MIL-G-21032(SHIPS)
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MILITARY SPECIFICATION

GASKETS, METALLIC-ASBESTOS, SPIRAL WOUND

(FOR ASA COMMERCIAL FLANGED

JOINTS IN PIPING SYSTEMS)

1. SCOPE

1.1 Scope. - This specification covers spiral wound metallic asbestos gaskets for valve bonnets and pipe line gaskets complete with outer metal retaining rings, to be used with ASA commercial flanges. The application pressures cover a range from 150 pounds per square inch (p.s.i.) to and including 2500 p.s.i., with maximum temperature rating of 1050° F. on the 900 p.s.i., 1500 p.s.i., and 2500 p.s.i. series.

1.2 Classification. - Gaskets shall be of the following types and series as specified (see 6.2):

Type I - Valve bonnet gaskets.
Type II - Pipeline flange gaskets, with outer metal ring:
- Series 150
- Series 300
- Series 400
- Series 600
- Series 900
- Series 1500
- Series 2500

2. APPLICABLE DOCUMENTS

2.1 The following specifications and standards, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

FEDERAL
- QQ-S-763 - Steel Bars, Shapes, and Forgings —— Corrosion-Resisting.
- PPP-B-566 - Boxes, Folding, Paperboard.
- 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 - Boxes, Fiber.
- PPP-B-676 - Boxes, Set-Up, Paperboard.
- PPP-T-76 - Tape, Pressure-Sensitive Adhesive, Paper, Water Resistant.

MILITARY
- MIL-P-116 - Preservation, Methods of.
- MIL-B-4229 - Boxes; Paperboard, Metal-Stayed.
- MIL-B-10377 - Boxes: Wood-Cleated, Veneer, Paper Overlaid.
- MIL-L-10547 - Liners, Case, Waterproof.

*See 6.4.

FSC 5330

NAVY DEPARTMENT
General Specifications for Inspection of Material.

STANDARDS

MILITARY
MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129 - Marking for Shipment and Storage.

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

2.2 Other publications. - The following documents form a part of this specification. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

OFFICIAL CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules.

(Application for copies should be addressed to the Official Classification Committee, 1 Park Avenue at 33rd Street, New York 16, N.Y.)

AMERICAN SOCIETY FOR TESTING MATERIALS
A-276-55 - Hot-Rolled and Cold Finished Corrosion-Resisting Steel Bars.

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

3. REQUIREMENTS

3.1 Qualification. - The gaskets furnished under this specification shall be a product which has been tested and has passed the qualification tests specified herein (see 6.3).

3.2 Design. -

3.2.1 Type I, valve bonnet gaskets. - The gaskets shall conform to the dimensions of the valve bonnet joints for which they are required as specified (see 6.2). The design shall be such that when the gasket is compressed to 0.135 inch, the load on the flange bolts or bolt studs shall equal a load equivalent to 30,000 ± 10 percent p.s.i. of cross-sectional area at the root of thread of bolt studs as specified for valve bonnet for which the gasket is ordered. Gaskets shall not interfere with satisfactory operation of the valve.

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3.2.2 Type II, series 150 line flange gaskets with outer metal rings. - Type II, series 150 gaskets shall consist of a refill snapped in a solid metal outer ring with a loose sliding fit. The ring shall be of soft carbon steel and shall have a thickness of 3/32 ± 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 0.120 thickness. Gaskets shall conform to tables I through IV.

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

I. p. s.	Pipe o. d.	Gasket refills		Minimum number of plies				Outer metal ring[3] o. d.	Test load	Gasket[5] thickness under compression
				Metal[2]			Asbestos			
		I. d.	O. d.	Inside periphery	Outside periphery	Total	Total			
Inches	Inches	Inches[1]	Inches[1]					Inches	Pounds[4]	Inch
1/4	0.540	1/2	7/8	--	--	--	--	1-3/4	15,100	0.125
1/2	.840	3/4	1-1/4	6	3	12	4	1-7/8	15,100	.132
3/4	1.050	1	1-9/16	6	3	14	6	2-1/4	15,100	.132
1	1.315	1- 1/4	1-7/8	3	3	9	4	2-5/8	15,100	.132
1-1/4	1.660	1-11/16	2-3/8	3	3	10	5	3	15,100	.135
1-1/2	1.900	2	2-3/4	3	3	11	6	3-3/8	15,100	.135
2	2.375	2- 9/16	3-3/8	3	3	11	6	4-1/8	24,200	.135
2-1/2	2.875	3- 1/16	3-7/8	3	3	12	7	4-7/8	24,200	.135
3	3.500	3- 3/4	4-3/4	3	3	12	7	5-3/8	24,200	.135
3-1/2	4.000	4- 1/8	5-1/4	3	3	14	9	6-3/8	48,500	.135
4	4.500	4- 3/4	5-7/8	3	3	14	9	6-7/8	48,500	.135
4-1/2	5.000	5- 5/16	6-1/2	--	--	--	--	7	------	.135
5	5.563	5-13/16	7	3	3	15	10	7-3/4	72,500	.135
6	6.625	6- 7/8	8-1/4	3	3	15	10	8-3/4	72,500	.135
8	8.625	8- 7/8	10-3/8	3	3	17	12	11	72,500	.135
10	10.750	10-13/16	12-1/2	3	3	18	13	13-3/8	151,000	.135
12	12.750	12- 7/8	14-3/4	3	3	21	16	16-1/8	151,000	.135
14 o.d.	14.000	14- 1/4	16	3	3	17	12	17-3/4	198,000	.135
16 o.d.	16.000	16- 1/4	18-1/4	3	3	21	16	20-1/4	264,000	.135

[1]Tolerance plus or minus 1/64 inch.
[2]There shall be no asbestos plies between the metal plies on the inside and on the outside periphery.
[3]Inside diameter of outer metal ring equals outside diameter of refills plus 1/32 inch for size under 4 inches, and 1/16 inch for size 4 inches and above with a tolerance of plus or minus 1/64 inch.
[4]Corresponds to bolting loads of 30,000 p. s. i. unit stress. Bolts up to 1 inch diameter use coarse thread series; 1 inch and larger diameters, use 8 thread series.
[5]Tolerances plus or minus 0.005 inch.

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

I.p.s.	Pipe o.d.	Gasket refills		Minimum number of plies				Outer metal ring[3] o.d., inches			Test load[4] gasket pressure	Gasket[5] thickness under compression
				Metal[2]			Asbestos					
		I.d. inch[1]	O.d. inch[1]	Inside periphery	Outside periphery	Total	Total	Series 300	Series 400	Series 600		
Inches	Inches										Pounds	Inch
1/4	0.540	1/2	27/32	4	3	9	3	1-3/4	1-3/4	1-3/4	12,600	0.125
1/2	.840	3/4	1- 7/32	6	3	12	4	2-1/8	2-1/8	2-1/8	12,600	.132
3/4	1.050	1	1-17/32	6	3	14	6	2-5/8	2-5/8	2-5/8	20,200	.132
1	1.315	1- 1/4	1-27/32	6	3	15	7	2-7/8	2-7/8	2-7/8	20,200	.132
1-1/4	1.660	1-11/16	2-11/32	6	3	15	7	3-1/4	3-1/4	3-1/4	24,200	.135
1-1/2	1.900	2	2-23/32	6	3	17	9	3-3/4	3-3/4	3-3/4	36,200	.135
2	2.375	2- 9/16	3-11/32	6	3	17	9	4-3/8	4-3/8	4-3/8	48,400	.135
2-1/2	2.875	3- 1/16	3-27/32	6	3	18	10	5-1/8	5-1/8	5-1/8	72,500	.135
3	3.500	3- 3/4	4-11/16	6	3	20	12	5-7/8	5-7/8	5-7/8	72,500	.135
3-1/2	4.000	4- 1/8	5- 3/16	6	3	22	14	6-1/2	6-3/8	6-3/8	101,000	.135
4	4.500	4- 3/4	5-13/16	6	3	22	14	7-1/8	7	7-5/8	101,000	.135
4-1/2	5.000	5- 5/16	6- 7/16	6	3	24	16	7-3/4	7-5/8	-----	132,000	.135
5	5.563	5-13/16	6-15/16	6	3	24	16	8-1/2	8-3/8	9-1/2	132,000	.135
6	6.625	6- 7/8	8- 3/16	6	3	27	19	9-7/8	9-3/4	10-1/2	198,000	.135
8	8.625	8- 7/8	10- 5/16	6	3	30	22	12-1/8	12	12-5/8	262,000	.135
10	10.750	10-13/16	12- 7/16	6	3	35	27	14-1/4	14-1/8	15-3/4	446,000	.135
12	12.750	12- 7/8	14-11/16	6	3	35	27	16-5/8	16-1/2	18	557,000	.135
14 o.d.	14.000	14- 1/4	16	6	3	32	24	19-1/8	19	19-3/8	578,000	.140
16 o.d.	16.000	16- 1/4	18- 1/4	6	3	36	28	21-1/4	21-1/8	22-1/4	[6]840,000	.135
18 o.d.	18.000	18- 1/2	20- 3/4	--	--	--	--	23-1/2	23-3/8	24-1/8	[6]1,008,000	.135

[1]Tolerance plus or minus 1/64 inch.
[2]There shall be no asbestos plies between the metal plies on the inside and on the outside periphery.
[3]Inside diameter of outer metal ring equals outside diameter of refills plus 1/32 inch for size under 4 inches and 1/16 inch for size 4 inches and above with a tolerance of plus or minus 1/64 inch.
[4]Corresponds to bolting load of 30,000 p.s.i. unit stress. Bolts: 3/4 inch diameter, 10 threads, 7/8 inch diameter, 9 threads; all other bolts 8 threads.
[5]Tolerance plus or minus 0.005 inch.
[6]Exceeds present load capacity of 600,000 pound testing machine available at Engineering Experiment Station, Annapolis, Md.

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Table III - Type II gasket characteristics for series 900 and 1500 p.s.i. ASA flanges.

I.p.s.	Pipe o.d. inch	Gasket refills Series 900 and 1500 ASA flanges		Minimum number of plies				Outer metal ring[3] o.d. inch		Test load[4] pounds		Gasket[5] thickness under compression
				Metal[2]			Asbestos					
		I.d. inch[1]	O.d. inch[1]	Inside periphery	Outside periphery	Total	Total	900 p.s.i.	1500 p.s.i.	Series 900 gaskets pressure	Series 1500 gaskets pressure	
Inches												Inch
1/4	0.540	------	------	--	--	--	--	-----	-----	------	---------	-----
1/2	.840	3/4	1-1/4	6	3	16	6	2-1/2	2-1/2	30,200	30,200	0.132
3/4	1.050	1	1-9/16	6	3	17	7	2-3/4	2-3/4	30,200	30,200	.132
1	1.315	1- 1/4	1-7/8	6	3	18	8	3-1/8	3-1/8	41,900	41,900	.135
1-1/4	1.660	1-11/16	2-3/8	6	3	21	11	3-1/2	3-1/2	50,300	50,300	.135
1-1/2	1.900	2	2-3/4	6	3	22	12	3-7/8	3-7/8	66,100	66,100	.135
2	2.375	2- 9/16	3-3/8	6	3	24	14	5-5/8	5-5/8	101,000	101,000	.135
2-1/2	2.875	3- 1/16	3-7/8	6	3	27	17	6-1/2	6-1/2	132,000	132,000	.135
3	3.500	3- 3/4	4-3/4	6	3	27	17	6-5/8	6-7/8	101,000	175,000	.135
3-1/2	4.000	------	-----	--	--	--	--	-----	-----	-----	-------	.135
4	4.500	4- 3/4	5-7/8	6	3	30	20	8-1/8	8-1/4	175,000	223,000	.135
4-1/2	5.000	------	-----	--	--	--	--	-----	-----	-----	-------	.135
5	5.563	5-13/16	7	6	3	33	23	9-3/4	10	223,000	337,000	.135
6	6.625	6- 7/8	8-1/4	6	3	34	24	11-3/8	11-1/8	282,000	416,000	.135
8	8.625	8- 7/8	10-3/8	6	3	38	28	14-1/8	13-7/8	416,000	605,000	.125
10	10.725	10-13/16	12-1/2	6	3	40	30	17-1/8	17-1/8	554,000	[6]829,000	.135
12	12.750	12- 7/8	14-3/4	6	3	42	32	19-5/8	20-1/2	[6]693,000	[6]1,273,000	.135

[1]Tolerance plus or minus 1/64 inch.
[2]There shall be no asbestos plies between the metal plies on the inside and on the outside periphery.
[3]Inside diameter of outer metal ring equals outside diameter of refills plus 1/32 inch for size under 4 inches and 1/16 inch for size 4 inches and above with a tolerance of plus or minus 1/64 inch.
[4]Corresponds to bolting load of 30,000 p.s.i. unit stress. Bolts: 3/4 inch diameter, 10 threads, 7/8 inch diameter, 9 threads; all other bolts 8 threads.
[5]Tolerance plus or minus 0.005 inch.
[6]Exceeds present load capacity of 600,000 pounds testing machine available at Engineering Experiment Station, Annapolis, Md.

Table IV - Type II gasket characteristics for series 2500 p.s.i. ASA flanges.

I.p.s.	Pipe o.d.	Gasket refills		Minimum number of plies				Outer metal ring[3] o.d.	Test load[4] gasket pressure	Gasket[5] thickness under compression
				Metal[2]			Asbestos			
		I.d. inch[1]	O.d. inch[1]	Inside periphery	Outside periphery	Total	Total			
Inches	Inches							Inches	Pounds	Inch
1/4	0.540	-----	-----	--	--	--	--	------	-------	-----
1/2	.840	3/4	1-1/4	6	3	21	11	2-3/4	30,200	0.132
3/4	1.050	1	1-9/16	6	3	24	14	3	30,200	.132
1	1.315	1-1/4	1-7/8	6	3	25	15	3-3/8	41,900	.132
1-1/4	1.660	1-9/16	2-3/8	6	3	24	14	4-1/8	66,100	.135
1-1/2	1.900	1-7/8	2-3/4	6	3	25	15	4-5/8	87,300	.135
2	2.375	2-5/16	3-3/8	6	3	25	15	5-3/4	132,000	.135
2-1/2	2.875	2-3/4	3-7/8	6	3	28	18	6-5/8	175,000	.135
3	3.500	3-5/8	4-3/4	6	3	33	23	7-3/4	223,000	.135
3-1/2	4.000	-----	-----	--	--	--	--	-----	-------	.135
4	4.500	4-5/8	5-7/8	6	3	37	27	9-1/4	337,000	.135
4-1/2	5.000	-----	-----	--	--	--	--	-----	-------	.135
5	5.563	5-7/8	7	6	3	38	28	11	475,000	.135
6	6.625	6-3/4	8-1/4	6	3	41	31	12-1/2	[6]636,000	.135
8	8.625	8-1/2	10-3/8	6	3	41	31	15-1/4	[6]955,000	.135
10	10.750	10-5/8	12-1/2	6	3	47	37	18-3/4	[6]1,545,000	.135
12	12.750	12-3/4	14-3/4	6	3	51	41	21-5/8	[6]1,893,000	.135

[1] Tolerance plus or minus 1/64 inch.
[2] There shall be no asbestos plies between the metal plies on the inside and on the outside periphery.
[3] Inside diameter of outer metal ring equals outside diameter of refills plus 1/32 inch for size under 4 inches and 1/16 inch for size 4 inches and above with a tolerance of plus or minus 1/64 inch.
[4] Corresponds to bolting load of 30,000 p.s.i. unit stress. Bolts: 3/4 inch diameter, 10 threads, 7/8 inch diameter, 9 threads; all other bolts 8 threads.
[5] Tolerance plus or minus 0.005 inch.
[6] Exceeds present load capacity of 600,000 pound testing machine available at Engineering Experiment Station, Annapolis, Md.

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3.2.2.1 Refills for all series of type II gaskets. - Refills shall be of the inside and outside dimensions specified (see 6.2). These dimensions shall be in accordance with the line flange joints for which they are designed (see tables I through IV). The refill shall assemble with the outer metal ring of maximum permissible inside diameter as allowed by the tolerance specified in tables I through IV.

3.3 Materials. -

3.3.1 Metal strip. - The metal strip used in the manufacture of the gasket refill for gaskets constructed as specified in tables I and II shall conform to class 304 of Specification QQ-S-763. The metal strip used in the manufacture of the gasket refill for gaskets constructed as specified in tables III and IV shall conform to class 316L with extremely low carbon (0.03 max.) or 309 scb in accordance with Publication ASTM-A276-55, columbium and tantalum stabilized ten time carbon content, minimum.

3.4 Construction. - The gaskets shall be composed of a single strip of metal wound in spiral dovetail shape, 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 (see tables I through IV) either a continuous single length or in two lengths depending upon the design. The asbestos paper may be either a single strip or in two strips. Spot welds on the gasket inside diameter shall be not less than three in number and equally spaced at 2 inches maximum spacing. The outside weld shall consist of not less than three spot welds. The three or more outside spot welds shall develop the strength of the metal strip in tension.

3.4.1 Pressure. - Complete gaskets and refills specified in table I through IV shall be suitable for the nominal steam pressures specified herein. Gaskets constructed as specified in tables I and II for series 150, 300, 400 and 600 shall be suitable for temperatures up to 850° F. Gaskets constructed as specified in tables III and IV for series 900, 1,500, and 2500 shall be suitable for temperatures up to 1050° F.

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

3.4.3 Asbestos strip. - The asbestos strip shall be not more than 0.022 inch thick.

3.4.4 Gasket thickness. - The thickness of the finished gasket shall be 0.175 $\pm$ 0.005 inch.

3.4.5 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.

3.4.6 Gaskets shall pass the endurance, line thermal shock and compression load tests specified in 4.6.

3.5 Marking. - Type II gaskets shall be steel-stamped on one side of the outer ring to show the pipe size for which intended and corresponding steam pressure. Where refills are purchased separate from the rings, all refills shall be marked using a piece of pressure sensitive tape having the pipe size and pressure printed thereon. In applying the pressure sensitive tape, the tape shall be looped through the refill and brought back upon itself for firm retention.

3.6 Workmanship. - The workmanship shall be first class in every respect.

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4. QUALITY ASSURANCE PROVISIONS

4.1 Inspection procedures. - For Naval purchases, the general inspection procedures shall be in accordance with General Specifications for Inspection of Material.

4.2 Qualification tests at a Government laboratory. - Qualification tests shall be conducted at the Engineering Experiment Station, Annapolis, Md. These tests shall consist of the tests specified in 4.6.

4.3 Sampling for lot acceptance. -

4.3.1 Lot. - For purposes of sampling, a lot shall consist of not more than 5000 gaskets of one type, series and size, wound on one machine by one operator and offered for acceptance inspection at one time. Wherever practicable, the lot shall be identifiable in approximate order of production until sampling has been completed, by some method such as placing gaskets wound during each continuous period of 4 hours or less temporarily in separate containers.

4.3.2 Sampling for visual and dimensional examination. - A random sample of gaskets shall be selected from each lot offered for Government examination in accordance with Standard MIL-STD-105 at inspection level III for lots of 40 and under, inspection level II for lots of 41 to 300 and inspection level I for lots of 301 and over. The acceptable quality level (A. Q. L.) shall be 1.5 percent defective. However the smallest sample size shall be 1.5. Where the lot is approximately identified in order of production, the sample gaskets shall be selected so that each period of continuous production is represented. Otherwise the sample shall be selected at random.

4.3.2.1 Sampling for ply count. - One third of the sample gaskets selected in accordance with 4.3.2 shall be subjected to the ply count in accordance with 4.4.1.1.

4.3.3 Sampling for tests. - One fifth of the sample selected in accordance with 4.3.2 shall be subjected to the lot acceptance test specified in 4.4.2. If the sample number should be odd, then the higher even number of sample gaskets shall be selected.

4.3.4 Sampling for comparison inspection. - The Government inspector shall select 2 sample gaskets for the inspection specified in 4.4.3 from the first lot of each type, series and size offered for comparison inspection under each contract or order, and thereafter from one lot out of every 10 lots of each type, series and size offered for comparison inspection under the contract or order which have passed the lot acceptance examination and tests at the place of manufacture. Insofar as is practicable, the samples chosen for comparison inspection shall be duplicates of the samples chosen in accordance with 4.3.3. The samples shall be forwarded to the Naval Engineering Experiment Station, Annapolis, Md. In case lot acceptance tests are performed at the place of manufacture, a copy of the test data obtained from the samples chosen in accordance with 4.3.3 shall accompany the comparison inspection samples.

4.3.5 Sampling for determination of composition of metal strip. - A sample of approximately 2 ounces of the metal strip used in the manufacture of each lot of gaskets shall be taken before manufacturing begins and another 2 ounce sample shall be taken after the last one has been manufactured. Both samples shall be forwarded to a laboratory designated by the bureau or agency concerned for chemical analysis (see 4.6.3).

4.4 Examination and test. -

4.4.1 Visual and dimensional examination. - Each of the sample gaskets selected in accordance with 4.3.2 shall be visually and dimensionally examined to verify compliance with the requirements of this specification not involving tests. Any gasket in the sample containing one or more visual or dimensional defects shall be rejected and if the number of defective gaskets in any sample exceed the acceptance number for that sample, the lot represented by the sample shall be rejected.

4.4.1.1 Ply count. - The Government inspector shall carefully count the plies of the sample gaskets selected in accordance with 4.3.2.1. A magnifying glass or other suitable device shall be used to insure accuracy of the count. If any one of the samples is found not to conform to the requirements of this specification, the entire lot shall be rejected.

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4.4.2 Lot acceptance tests. -

4.4.2.1 Place of test. - Lot acceptance tests shall be performed at the place of manufacture if facilities therefor are available. Otherwise, they shall be performed at the Engineering Experiment Station, Annapolis, Md.

4.4.2.2 Each of the sample gaskets selected in accordance with 4.3.3 shall be tested in accordance with 4.6.2. If any sample gasket fails the test, the lot represented by the sample shall be rejected.

4.4.3 Comparison inspection. -

4.4.3.1 Procedure. - The sample gaskets selected and forwarded in accordance with 4.3.4 shall be subjected to the compression load test specified in 4.6.2 and to such other tests of those specified in 4.6 as the Government inspector or the Engineering Experiment Station considers necessary to establish conformance with the requirements of this specification.

4.4.3.2 Action in case of failure. - Except as hereinafter specified, acceptance and rejection of lots shall normally be on the basis of the sampling, examination and tests of 4.3.2, 4.3.3, 4.4.1 and 4.4.2 and acceptance shall not be withheld pending receipt of test reports on comparison inspection samples. However, upon receipt of an unsatisfactory test report on a comparison inspection sample the Government inspector shall select additional samples from every subsequent lot offered for inspection which has passed the lot acceptance examination and tests at the place of manufacture. The samples so selected shall be submitted to the Engineering Experiment Station, Annapolis, Md. and shall there be subjected to the test(s) wherein failure was observed. Lots shall then be accepted only upon receipt of a satisfactory test report on the samples so selected. This additional testing shall be discontinued and lot acceptance returned to the normal basis when 4 successive lots have been accepted.

4.4.4 Rejected lots. - Rejected lots may be offered again for Government acceptance inspection provided the contractor has repaired or removed all nonconforming gaskets. Samples shall again be selected from such resubmitted lots and inspected to verify compliance with this specification.

4.5 Control chart procedure. - For the information of the bureau of agency concerned, and to aid the manufacturer in controlling quality, the Government inspector, with the cooperation of the manufacturer, shall continuously maintain a control chart for compression test data for each type, series and size of gaskets in accordance with the directions contained in section 4.5.1 and 4.5.2. The compression thickness referred to in 4.5.1 and 4.5.2 means the average thickness of the sample gasket at (as applicable, in accordance with tables I through IV) 30,000 p.s.i. bolt stress (root area) when the sample is tested as specified in 4.6.2.

4.5.1 Directions for construction of the charts. - Direction for construction of the charts shall be as follows: On suitable cross-section paper, lay out a chart with vertical scale at the left for the mean of the two compressed thicknesses obtained from the pairs of sample gaskets tested in accordance with 4.4.2, and for the numerical value of the difference of the two compressed thicknesses, with a horizontal scale for date of sampling and inspection lot number. Draw a horizontal central line for the mean at the compressed thickness value given in tables I through IV. Draw two horizontal control lines for the mean above and below the central line respectively at distances from the central line corresponding to a compressed thickness of 3.5 thousandths of an inch. Draw one horizontal control line for the difference corresponding to 9.6 thousandths of an inch.

4.5.2 Directions for use of chart. - Directions for use of chart shall be as follows: Plot on this chart the successive means and differences of compressed thicknesses of pairs of gaskets tested in accordance with 4.4.2. When comparison inspection on pairs of samples representing a lot are tested in accordance with 4.4.3 plot the points for the comparison inspection on the chart vertically in line with the points for the lot acceptance tests, using some convenient device to distinguish the two types of points. The

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Government inspector shall inform the bureau or agency concerned and warn the manufacturer whenever any point falls outside control limits on the chart, and whenever a dangerous trend is observable in a succession of points, and (in case lot acceptance tests are performed at the place of manufacture) whenever the comparison inspection results plotted on the chart for means for all sizes lies either above or below all the corresponding ten lot acceptance points.

4.6 Methods of test. -

4.6.1 Line thermal shock test. - The apparatus used for this test shall consist of 6 inch pipe sections flanged together with welding-neck flanges to provide two joints. The center or spool-piece section shall consist of two flanges butt welded together. The end sections shall consist of 6 inch size pipe flanged at one end and blanked off at the other. One end section shall be provided with steam and boiler feedwater inlet connections and the other with an exhaust connection. Two nozzles for directing a spray of boiler feedwater on the inner periphery of the test joints shall be centrally located within the apparatus, one at the centerline of each joint. Each nozzle shall consist of a one 6 inch size pipe with 6 holes of 1/8 inch diameter drilled radially at 60 degree intervals around the pipe. Thermocouples shall be placed approximately for measurement of temperatures at outer surface of pipe, at the raised faces of the test joints, of inlet steam and boiler feedwater, and at the exhaust connection. The test shall consist of 20 cycles of thermal shock obtained by changing conditions from steam at 600 p.s.i.g. and 850° F. to boiler feedwater at 750 p.s.i.g. and 250° F. for series 300, 400 and 600, from 1500 pounds gage pressure and 1050° F. to boiler feedwater at 1875 pounds gage pressure and 430° F. for series 900 and 1500, and steam from 2500 gage pressure and 1050° F. to boiler feedwater at 2900 pounds gage pressure and 430° F. for series 2500. The shocks shall continue for 20 cycles.

4.6.2 Compression load test. -

4.6.2.1 The test shall consist of subjecting the gaskets to compression in a Baldwin-Southwark, or equal, hydraulic compression machine of suitable capacity and measuring the thickness of the gaskets while under the tests loads specified in 3.2.1 for type I gaskets and 3.2.2 for type II gaskets.

4.6.2.2 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 spiral) having 60 to 100 serrations per inch of face width with depth of serrations not exceeding 0.003 inch or an RHR finish of 63 to 1000. For special installations involving radioactive service or hazardous fluids where a finer finish is required, a maximum RHR of 500 shall be specified. 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 compression plate 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.

4.6.2.3 During the test, the increment of load shall be applied until a load corresponding to 30,000 p.s.i. bolt stress (root area) is obtained as applicable for each specific size of gasket in accordance with 3.2.1 for type I gaskets and 3.2.2 for type II gaskets. The maximum rate of loading allowed will be 2,000 pounds per second.

4.6.2.4 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 should 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. At each interval, 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 counter clockwise 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

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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 buckling on the inner periphery, condition of welds, and binding of the gasket filler in the outer metal ring. It may be noted that the final micrometer thickness and the released average dial indicator thickness of the gasket will 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 buckling on the inner edge of the gasket shall be allowed. