

MIL-G-21032D  
28 April 1972  
~~SUPERSEDED~~  
MIL-G-0021032C (SHIPS)  
30 April 1970  
USED IN LIEU OF  
MIL-G-21032B  
16 August 1961  
(See 6.3)

## MILITARY SPECIFICATION

### GASKETS, METALLIC-ASBESTOS, SPIRAL WOUND

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

#### 1. SCOPE

1.1 Scope. This specification covers spiral wound metallic-asbestos gaskets for use in both pipeline joints and other applications where pressure and temperature conditions do not exceed 2500 pounds per square inch (p.s.i.) and 1050°F.

1.2 Classification. Gaskets shall be of the following type and series as specified (see 6.1):

- Type I - Gaskets for applications other than pipeline flange joints such as valve bonnets, pumps and other equipment applications. (This specification does not apply to gaskets for boiler manholes and handholes which are sealed by internal pressure. Requirements for gaskets used in internal pressure seating manholes and handholes are contained in MIL-G-15342.)
- Type II - Gaskets for ANSI B16.5 pipeline flange joints, with metal outer ring. Series 150, 300, 400, 600, 900, 1500, and 2500.

1.2.1 Gaskets shall be of the following materials (see 3.2 and 6.1):

- Class A - Corrosion resistant steel (for all temperatures up to 1050°F max.)
- Class B - Nickel-chromium iron alloy (for temperatures up to 900°F max.)

#### 2. APPLICABLE DOCUMENTS

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

#### SPECIFICATIONS

##### FEDERAL

- PPP-B-566 - Boxes, Folding, Paperboard.
- PPP-B-576 - Box, 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.
- PPP-B-665 - Boxes, Paperboard, Metal Stayed (Including Stay Material).
- PPP-B-676 - Boxes, Setup.

##### MILITARY

- MIL-L-10547 - Liners, Case, and Sheet, Overwrap; Water-Vaporproof or Water-proof, Flexible.
- MIL-G-15342 - Gaskets (Metallic Asbestos, Spiral Wound, Symbol 2410, For Boilers).
- MIL-N-23228 - Nickel-Chromium-Iron Alloy Plate, Sheet and Strip, Air Melted or Vacuum Remelted.
- MIL-A-24058 - Asbestos, Packing and Gasketing Material, Impregnated.

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## STANDARD

## MILITARY

MIL-STD-129 - Marking for Shipment and Storage.

(Copies of specifications, standards, drawings and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

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

## AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

B16.5 - Steel Pipe Flanges and Flanged Fittings.

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, N. Y. 10018.)

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A167 - Corrosion-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.  
B168 - Nickel-Chromium-Iron Alloy Plate, Sheet, and Strip.

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

## AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

Boiler and Pressure Vessel Code.  
Section VIII - U-fired Pressure Vessels.

(Application for copies should be addressed to the American Society of Mechanical Engineers, 345 E. 47th Street, New York, N.Y. 10017.)

## UNIFORM CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules.

(Application for copies should be addressed to the Uniform Classification Committee, 202 Union Station, 516 West Jackson Boulevard, Chicago, Illinois 60606.)

## NATIONAL CLASSIFICATION BOARD

National Motor Freight Classification Rules.

(Application for copies should be addressed to the National Motor Freight Traffic Association, Inc., 1616 P Street, N.W., Washington, D. C. 20036.)

(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.)

## 1. REQUIREMENTS

## 1.1 Design (see 6.1).

1.1.1 Type I gaskets. Type I gaskets shall be compatible with the specific flange design and shall have an uncompressed thickness of either  $0.125 \pm 0.005$  inch or  $0.175 \pm 0.005$  inch as specified by the procuring activity. The procuring activity is responsible for furnishing complete data including gasket material, dimensions, the compressed thickness, compression test load, the number and size of bolts, bolt material and service conditions.

1.1.1.1 Restricted compression flange design. The gasket shall be capable of being compressed to the specified thickness as determined by the joint dimensions by a compressive load range as specified by the equipment manufacturer. Since type I gaskets are special gaskets for specific component such as valve bonnet joint, etc., the procuring activity shall obtain the compression load information from the equipment manufacturer. In those cases where this information cannot be obtained the following design criteria may be utilized if desired for procurement of the gaskets. Gaskets shall be designed in accordance with the minimum design seating stress as defined in the ASME Boiler and Pressure Vessel Code, Section VIII utilizing the formula  $W_2 = 3.14 b G y$  except that  $y$  be modified to read minimum 6000 psi.

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3.1.1.2 Unrestricted compression flange design. Unless otherwise specified by the original equipment manufacturer, gaskets shall be capable of being compressed to  $0.130 \pm 0.003$  inch for gaskets having an original thickness of 0.175 or to  $0.100 \pm 0.003$  inch for gaskets having an original thickness of 0.135 inch at a compression load specified by the equipment manufacturer. If compression load information specified in 3.1.1 is not available, the procuring activity may specify the gasket be designed in accordance with the minimum seating stress defined in the ASME Boiler and Pressure Vessel Code, Section VIII and as modified in 3.1.1.1.

