	3 1/16	11/16	1 11/16	11/16
1 1/2	2 9/16	3	3 5/16	3/4	1 13/16	3/4
1 3/4	2 13/16	3 3/8	3 5/8	13/16	2	13/16
2	3 3/16	3 7/8	4 1/8	15/16	2 1/4	15/16
2 1/4	3 1/2	4 1/4	4 1/2	1	2 1/2	1
2 1/2	3 15/16	4 3/4	5 1/16	1 1/8	2 13/16	1 1/8
2 3/4	4 3/8	5 1/4	5 5/8	1 1/4	3 1/8	1 1/4
3	4 13/16	5 3/4	6 3/16	1 3/8	3 7/16	1 3/8
3 1/2	5 9/16	6 3/4	7 3/16	1 5/8	3 15/16	1 5/8
4	6 5/16	7 5/8	8 1/8	1 13/16	4 1/2	1 13/16

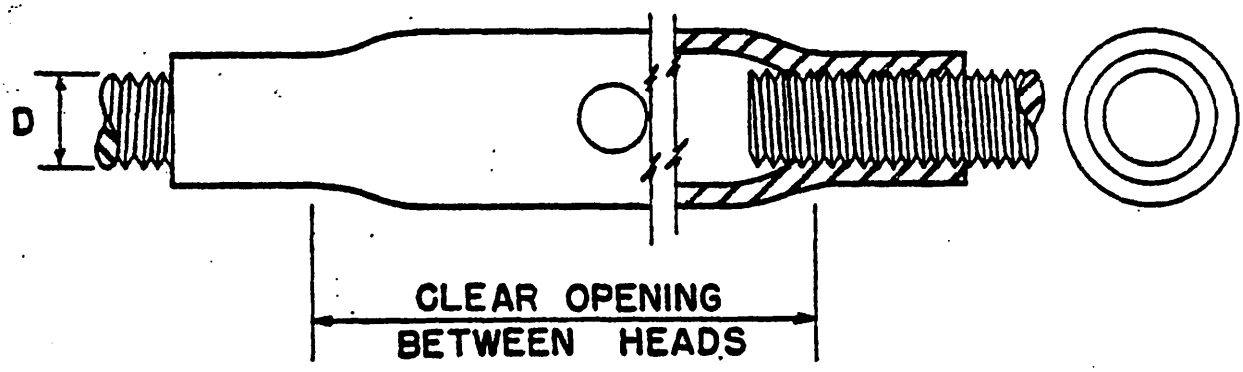

FIGURE 5. Type II, pipe turnbuckle body.

3.9.3 Type III, rigging. Rigging turnbuckle bodies shall be forged, shall be similar to figure 6, and shall be provided with a jam nut of a type which does not depend upon deformation of the threads for security. Holes in body shall be ¼ inch in diameter for sizes up to and including ⅝ inch; holes in body for sizes larger than ⅝ inch shall be ½ inch in diameter.

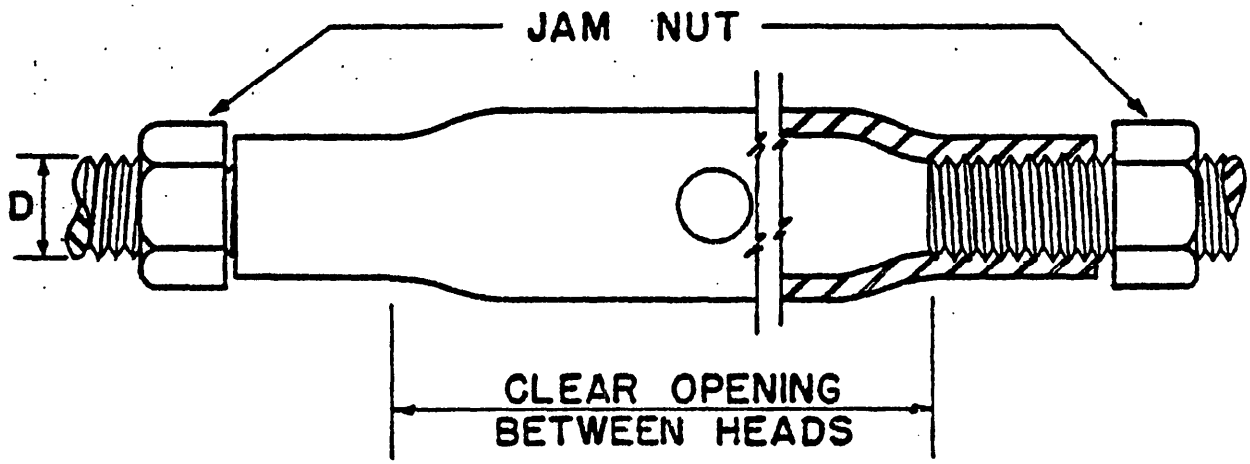

FIGURE 6. Type III, rigging turnbuckle body.

3.9.3.1 Jam nuts. Jam nuts shall be right-hand or left-hand threaded, as required, made of carbon steel of a type selected from the group C1016 to C1020, inclusive, of Fed. Std. No. 66, and shall conform to the dimensional requirements of FF–N–836, as applicable, for type II, style 2 nut.

3.10 Turnbuckle, classes. Turnbuckle classes 1 to 8, inclusive, shall be of the sizes given in tables II and III, as specified. Class 1 turnbuckle shall consist of a body only, without end pulls, and the heads undrilled. Class 2 turnbuckle shall consist of a body only, without end pulls, and the heads threaded right and left hand. The arrangement of turnbuckle bodies and end pulls for classes 3, 4, 5, 6, 7, and 8 shall be similar to figure 7.

3.11 End pulls.

3.11.1 Eye end pulls. Eye end pulls shall be forged, resistance welded, or arc or gas welded, at the

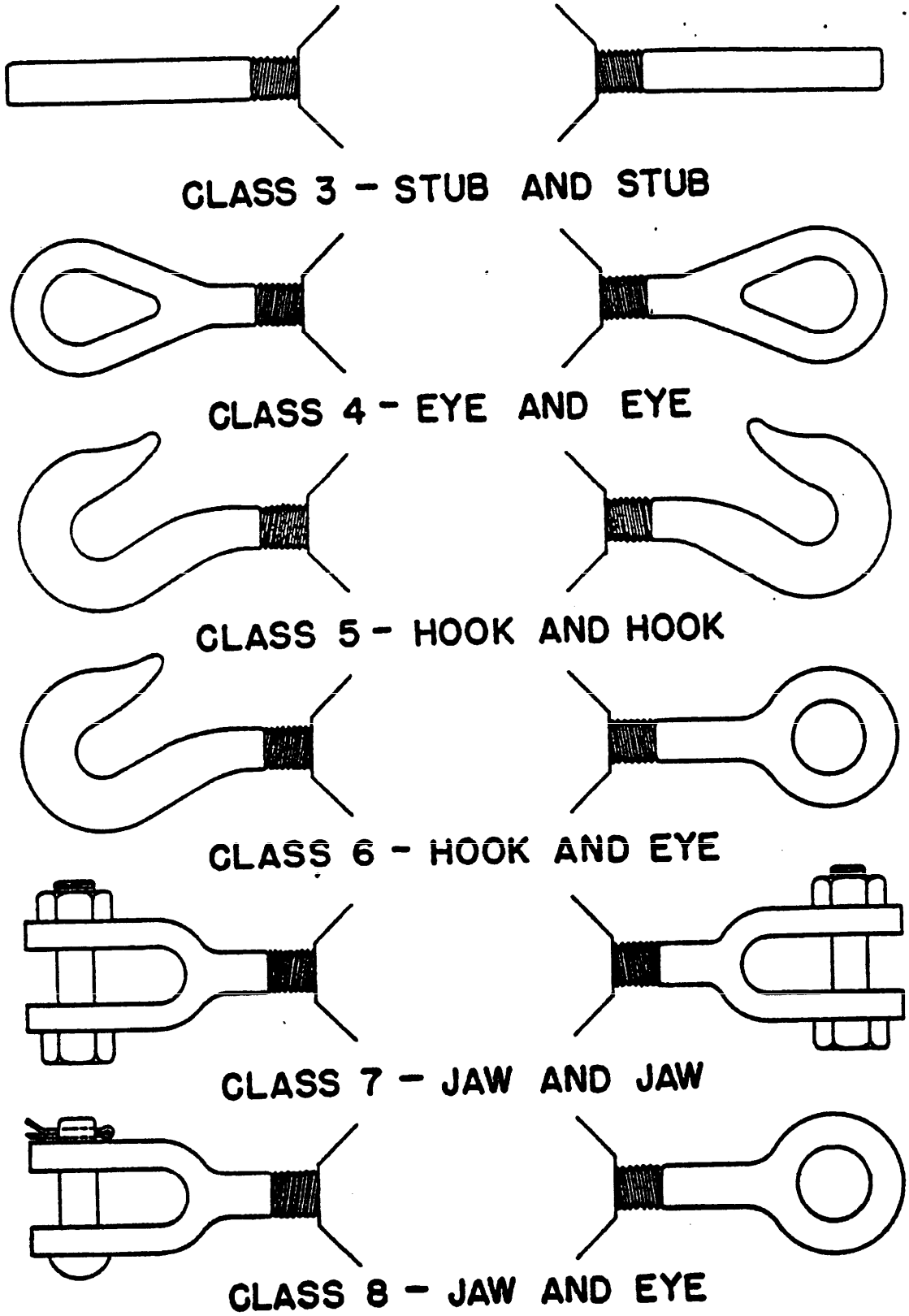

FIGURE 7. Classes of turnbuckles.

option of the contractor, except that when forged bodies are specified forged-eye end pulls shall be required.

3.11.1.1 Forged. Forged-eye end pulls shall be similar to figure 8. The shape of the eye may be either oval or round. Minimum dimensions are as shown in table V.

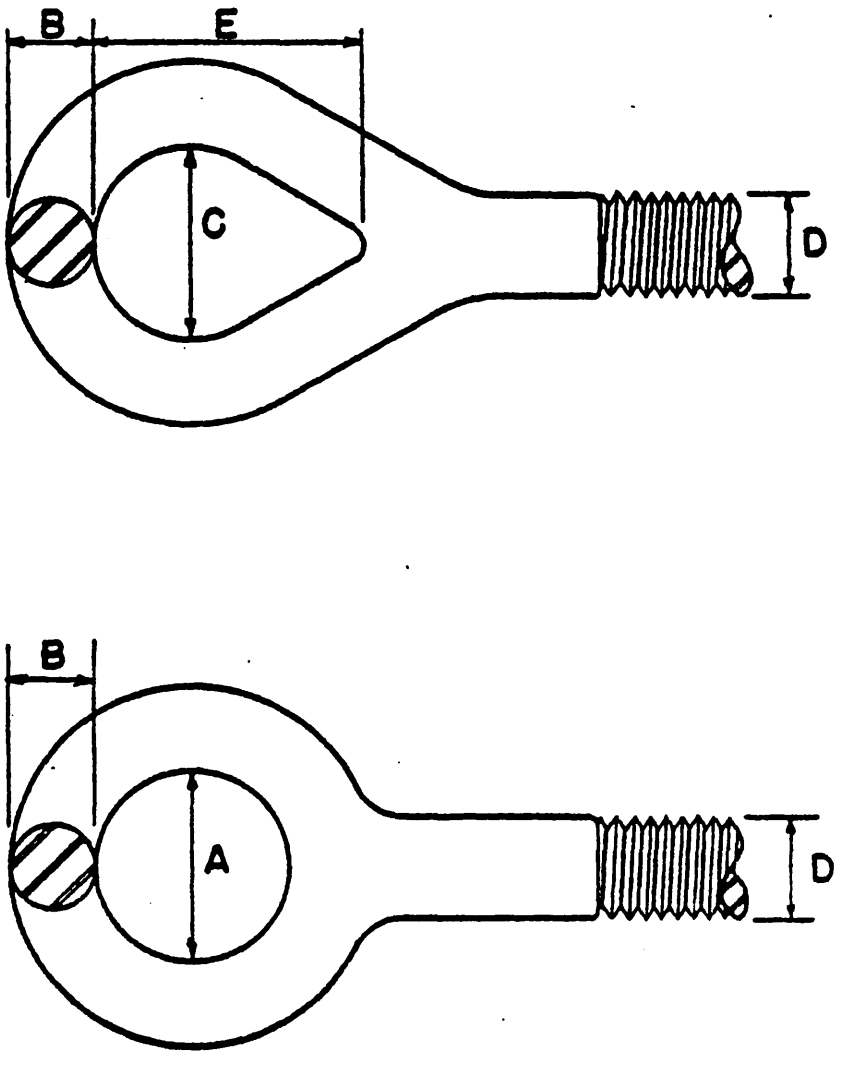

FIGURE 8. Forged-eye end pull.

3.11.1.2 Resistance welded. Resistance-welded eye end pulls shall be similar to figure 9. They shall be fabricated from one piece of material by bending the material to form the eye and joining by resistance welding process. The outside diameter of the eye shall be not less than 3½ times the nominal diameter of the end pull. Nominal dimension "D" and dimension "B" shall be in accordance with table V.

3.11.1.3 Arc or gas welded. Arc- or gas welded-eye end pulls shall be similar to figure 10. They shall be fabricated from one piece of material by bending the material to form the eye and joining by welding. The cross-sectional area through the weld shall be not less than the cross-sectional area of the bar. The

TABLE V. Dimensions of eye end pulls (inches)

D Nominal	A Minimum	B Minimum	C Minimum	E Minimum
1/4	1/2	7/32	11/32	11/16
5/16	5/8	9/32	7/16	13/16
3/8	3/4	11/32	17/32	15/16
1/2	1	7/16	23/32	1 3/16
5/8	1 1/4	1/2	7/8	1 3/8
3/4	1 1/2	5/8	1	1 5/8
7/8	1 3/4	3/4	1 1/4	1 7/8
1	2	7/8	1 7/16	2 1/4
1 1/4	2 1/8	1 1/16	1 11/16	2 9/16
1 1/2	2 1/4	1 1/4	2 1/8	3 1/4
1 3/4	2 1/2	1 7/16	2 3/8	3 3/4
2	3	1 5/8	2 11/16	4 3/8
2 1/4	3 1/4	1 13/16	2 15/16	5 3/16
2 1/2	3 1/2	2	3 1/8	6

outside diameter of the eye shall be not less than 3½ times the nominal diameter of the end pull. Nominal dimension "D" and dimension "B" shall be in accordance with table V.

3.11.2 Jaw end pulls. Jaw end pulls shall be forged, arc or gas welded, or upset, at the option of the contractor, except that if forged bodies are specified, forged-jaw end pulls shall be provided. Jaw end pulls 5/8 inch and smaller shall be provided with a steel hexagon-head bolt and nut. Jaw end pulls 3/4 inch size and larger shall be provided with round-head steel pin and cotter.

3.11.2.1 Forged. Forged-jaw end pulls shall be similar to figure 11 and shall comply with the dimensional requirements of table VI. The area of the cross section X-X shall be not less than 0.75 of the area corresponding to the nominal diameter. The area of the cross section Y-Y shall be not less than 0.40 of the area corresponding to the nominal diameter.

3.11.2.2 Arc or gas welded. Arc-or gas-welded end pulls shall be similar to figure 12 and shall comply with the dimensional requirements of table VII. The area of the cross section X-X shall be not less than 0.75 of the area corresponding to the nominal diameter. The area of the cross section Y-Y shall be not less than 0.40 of the area corresponding to the nominal diameter.

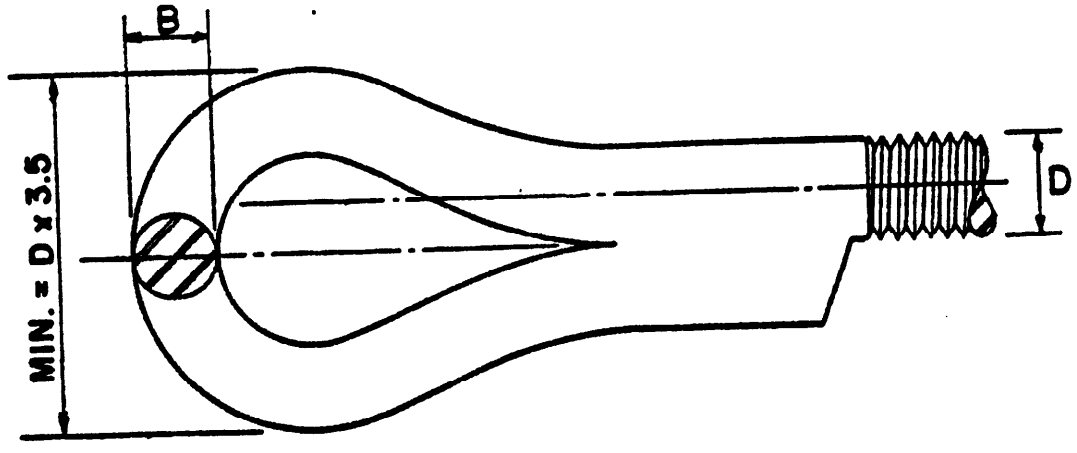

FIGURE 9. Resistance-welded-eye end pull.

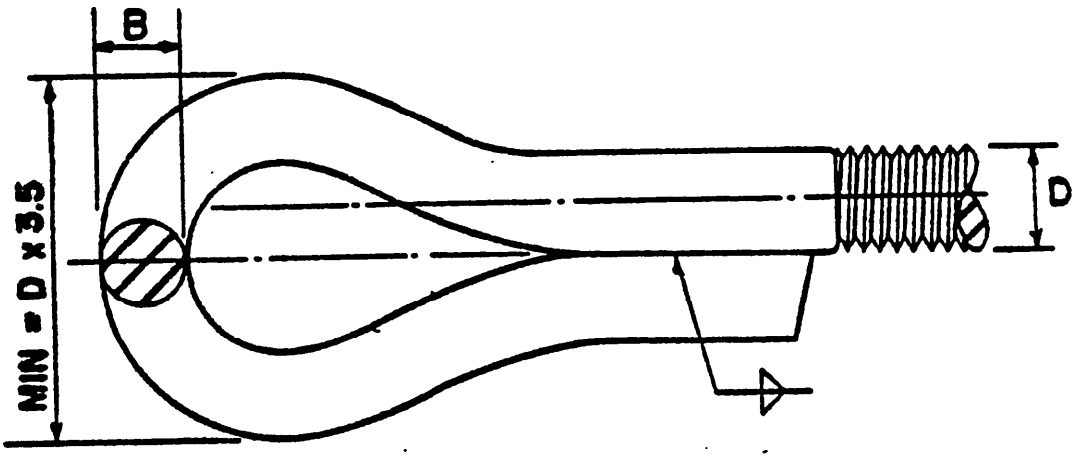

FIGURE 10. Arc- or gas-welded-eye end pull.

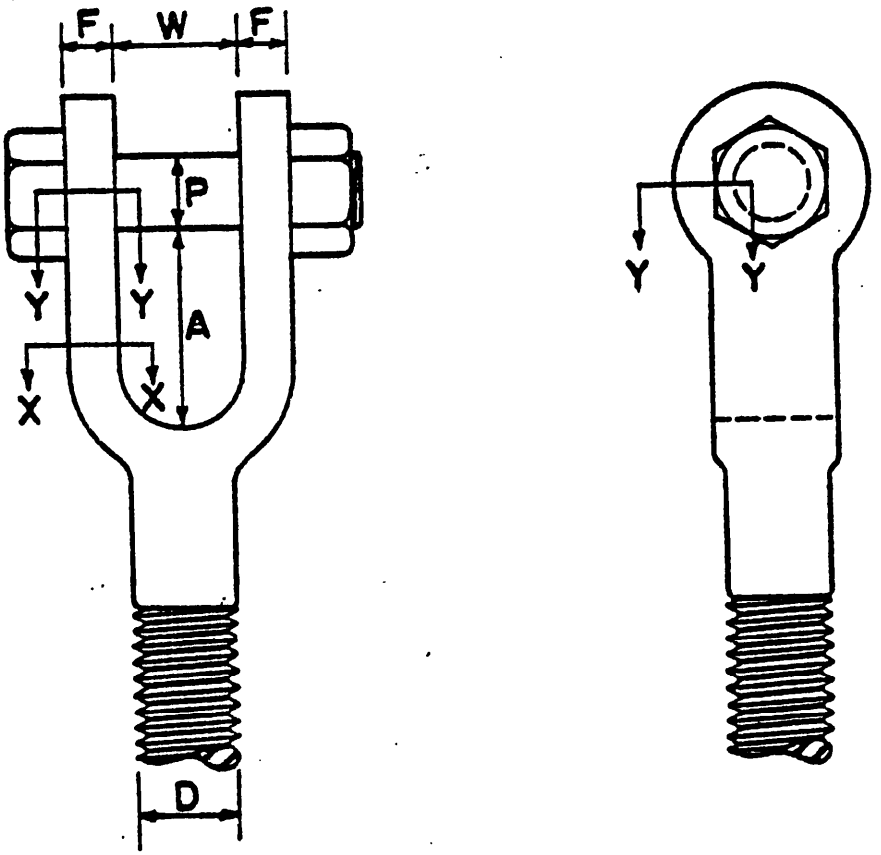

FIGURE 11. Forged-jaw end pull.

TABLE VI. Dimensions of forged-jaw end pulls

D Nominal	A Minimum	F Minimum	P Minimum	W Minimum
Inches	Inches	Inches	Inches	Inches
1/4	5/8	1/8	1/4	3/8
5/16	23/32	1/8	1/4	15/32
3/8	13/16	3/16	5/16	1/2
1/2	1 1/32	1/4	3/8	5/8
5/8	1 1/4	5/16	1/2	3/4
3/4	1 1/2	3/8	5/8	15/16
7/8	1 3/4	7/16	3/4	1 1/8
1	2	1/2	7/8	1 3/16
1 1/4	2 3/8	5/8	1 1/8	1 3/4
1 1/2	2 3/4	11/16	1 3/8	2 1/16
1 3/4	3	3/4	1 5/8	2 3/8
2	3 3/4	13/16	1 7/8	2 1/2
2 1/4	4	7/8	2 1/16	2 5/8
2 1/2	4 1/4	1	2 1/4	2 7/8

3.11.2.3 Upset. Upset jaw end pulls shall be similar to figure 13 and shall comply with the dimensional requirements of table VIII. The area of the cross section X-X shall be not less than 0.75 of the area corresponding to the nominal diameter. The area of the cross section Y-Y shall be not less than 0.40 of the area corresponding to the nominal diameter.

TABLE VII. Dimensions of arc- or gas-welded-jaw end pulls

D Nominal size	A Minimum	F Minimum	P Minimum	S Minimum	W Minimum
Inches	Inches	Inches	Inches	Inch	Inches
1/4	5/8	1/4	1/4	3/16	3/8
5/16	23/32	1/4	1/4	3/16	15/32
3/8	13/16	5/16	5/16	3/16	1/2
1/2	1 1/32	3/8	3/8	3/16	5/8
5/8	1 1/4	1/2	1/2	1/4	3/4
3/4	1 1/2	9/16	5/8	5/16	15/16
7/8	1 3/4	11/16	3/4	3/8	1 1/8
1	2	3/4	7/8	3/8	1 3/16
1 1/4	2 3/8	7/8	1 1/8	7/16	1 3/4
1 1/2	2 3/4	1 1/8	1 3/8	1/2	2 1/16
1 3/4	3	1 1/4	1 5/8	5/8	2 3/8
2	3 3/4	1 1/2	1 7/8	11/16	2 1/2
2 1/4	4	1 1/2	2 1/16	3/4	2 5/8
2 1/2	4 1/4	1 9/16	2 1/4	13/16	2 7/8

3.11.3 Hook end pulls. Hook end pulls shall be forged. Hooks shall be similar to figure 14, and comply with the dimensional requirements of table IX.

3.12 Workmanship. Turnbuckles and end pulls shall be finished in a workmanlike manner. All parts shall be properly shaped and shall be free from fins, cracks, flaws, seams, and other injurious defects. The screw threads shall be true to form, clean cut, and free from injurious defects.

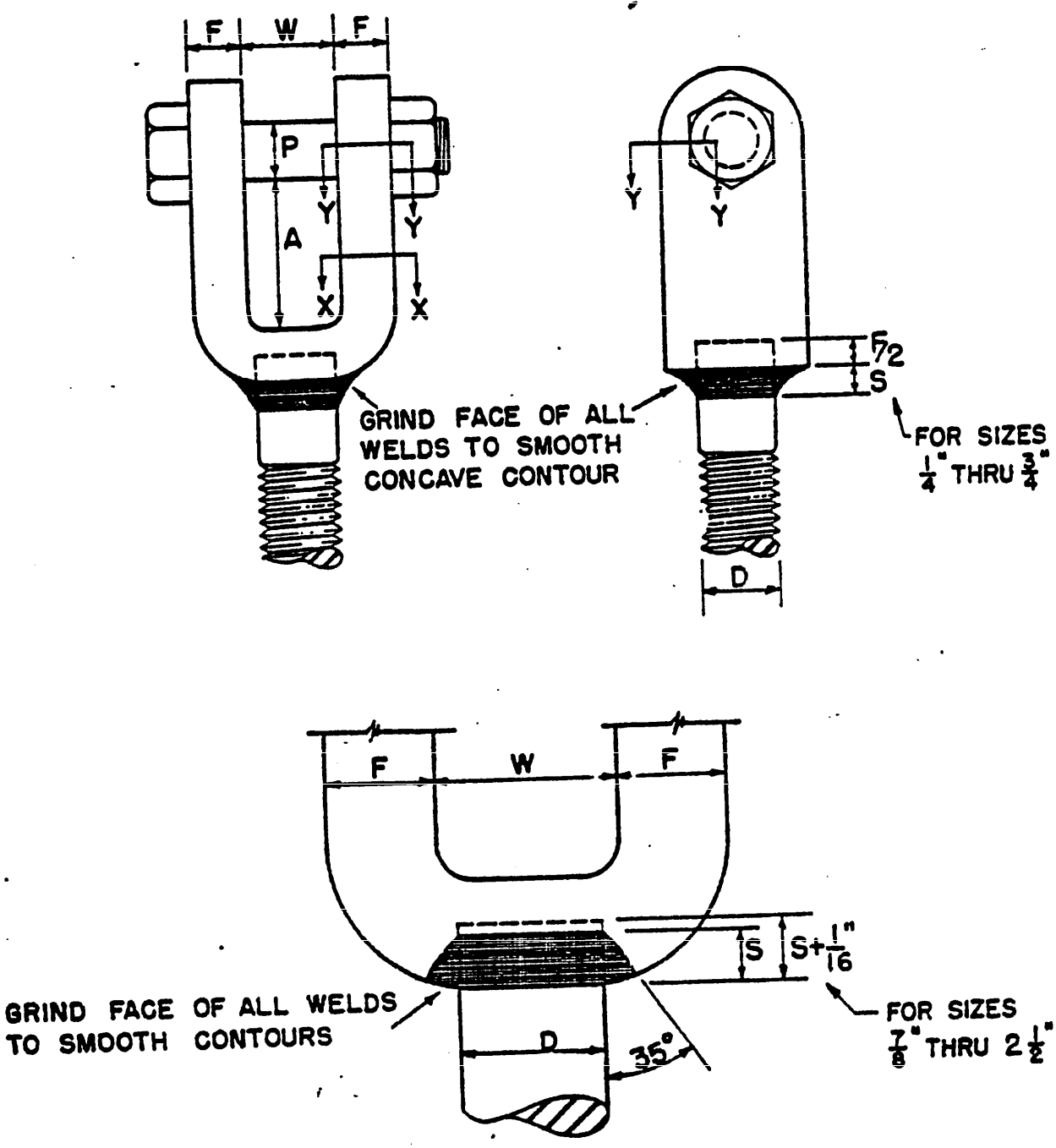

FIGURE 12. Arc- or gas-welded-jaw end pull.

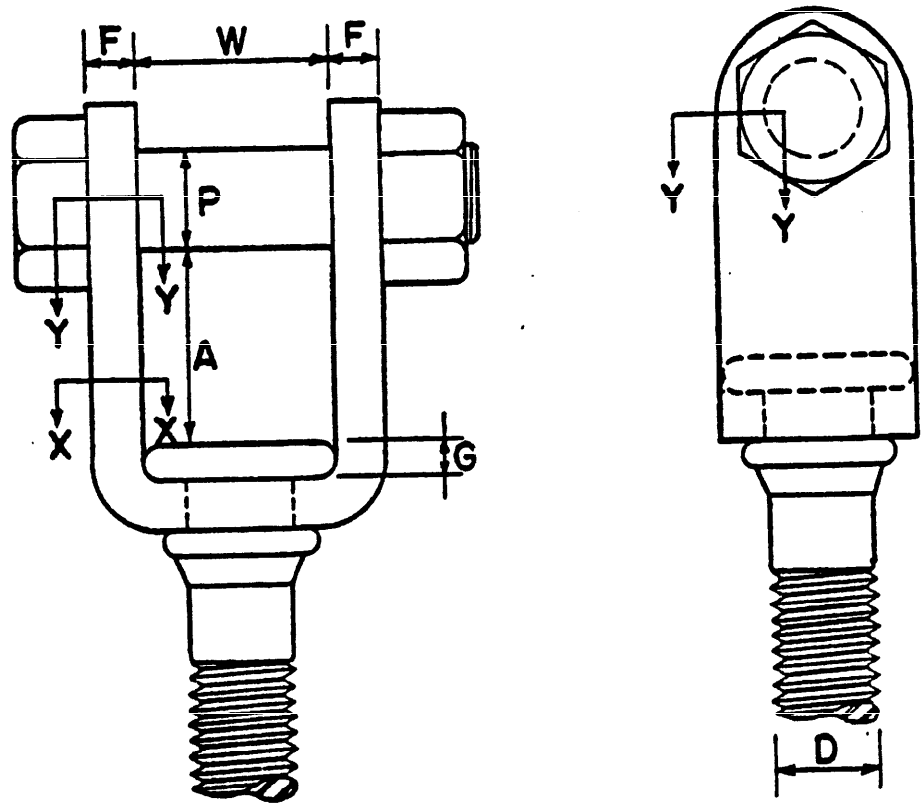

FIGURE 18. Upset jaw end pull.

TABLE VIII. Dimensions of upset end pulls.

D Nominal	A Minimum	F Minimum	G Minimum	P Minimum	W Minimum
Inches	Inches	Inch	Inch	Inches	Inches
1/4	1/2	1/8	1/8	1/4	1/2
3/8	11/16	3/16	5/32	3/8	3/4
1/2	1	1/4	3/16	1/2	1
5/8	1 1/4	5/16	1/4	5/8	1 5/32
3/4	1 7/16	3/8	5/16	3/4	1 5/16
7/8	1 11/16	7/16	3/8	7/8	1 1/2
1	1 7/8	1/2	7/16	1	1 3/4
1 1/4	2 3/8	5/8	1/2	1 1/4	2 5/16
1 1/2	2 7/8	11/16	9/16	1 1/2	2 5/8
1 3/4	3 3/8	3/4	5/8	1 3/4	3 1/16
2	3 7/8	13/16	11/16	2	3 1/2
2 1/4	4 3/8	7/8	3/4	2 1/4	3 15/16
2 1/2	4 7/8	1	13/16	2 1/2	4 3/8

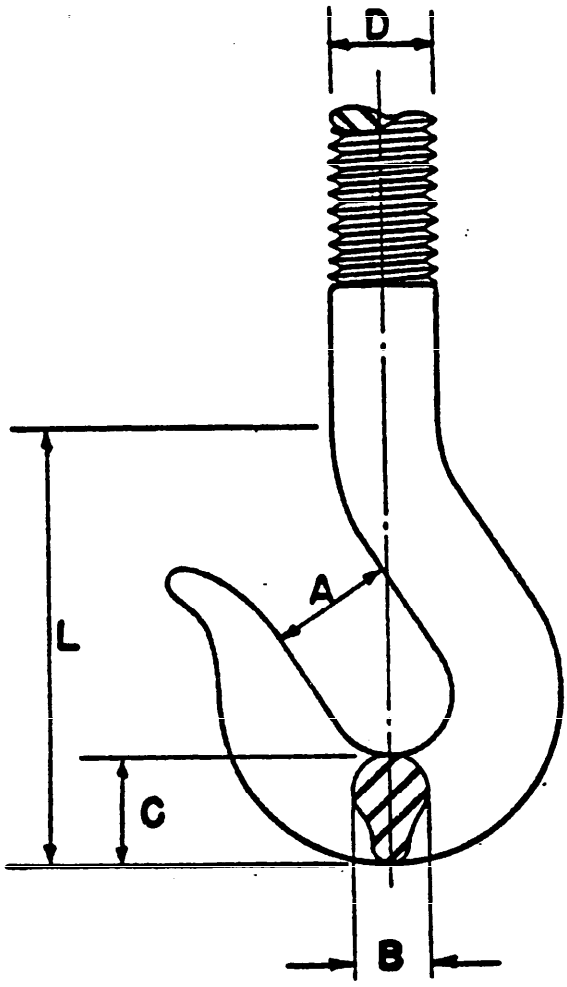

FIGURE 14. Hook end pull.

TABLE IX. Dimensions of hook end pulls

D Nominal	A Minimum	B Minimum	C Minimum	L Minimum
Inches	Inches	Inches	Inches	Inches
1/4	7/16	3/16	11/32	1
5/16	1/2	1/8	7/16	1 1/4
3/8	9/16	11/32	7/16	1 9/16
1/2	5/8	7/16	5/8	2
5/8	13/16	17/32	3/4	2 7/16
3/4	31/32	5/8	15/16	2 15/16
7/8	1 1/8	3/4	1	3 7/16
1	1 1/4	13/16	1 3/16	3 7/8
1 1/4	1 1/2	1	1 7/16	4 15/16
1 1/2	1 7/8	1 3/16	1 3/4	5 7/8

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 that supplies and services conform to prescribed requirements.

4.2 Sampling.

4.2.1 Lot. All turnbuckles of the same type, form, class, and size, not exceeding 1000 and presented at one time, shall be considered a lot.

4.2.2 Sample for examination. A random sample of turnbuckles shall be selected from each lot in accordance with table X for the examination specified in 4.3.

4.2.3 Sampling for tests. A random sample of turnbuckles shall be selected from each inspection lot in accordance with table XI for the breaking strength, proof, bending, and galvanizing tests specified in 4.4. End pull samples for bending tests shall be selected prior to threading. Failure of any sample in any test shall be cause for rejection of the lot represented by the sample. Specimens used for breaking strength and bend tests may be used for galvanizing tests.

4.3 Examination. Each sample turnbuckle selected in accordance with table X shall be examined to verify compliance with the requirements of this specification. Examination shall be conducted as specified in table XII. Any turnbuckle in the sample containing one or more visual and dimensional defects shall not be offered for delivery and if the number of defective turnbuckles in any sample exceeds the acceptance number for that sample, this shall be cause for rejection of the lot represented by the sample. Table XII shall be applied separately to major and minor defects for purposes of lot acceptance or rejection.

TABLE X. Sampling for examination

Number of turnbuckles in lot	Number of turnbuckles in sample	Acceptance number (defectives)	Rejection number (defectives)
40 or under	10	0	1
41 to 110	15	1	2
111 to 300	25	1	2
301 to 500	35	2	3
501 to 800	50	3	4
801 to 1000	75	4	5

TABLE XI. Sampling for tests

Number of turnbuckles in lot	Number of samples to be selected for:		
	Proof	Breaking strength and galvanizing	Bend and galvanzing
40 and under	3	1	1
41 to 110	5	1	1
111 to 300	7	2	2
301 to 500	10	3	3
501 to 1300	15	5	5
1301 to 3200	25	7	7

TABLE XII. Classification of defects

Catagories	Defects
Critical:	
1	None Defined
Major:	
101	Type and size not as specified.
102	Material not as specified; surface not smooth, evidence of scale, fins, cracks, flaws, and seams.
103	End pulls or locknuts, missing, damaged, or fail to mate as required.
104	Shape of the head of the body not as required.
105	Clear opening between heads not within specified tolerance.
106	Head length of body less than the required minimum.
107	Thread length of end pulls less than required.
108	Screw threads nonconforming; not right- or left-hand as required, size and pitch not as specified, pitch, major and minor diameters not within requirements, threads not square or concentric, form not true or clean cut, threads stripped, crossed, chipped, or damaged.
109	Shape and dimensions of end pulls not as specified, parts missing, incomplete, or damaged.
110	Surface not free from burrs, sharp edges, or loose scale; not free from rust or corrosion.
111	Zinc coating when applicable, nonconforming, not adherent, not uniform or smooth, not free from uncoated spots, injurious lumps, blisters, dross, or flux; not coated after threading.
Minor:	
201	Marking of packages not as specified.
202	Packaging and packing not as required.

4.4 Tests.

4.4.1 Proof test. Each sample turnbuckle selected in accordance with 4.2.3 shall be subjected to a proof test of one-half the specified breaking strength for the end pull. Test loads shall be applied at end pulls.

4.4.2 Breaking strength test. Each sample turnbuckle selected in accordance with 4.2.3 shall be tested to failure. Loads shall be applied at end pulls.

4.4.3 Bending. Each end pull sample selected in accordance with 4.2.3 shall be bent cold through an angle of 90° around a pin twice the nominal diameter of the end pull.

4.4.4 Galvanizing test. If the hot dip zinc-coating method is used, no thickness test will be required. If the electrodeposition method is used, the thickness shall be determined, for the number of samples required by table XI, by the drop test method in conformance with QQ-Z-325.

4.4.5 Possible test failures. Possible test failures are defined as follows:

(a) Proof test.
  (1) Evidence of deformation or signs of incipient cracks in turnbuckle body or end pull as a result of specified proof test.

(b) Breaking strength test.
  (1) Breaking strength or turnbuckles equipped with end pulls less than the required minimum value.

(c) Bending test.
  (1) Evidence of cracks or rupture when the unthreaded end pull is bent cold as required.

(d) Galvanizing test.
(1) Coating nonconforming; nonadherent, evidence of coat flaking off, or separating from basic metal; thickness less than the allowable minimum.

5. PREPARATION FOR DELIVERY

5.1 Preservation. All self-colored turnbuckles shall be cleaned in accordance with method C-1, preserved with type P-1 preservative and packaged in accordance with method I of MIL-P-116. Zinc- or black-colored turnbuckles shall be preserved and packaged in accordance with MIL-P-116.

5.2 Packaging. Packaging shall be Level A, B, or C, as specified (see 6.1).

5.2.1 Level A. Turnbuckles of the same size, preserved as required by 5.1, shall be packaged in fiberboard boxes conforming to class weather-resistant grade W5c or W5s of PPP-B-636, wired, bulk or loose, in accordance with the requirements of table XIII (see 5.3.4).

5.2.2 Level B. Turnbuckles of the same size shall be packaged in fiberboard boxes conforming to class domestic, grade 175 of PPP-B-636.

5.2.3 Level C. Packaging shall be sufficient to afford adequate protection against corrosion and physical damage during shipment from supply source to using activity until early installation.

5.3 Packing. Packing shall be Level A, B, or C, as specified (see 6.1).

5.3.1 Level A. Turnbuckles shall be packed in containers conforming to any one of the following specifications at the option of the supplier.

Specification	Type or class
PPP-B-585	Class 3 use
PPP-B-591	Overseas type
PPP-B-601	Overseas type
PPP-B-621	Class 2
PPP-B-636	Class weather-resistant
PPP-B-640	Class 2
PPP-B-576	Class 2

5.3.1.1 Box closures shall be closed and strapped or banded in accordance with the applicable box specification or appendix thereto.

5.3.2 Level B. Turnbuckles shall be packaged in containers conforming to any one of the following specifications at the option of the supplier:

Specification	Type or class
PPP-B-585	Class 1 or 2 use
PPP-B-591	Domestic type
PPP-B-601	Domestic type
PPP-B-621	Class 1
PPP-B-636	Class domestic
PPP-B-640	Class 1
PPP-B-576	Class 1

5.3.2.1 Box closure shall be as specified in the applicable box specification or appendix thereto.

5.3.3 Level C. Turnbuckles packaged as specified in 5.2 shall be packed in a manner to insure safe delivery at destination. Containers shall conform to the applicable rule and regulations applicable to the mode of transportation.

5.3.4 Quantity. Quantity of items per unit package shall be in accordance with table XIII.

TABLE XIII. Quantity per package

Size	Number of identical items in unit package
¼ by 4	10 in carton
5/16 by 4½	10 in carton
⅜ by 6	10 in carton
½ by 6	10 in carton
½ by 9	5 wired
½ by 12	5 wired
⅝ by 6	5 wired
⅝ by 9	5 wired
⅝ by 12	5 wired
⅝ by 18	5 wired
¾ by 6	5 wired
¾ by 9	5 wired
¾ by 12	3 wired
¾ by 18	3 wired
¾ by 24	Bulk
⅞ by 6	5 wired
⅞ by 12	Bulk
⅞ by 18	Bulk
⅞ by 24	Bulk
1 by 6	5 wired
1 by 12	Bulk
1 by 18	Bulk
1 by 24	Bulk
1 by 36	Bulk
1¼ by 6	Bulk
1¼ by 12	Bulk
1¼ by 18	Bulk
1¼ by 24	Bulk
1¼ by 36	Bulk
1⅜ by 6	Bulk
1½ by 6	Bulk
1½ by 12	Bulk
1½ by 18	Bulk
1½ by 24	Bulk
1½ by 36	Loose
1½ by 48	Bulk
1¾ by 6	Bulk
1¾ by 18	Loose
1¾ by 24	Loose
1¾ by 36	Loose
1¾ by 48	Bulk
2 by 6	Loose
2 by 24	Loose
2 36	Loose
2 48	Loose
All larger sizes	

5.3.5 The gross weight of single and double wall fiberboard shipping containers shall not exceed the weight limitations of the container specification. Gross weight of all other containers shall not exceed 200 pounds. Loads in single or double wall fiberboard boxes shall conform to type I or II of the appendix of the box specification.

5.3.6 Palletization. When specified (see 6.1), material shall be palletized in accordance with MIL-STD-147 for level A or B shipments.

5.4 Marking.

5.4.1 Military agencies. In addition to any special marking specified (see 6.1), interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

5.4.2 Civil agencies. Marking for shipment shall be in accordance with the standard marking of Fed. Std. No. 123.

6. NOTES

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

(a) Title, number, and date of this specification.
(b) Type, class, and size (see 1.2, 3.3, and tables II and III).
(c) Material, if different (see 3.1).
(d) Type thread required (see 3.5).
(e) Type finish required (see 3.8).
(f) Form required, if type I is specified (see 3.9.1).
(g) Selection of applicable levels of packaging and packing required (see 5.2 and 5.3).
(h) If palletization is required (see 5.3.6).
(i) Special marking, if required (see 5.4).

6.3 Federal specifications do not include all types, classes, sizes, etc., of the commodities indicated by the titles of the specifications or which are commercially available but are intended to cover the types, classes, etc., which are suitable for Federal Government requirements.

6.4 Supersession data. This specification includes the requirements of the following military specifications and standards:

MIL-T-22745(SHIPS), dated February 10, 1961.
MS27120, dated March 3, 1961.
MS27950, dated February 9, 1961.
MS27951, dated February 9, 1961.
MS27952, dated February 9, 1961.
MS27953, dated February 9, 1961.
MS27954, dated February 9, 1961.

MILITARY CUSTODIANS:
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Preparing activity:
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Navy—SH
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