3.1.1.3 If approved by the procuring activity, gaskets requiring a total compressive force in excess of 357,000 pounds may be exempted from the compression test requirement, since the compression load is in excess of the capacity of commonly available testing machines. If enough is known about such a gasket, an alternate compression test may be performed by specifying a required thickness range when compressed to 350,000 pounds (see 6.1).

3.1.2 Type II, pipeline flange gaskets with outer metal rings. Type II gaskets shall consist of a refill snapped in a solid metal outer ring with a sliding fit. The ring shall have a thickness of  $0.125 \pm 0.006$  inch. The ring shall have a V-shaped groove or other satisfactory retaining feature machined on the inside periphery to fit the outside periphery of the refill. The design shall be such that the gasket can be compressed without damage to 0.119 inch thickness. Gaskets shall conform to tables I through V.

Table I - Gasket characteristics for series 150 p.s.i. ANSI flanges.

I.p.s.	Pipe o.d.	Gasket refill (see figure 1)		Number of plies		Metal <sup>1/</sup> outer ring o.d.	Test <sup>4/</sup> load
				Metal <sup>2/</sup>			
		I.d.	O.d. 1/	Inside periphery $\pm 1/2$ turn	Outside <sup>3/</sup> periphery $\pm 1/2$ turn		
Inches	Inches	Inches <sup>2/</sup>	Inches <sup>2/</sup>			Inches	Pounds
1/4	0.540	1/2	27/32	-	-	1-3/4	12,600
1/2	0.840	3/4	1-7/32	6	3	1-7/8	12,600
3/4	1.050	1	1-17/32	6	3	2-1/4	12,600
1	1.315	1-1/4	1-27/32	3	3	2-5/8	12,600
1-1/4	1.660	1-23/32	2-13/32	3	3	3	15,100
1-1/2	1.900	2-1/8	2-23/32	3	3	3-3/8	15,100
2	2.375	2-3/4	3-13/32	3	3	4-1/8	24,200
2-1/2	2.875	3-1/8	3-27/32	3	3	4-7/8	24,200
3	3.500	4	4-23/32	3	3	5-3/8	24,200
3-1/2	4.000	4-1/2	5-7/32	3	3	6-3/8	48,500
4	4.500	5	5-27/32	3	3	6-7/8	48,500
5	5.563	6-1/8	6-31/32	3	3	7-3/4	72,500
6	6.625	7-3/16	8-7/32	3	3	8-3/4	72,500
8	8.625	9-3/16	10-13/32	3	3	11	72,500
10	10.750	11-5/16	12-19/32	3	3	13-3/8	151,000
12	12.750	13-3/8	14-23/32	3	3	16-1/8	151,000
14 o.d.	14.000	14-5/8	15-11/32	3	3	17-3/4	190,000
16 o.d.	16.000	16-5/8	18-7/32	3	3	20-1/4	264,000

<sup>1/</sup> Neither o.d. dimension nor outside plies includes additional unwelded plies (see 3.1.1.1(a)).

<sup>2/</sup> There shall be no asbestos plies between the metal plies on the inside on the outside periphery.

<sup>3/</sup> Tolerance plus or minus 1/32 inch for sizes up to 8 inches i.p.s. and plus or minus 1/16 inch for sizes over 8 inches i.p.s.

<sup>4/</sup> Corresponds to bolting loads of 30,000 p.s.i.  $\pm$  10 percent unit stress, except for gasket sizes 1 inch and smaller, which are based upon unit bolt stress of 25,000 p.s.i. at thread root area. When under this compressive test load, the gasket thickness shall be  $0.130 \pm 0.003$  inch.

<sup>5/</sup> Tolerance plus or minus 1/64 inch on the i.d. and plus 1/16, minus 1/32 inch on the o.d.

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Table 11 - Type II gasket characteristics for series 300, 400 and 600 ANSI flanges.

I.p.s.	Pipe O.d.	Gasket refills (see figure-1)		Number of plies			Metal outer ring <sup>5/</sup> O.d., inches			Test load, pounds <sup>6/</sup>		
		I.d. $\frac{1}{2}$ inch	O.d. Inches $\frac{1}{2}$ , $\frac{2}{2}$	Inside periphery $\frac{1}{2}$ turn	Outside periphery $\frac{1}{2}$ turn	Total (min.) $\frac{4}{2}$	Series 300	Series 400	Series 600	Series 300	Series 400	Series 600
Inches	Inches											
1/4	0.540	1/2	27/32	4	3	--	1-3/4	1-3/4	1-3/4	12,600	12,600	12,600
1/2	.860	3/4	1-7/32	6	3	--	2-1/8	2-1/8	2-1/8	12,600	12,600	12,600
3/4	1.050	1	1-17/32	6	3	--	2-5/8	2-5/8	2-5/8	20,200	20,200	20,200
1	1.315	1-1/4	1-27/32	6	3	--	2-7/8	2-7/8	2-7/8	20,200	20,200	20,200
1-1/4	1.660	1-11/16	2-11/32	6	3	--	3-1/4	3-1/4	3-1/4	24,200	24,200	24,200
1-1/2	1.900	2	2-23/32	6	3	--	3-3/4	3-3/4	3-3/4	36,200	36,200	36,200
2	2.375	2-9/16	3-11/32	6	3	--	4-3/8	4-3/8	4-3/8	48,400	48,400	48,400
2-1/2	2.875	2-15/16	3-27/32	6	3	--	5-1/8	5-1/8	5-1/8	72,500	72,500	72,500
3	3.500	3-3/4	4-23/32	6	3	--	5-7/8	5-7/8	5-7/8	72,500	72,500	72,500
3-1/2	4.000	4-3/8	5-7/32	6	3	--	6-1/2	6-3/8	6-3/8	101,000	101,000	101,000
4	4.500	4-3/4	5-27/32	6	3	--	7-1/8	7	7-5/8	72,500	101,000	101,000
4-1/2	5.000	5-5/16	6-15/32	6	3	--	7-3/4	7-5/8	---	72,500	101,000	---
5	5.583	5-13/16	6-31/32	6	3	--	8-1/2	8-3/8	9-1/2	72,500	101,000	132,000
6	6.625	6-7/8	8-7/32	6	3	--	9-7/8	9-3/4	10-1/2	108,700	150,800	198,000
8	8.625	8-7/8	10-11/32	6	3	--	12-1/8	12	12-5/8	150,800	198,300	262,000
10	10.750	10-13/16	12-15/32	6	3	--	14-1/4	14-1/8	15-3/4	264,400	349,400	446,000
12	12.750	12-7/8	14-23/32	6	3	--	16-5/8	16-1/2	18	349,400	446,000	557,000
14 O.d.	14.000	14-1/4	15-31/32	6	3	32	19-1/8	19	19-3/8	436,800	557,000	---
16 O.d.	16.000	16-1/4	18-7/32	66	3	35	21-1/4	21-1/8	22-1/4	557,000	---	---
18 O.d.	18.000	18-1/2	20-23/32	6	3	35	23-1/2	23-3/8	24-1/8	---	---	---

1/ Tolerance plus or minus 1/64 inch on the i.d. and plus 1/16, minus 1/32 inch on the O.d.

2/ Neither O.d. dimension nor outside plies includes additional unwelded plies (see 3.3.1.1(a)).

3/ There shall be no asbestos plies between the metal plies on the inside and on the outside periphery.

4/ The 32 plies minimum for 14 inch size applies to 600 series only and the 35 plies minimum for 16 inch size applies to 400/600 series only.

5/ Tolerance plus or minus 1/32 inch for sizes up to 8 inch i.p.s. and plus or minus 1/16 inch for sizes over 8 inches i.p.s.

6/ Corresponds to bolting load of 30,000 p.s.i. plus or minus 10 percent unit stress, except for gasket sizes 1 inch and smaller, which are based upon unit bolt stress of 25,000 p.s.i. at the thread root area. When under this compressive test load, the gasket thickness shall be 0.130  $\pm$  0.005 inch.

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Table III - Type II gasket characteristics for series 900 p.s.i. ANSI flanges.

Table III - Type II Gasket Characteristics for Series 900								
I.p.s.	Pipe o.d.	Gasket refill (see figure 1)		Number of plies			Metal outer <sup>2/</sup> ring o.d. inch	Test load <sup>3/</sup> pounds
				Metal <sup>2/</sup>				
		I.d.	O.d. 1/	Inside periphery ±1/2 turn	Outside periphery ±1/2 turn 2/	Total (min.)	Series 900	Series 900
Inches	Inches	Inches <sup>2/</sup>	Inches <sup>2/</sup>				P.s.i.	
1/4	0.540	-----	-----	--	--	--	-----	-----
1/2	.840	3/4	1-7/32	6	3	--	2-1/2	30,200
3/4	1.050	1	1-17/32	6	3	--	2-3/4	30,200
1	1.315	1-1/4	1-27/32	6	3	--	3-1/8	41,900
1-1/4	1.660	1-11/16	2-11/32	6	3	--	3-1/2	50,300
1-1/2	1.900	2	2-23/32	6	3	--	3-7/8	66,100
2	2.375	2-9/16	3-11/32	6	3	--	5-5/8	101,000
2-1/2	2.875	2-15/16	3-27/32	6	3	--	6-1/2	132,000
3	3.500	3-3/4	4-23/32	6	3	--	6-5/8	101,000
4	4.500	4-3/4	5-27/32	6	3	--	8-1/8	175,000
5	5.561	5-13/16	6-31/32	6	3	--	9-3/4	223,000
6	6.625	6-7/8	8-7/32	6	3	--	11-3/8	262,000
8	8.625	8-7/8	10-11/32	6	3	--	14-1/8	416,000
10	10.725	10-13/16	12-15/32	6	3	--	17-1/8	534,000
12	12.750	12-7/8	14-23/32	6	3	42	19-5/8	-----

- 1/ Neither o.d. dimension nor outside plies includes additional unwelded plies (see 1.3.1.1(a)).
- 2/ There shall be no asbestos plies between the metal plies on the inside and on the outside periphery.
- 3/ Tolerance plus or minus 1/32 inch for sizes up to 8 inch i.p.s. and plus or minus 1/16 inch for sizes over 8 inches i.p.s.
- 4/ Corresponds to bolting load of 30,000 p.s.i. plus or minus 10 percent unit stress, except for gasket sizes 1 inch and smaller, which are based upon unit bolt stress of 25,000 p.s.i. at the thread root area. When under this compressive test load, the gasket thickness shall be 0.130 ± 0.005 inch.
- 5/ Tolerance plus or minus 1/64 inch on the i.d. and plus 1/16, minus 1/32 inch on the o.d.

Table IV - Type II gasket characteristics for series 1500 p.s.i. ANSI flanges.

Table IV - Type 1 Gasket Characteristics for Series 2000								
I.p.s.	Pipe o.d.	Gasket refills (see figure 1)		Number of plies			Metal outer <sup>3/</sup> ring o.d. inch	Test load <sup>3/</sup> pounds
				Metal <sup>2/</sup>				
		I.d.	O.d.	Inside periphery ±1/2 turn	Outside periphery ±1/2 turn 1/	Total (min.)		
Inches	Inches	Inches <sup>5/</sup>	Inches <sup>5/</sup>				P.s.i.	
1/4	0.540	-----	-----	--	--	--	-----	-----
1/2	.840	3/4	1-7/32	6	3	--	2-1/2	30,200
3/4	1.050	1	1-17/32	6	3	--	2-3/4	30,200
1	1.315	1-1/4	1-27/32	6	3	--	3-1/8	41,900
1-1/4	1.660	1-11/16	2-11/32	6	3	--	3-1/2	50,300
1-1/2	1.900	2	2-23/32	6	3	--	3-7/8	66,100
2	2.375	2-9/16	3-11/32	6	3	--	5-5/8	101,000
2-1/2	2.875	2-15/16	3-27/32	6	3	--	6-1/2	132,000
3	3.500	3-3/4	4-23/32	6	3	--	6-7/8	175,000
4	4.500	4-3/4	5-27/32	6	3	--	8-1/4	223,000
5	5.561	5-13/16	6-31/32	6	3	--	10	327,000
6	6.625	6-7/8	8-7/32	6	3	--	11-1/8	416,000
8	8.625	8-7/8	10-11/32	6	3	38	13-7/8	-----
10	10.725	10-13/16	12-15/32	6	3	40	17-1/8	-----
12	12.750	12-7/8	14-23/32	6	3	42	20-1/2	-----

See footnotes at top of next page.

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- 1/ Neither o.d. dimension nor outside plies includes additional unwelded plies (see 3.3.1.1(a)).
- 2/ There shall be no asbestos plies between the metal plies on the inside and on the outside periphery.
- 3/ Tolerance plus or minus 1/32 inch for sizes up to 8 inch i.p.s. and plus or minus 1/16 inch for sizes over 8 inch i.p.s.
- 4/ Corresponds to bolting load of 30,000 p.s.i. plus or minus 10 percent unit stress, except for gasket sizes 1 inch and smaller, which are based upon unit bolt stress of 25,000 p.s.i. at the thread root area. When under this compressive test load, the gasket thickness shall be  $0.130 \pm 0.005$  inch.
- 5/ Tolerance plus or minus 1/64 inch on the i.d. and plus 1/16, minus 1/32 inch on the o.d.

Table V - Type II gasket characteristics for series 2500 p.s.i ANSI flanges.

I.p.s.	Pipe o.d.	Gasket refill (see figure-1)		Number of plies			Metal <sup>3/</sup> outer ring o.d.	Test load <sup>4/</sup>
				Metal <sup>2/</sup>				
		I.d.	O.d. <sup>1/</sup>	Inside periphery +1/2 turn	Outside periphery <sup>1/</sup> +1/2 turn	Total (min.)		
Inches	Inches	Inches <sup>5/</sup>	Inches <sup>5/</sup>				Inches	Pounds
1/2	0.840	3/4	1-7/32	6	3	-	2-3/4	30,200
3/4	1.050	1	1-17/32	6	3	-	3	30,200
1	1.315	1-1/4	1-27/32	6	3	-	3-3/8	41,900
1-1/4	1.660	1-9/16	2-11/32	6	3	-	4-1/8	55,100
1-1/2	1.900	1-7/8	2-23/32	6	3	-	4-5/8	72,800
2	2.375	2-5/16	3-11/32	6	3	-	5-3/4	110,000
2-1/2	2.875	2-3/4	3-27/32	6	3	-	6-5/8	146,000
3	3.500	3-3/8	4-23/32	6	3	-	7-3/4	188,000
4	4.500	4-5/8	5-27/32	6	3	-	9-1/4	281,000
5	5.563	5-5/8	6-31/32	6	3	-	11	396,000
6	6.625	6-3/4	8-7/32	6	3	38	12-1/2	-----
8	8.625	8-1/2	10-11/32	6	3	41	15-1/4	-----
10	10.750	10-5/8	12-15/32	6	3	41	18-3/4	-----
12	12.750	12-3/4	14-23/32	6	3	50	21-5/8	-----

- 1/ Neither o.d. dimension nor outside plies includes additional unwelded plies (see 3.3.1.1(a)).
- 2/ There shall be no asbestos plies between metal plies on the inside and on the outside periphery.
- 3/ Tolerance plus or minus 1/32 inch for sizes up to 8 inch i.p.s. and plus or minus 1/16 inch over 8 inch i.p.s.
- 4/ Corresponds to bolting load on 25,000 p.s.i. unit stress. When under this compressive test load, the gasket thickness shall be  $0.130 \pm 0.005$  inch.
- 5/ Tolerance plus or minus 1/64 inch on the i.d. and plus 1/16, minus 1/32 inch on the o.d.

3.1.2.1 Refills for all series of type II gaskets. Refills shall be of the inside and outside dimensions specified in table I through V.

3.1.2.2 Gasket thickness. The thickness of the finished gasket (before compression) shall be  $0.175 \pm 0.005$  inch.

## 3.2 Materials (see 6.1).

3.2.1 Metal strip. The metal strip used in the gaskets shall be of the following materials (see 6.1):

- (a) Class A gaskets which are intended for all temperatures up to 1050°F. shall be corrosion resisting steel type 347 or 309S in accordance with ASTM A167 except that type 309S shall be stabilized with columbium and tantalum not exceeding 0.10 percent and their combination to be not less than 10 times the carbon content.
- (b) Class B gaskets which are intended for temperatures up to 900°F. maximum shall be nickel-chromium-iron alloy, cold rolled and annealed in accordance with MIL-N-23228 or ASTM B168.

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3.3.2 Metal outer ring. Unless otherwise specified in the contract or order, the metal outer ring shall be of soft carbon steel. At the option of the manufacturer a protective coating may be applied to the metal outer ring. The resulting dimensions shall conform to tables I through V.

3.3.3 Asbestos paper. Asbestos paper cushion shall be the low chloride variety conforming to type III of MIL-A-74038.

3.3.4 Special application. For special applications other materials may be used only upon specific approval of the activity concerned.

### 3.3 Construction.

3.3.1 Assembly. The gasket shall be composed of a single strip of dovetail shaped metal spirally wound, starting on the inside and working outward ply-by-ply to the desired size. Between some of the plies shall be a cushion of asbestos paper (for type II gaskets see table I through V) either in a continuous single strip or in two strips depending upon the design.

3.3.1.1 Spot welds. The number and spacing of spot welds on the gasket i.d. and o.d. shall conform to the following:

- (a) Terminal spot welds. The end of the terminal plies shall be spot welded to the adjacent plies with a minimum of 2 terminal spot welds. The first terminal spot weld shall be no greater than 1/4 inch from the end of the terminal ply. The second terminal spot weld shall be no greater than 3/4 inch from the first terminal spot weld measured along the perimeter. For type II gaskets, the terminal ply of the o.d. is that ply which is spot welded to the adjacent ply to obtain the dimensions in tables I through V; a maximum of four additional unwelded plies of the same continuous metal strip may be wound over the spot welded ply to facilitate fitting the gasket to the outer metal ring.
- (b) Additional spot welds on the terminal plies. Additional spot welds shall be located on the gasket i.d. such that the total number of spot welds on the terminal ply (including the terminal spot welds described in (a)) shall be not less than 3 and spaced at 3 inches maximum spacing along the perimeter between the adjacent spot welds in either direction.

3.3.2 Metal strip. The metal strip shall be not less than 0.007 and not more than 0.009 inch in thickness.

3.3.3 Plies. A ply shall consist of one 360 degree turn of metal strip. Plies shall be counted adjacent to a terminal weld. An asbestos ply shall consist of one 360 degree turn of asbestos strip(s) depending upon the design.

3.3.4 Gaskets shall be capable of passing the compression load tests indicated in 4.4.1.

### 3.4 Marking.

3.4.1 Type I gaskets. Each type I gasket shall be marked with a sturdy paper tag (of tag stock) securely attached thereto, which shall contain thereon the following information as specified by the procuring activity:

- (a) Equipment manufacturer's name.
- (b) Type of equipment and model number.
- (c) Gasket part number.
- (d) Material of construction.
- (e) Gasket manufacturer's name.
- (f) Customer's order number.
- (g) Any other data required to clearly identify the end use of the gasket.

3.4.2 Type II gaskets. Each type II gasket shall be steel stamped clearly on one side of the outer metal ring to show the manufacturer's name, pipe size, pressure series, material of construction and "ANSI - MIL" to indicate that the gasket is for ANSI flanges and also meets the requirements of this specification (example: "2-600 W-Cr-Fe ANSI - MIL"). Both sides of the outer metal ring may be used where necessary on smaller sizes to furnish the above information.

3.4.3 Refills. When refills are purchased separate from the rings, each refill shall be identified by enclosing each refill in a paper or plastic bag, or by means approved by the procuring activity, having the manufacturer's name, pipe size, pressure series, material and

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"ANSI - MIL" printed thereon. If a paper or plastic bag is used, it shall be adequately stapled to insure that the refill is retained in the bag. Identification markings need not be printed on plastic bags provided the marking is placed in the bag and is visible without requiring the bag to be opened.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Inspection records of the examinations and tests shall be kept complete and available to the Government as specified in the contract or order.

#### 4.2 Sampling for quality conformance.

4.2.1 Lot. All gaskets of the same type and size offered for delivery at one time shall be considered a lot for purposes of sampling and inspection.

4.2.2 Sampling for visual, dimensional and alloy examination. Sample gaskets shall be selected at random from each lot in accordance with table VI for the examination specified in 4.3 and 4.4.4.

Table VI - Sampling for visual, dimensional and alloy examination.

Lot size (number of gaskets)	Sample size (number to be examined)	Acceptance number (defective)	Rejection number (defective)
2 to 10	All	0	0
11 to 25	10	0	1
26 to 40	15	0	1
41 to 110	25	1	2
111 to 300	35	1	2
301 to 500	50	2	3
501 to 800	75	3	4
801 to 1300	110	4	5
1301 and over	150	5	6

4.2.3 Sampling for compression tests. Sample gaskets shall be selected from each lot in accordance with table VII for the test specified in 4.4.1. If any gasket fails the compression test, the entire lot shall be rejected.

Table VII - Sampling for compression test.

Lot size (number of gaskets)	Sample size (number to be tested)
1 to 25	1
26 to 180	2
181 to 500	3
501 to 800	5
801 to 1,300	7
1,301 to 3,200	10
3,201 to 8,000	15
8,001 to 22,000	25
22,001 and over	35

4.3 Visual and dimensional examination. Each of the sample gaskets selected in accordance with 4.2.2 shall be examined and measured to verify conformance with all of the requirements of this specification which do not include the compression tests. Examinations shall be conducted as specified in table VIII. The number of plies shall be counted, a magnifying glass being used to insure accuracy of the count.



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Table VIII - Classification of defects.

Categories	Defects
<b>Critical</b>	
1	Alloy not as specified.
<b>Major</b>	
101	Type of gasket not as specified.
102	Number of metal plies less than specified minimum.
103	Spot welds (on inside and outside diameters) missing, not the required number, incorrectly spaced, or spot welds defective.
104	Uncompressed thickness of finished gasket not within specified tolerances.
105	Gasket refill not a sliding fit in the metal ring, or metal ring not provided with a satisfactory means of retaining the refill.
106	Inside or outside diameter of refill not within the specified tolerances.
107	Failures of gasket to conform to the dimensions specified for valve bonnets, pumps and other applications (type I only).
108	Identification markings missing, illegible, incorrect or not as specified.

4.3.1 Visual examination of spot welds. Spot welds shall be visually examined at a magnification of 5 to 10X. Defective spot welds, referenced in table VIII category 103, shall be defined as welds showing burn-through or cracks exceeding 20 percent of the width of the metal strip.

#### 4.4 Quality conformance tests.

##### 4.4.1 Compression load test.

4.4.1.1 The test shall consist of subjecting the gasket to compression in a hydraulic compression machine of suitable capacity and measuring the thickness of the gaskets while under the test loads specified in 3.1.1.1 and 3.1.1.2 for type I gaskets and tables I through V, as applicable for type II gaskets.

4.4.1.2 The gaskets shall be tested between steel test plates, the surfaces of which shall have a smooth finish machined with a circular lay (concentric or phonographic) having a roughness not exceeding 500 roughness height rating (RHR) produced by machining not less than 40 cuts of uniform depth per inch of face width. For special installations involving radioactive service or hazardous fluids where a finer finish is required, and so indicated in the contract or order, a maximum RHR of 125 shall be used. The test plates shall be centrally located under the ball and socket head of the test machine. The ball and socket head shall be used to equally distribute the load applied to the gasket. By means of inverted T straps, the upper construction plates shall be suspended and held in place when inserting a gasket. Four dial indicators graduated in 1/1000 inch divisions, located 90 degrees apart and mounted on the upper compression plate are employed for measuring the thickness of the gasket. (Electronic pick-up and recording of gasket thickness is acceptable in lieu of dial indicators.)

4.4.1.3 During the test the increment of load shall be applied until a load corresponding to the test load in accordance with 3.1.1.1 and 3.1.1.2 for type I gaskets and tables I through V as applicable for type II gaskets is obtained for the gasket under test. The maximum rate of loading allowed shall be 2,000 pounds per second. When specified (see 6.1), a plot showing load (ordinate) versus deflection (abscissa) shall be prepared and made available for each test made. To insure reliability of gasket compression characteristics for type II gaskets, the final compression test load shall be read just prior to the test plates making contact with the gasket compression stop ring (metal outer ring).

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4.4.1.4 The steel test plates shall be placed in contact with each other and under an applied load of 3,000 pounds, the dial indicators shall be set so that a zero reading is obtained with the maximum travel of the indicator plunger. The plates shall then be separated, a gasket centrally located between plates and the upper plate brought into contact with the gasket but no load applied. The dial indicators shall then be read, and the average of the four readings shall closely check the original micrometer thickness of the gasket. The load shall then be applied and the rate of loading depends on the size of gasket and the maximum load to be applied. The specified load shall be maintained only for a sufficient time, 5 to 10 seconds, to obtain the dial indicator readings. By means of reading the dial indicator scales counterclockwise instead of clockwise the actual thickness of the gasket shall be directly obtained. The average of the four dial indicator readings shall be considered to be the thickness of the gasket. After completion of the test, the load shall be released but the upper compression plate shall be left in contact with the gasket for approximately 10 seconds and the dial indicator readings shall be taken to determine the recovery of the gaskets. The test plates shall then be separated, the gasket removed from the test machine, measured for thickness by micrometers, examined for excessive buckling on the inner periphery and condition of welds. It may be noted that the final micrometer thickness and the released average dial indicator thickness of the gasket shall be approximately the same providing the dial indicators are in proper adjustment. Occasionally between test runs the zero setting of the dial indicators shall be checked with the test plates in contact with one another. No excessive buckling on the inner edge of the gasket shall be allowed (see 4.4.2(a)). All gaskets undergoing the compression test shall recover at least 0.010 inch for gaskets having a nominal thickness of 0.175 inch and 0.005 inch for gaskets having a nominal thickness of 0.125 inch. It shall be the responsibility of the gasket manufacturer to adjust dial indicator readings to compensate for any deflection of test plates under load.

4.4.2 Test failures. Test failures are defined as follows:

- (a) Gasket buckled excessively on inner periphery to the extent that metal plies separated or the dovetail formed metal strip imploded.
- (b) Welding failed.
- (c) Gasket thickness recovered less than specified in 4.4.1.4 after release of compression test load.

4.4.3 Chemical analysis. Mill certification of materials may be accepted in lieu of performing chemical and physical tests. Such certification shall contain the results of the chemical check analysis of the heat from the steel obtained, the heat number and date. When considered necessary, the samples selected in accordance with 4.2 shall be subjected to a chemical analysis to determine conformance with 3.2.1.

4.4.4 Alloy identity. Prior to packaging, each of the sample gaskets selected in accordance with 4.2.2 shall be examined for alloy identity by a spot tester manufactured by Systems Scientific Laboratory, Ridgewood, New Jersey 07451 or Spot Testers Inc., Springfield, New Jersey 07081 or other tester approved by the procuring activity. If any sample fails the alloy identity examination, the entire lot shall be rejected.

4.5 Inspection of preparation for delivery. The packaging, packing and marking shall be inspected for compliance with section 5 of this document.

## 5. PREPARATION FOR DELIVERY

(The preparation for delivery requirements specified herein apply only for direct Government procurements. For the extent of applicability of the preparation for delivery requirements of referenced documents listed in section 2, see 6.2.)

### 5.1 Packaging.

5.1.1 Level A. Gaskets and refills, quantity as specified (see 5.1), shall be packaged in boxes conforming to PPP-B-566, PPP-B-636, PPP-B-665 or PPP-B-676, at the option of the contractor. Box closure shall be as specified in the applicable box specification or appendix thereto.

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5.1.1.1 Bundling. When specified (see 6.1), gaskets shall be bundled, tied and wrapped in a non-corrosive, dust protective opaque or transparent paper or film. The wrapper shall be secured with pressure sensitive tape. The quantity per bundle and required ties shall be as follows:

(a) Type I gaskets (without outer metal rings)

<u>Size</u>	<u>Quantity and tying</u>
Up to and including 6 inches	25 pieces
Over 6 inches to 12 inches, inclusive	10 pieces, tied in 2 equidistant places
Over 12 inches to 15 inches, inclusive	10 pieces, tied in 3 equidistant places
Over 15 inches	5 pieces, tied in 4 equidistant places

(b) Type II gaskets (with outer metal rings)

<u>Size</u>	<u>Quantity and tying</u>
Up to and including 5 inches	25 pieces
Over 5 inches to 8 inches, inclusive	25 pieces, tied in 2 equidistant places
Over 8 inches to 11 inches, inclusive	25 pieces, tied in 4 equidistant places
Over 11 inches, to 16 inches, inclusive	10 pieces, tied in 4 equidistant places
Over 16 inches	5 pieces, tied in 4 equidistant places.

5.1.1.2 Bulk. When specified (see 6.1), gaskets of like size and description shall be bulk packed directly into shipping containers for the level specified.

5.1.2 Level C. Packaging of gaskets and refills shall afford protection against corrosion, deterioration and physical damage during shipment from the supply source to the first receiving activity for immediate use. The supplier's normal packaging methods may be utilized when such meet the requirements of this level.

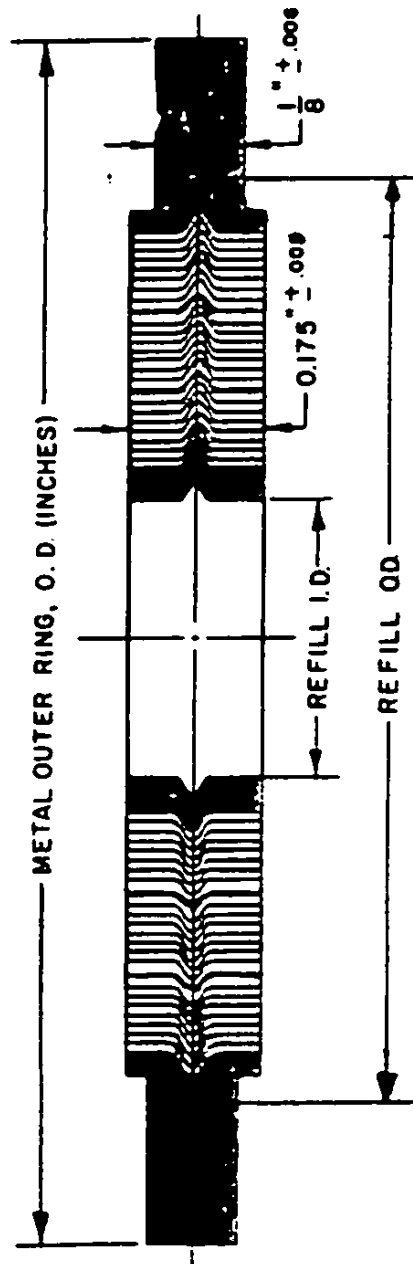
5.2 Packing.

5.2.1 Level A. Gaskets and refills, packaged as specified (see 6.1), shall be packed in fiberboard boxes conforming to PPP-B-636, weather resistant or PPP-B-640, class 2. Alternatively, gaskets and refills may be packed in containers conforming to any one of the following specifications at the option of the contractor:

<u>Specification</u>	<u>Type or class</u>
PPP-B-585	Class 3 use
PPP-B-591	Class II, weather-resistant
PPP-B-601	Overseas type
PPP-B-621	Class 2
PPP-B-576	Class 2

Shipping containers shall have caseliners conforming to MIL-L-10547. Caseliners shall be closed and sealed in accordance with the appendix to MIL-L-10547. Caseliners for weather-resistant or class 2 fiberboard boxes conforming to PPP-B-636 or PPP-B-640 respectively, may be omitted provided all center and edge seams and manufacturer's joints are waterproofed in accordance with the appendix to PPP-B-636. Boxes shall be closed, strapped or banded in accordance with the applicable box specification or appendix thereto, except that fiberboard boxes shall be reinforced with pressure-sensitive, reinforced, filament tape applied in accordance with the appendix to the applicable fiberboard box specification, in lieu of steel strapping. The gross weight of wood or wood-cleated boxes shall not exceed 200 pounds.

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SM 574424

Figure 1 - Gasket.

**STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL***(See Instructions – Reverse Side)*

<b>1. DOCUMENT NUMBER</b>		<b>2. DOCUMENT TITLE</b>	
<b>3a. NAME OF SUBMITTING ORGANIZATION</b>		<b>4. TYPE OF ORGANIZATION (Mark one)</b>	
<b>b. ADDRESS (Street, City, State, ZIP Code)</b>		<input type="checkbox"/> <b>VENDOR</b>	
		<input type="checkbox"/> <b>USER</b>	
		<input type="checkbox"/> <b>MANUFACTURER</b>	
		<input type="checkbox"/> <b>OTHER (Specify):</b> _____	
<b>5. PROBLEM AREAS</b>			
<b>a. Paragraph Number and Wording:</b>			
<b>b. Recommended Wording:</b>			
<b>c. Reason/Rationale for Recommendation:</b>			
<b>6. REMARKS</b>			
<b>7a. NAME OF SUBMITTER (Last, First, MI) – Optional</b>		<b>b. WORK TELEPHONE NUMBER (Include Area Code) – Optional</b>	
<b>c. MAILING ADDRESS (Street, City, State, ZIP Code) – Optional</b>		<b>8. DATE OF SUBMISSION (YYMMDD)</b>	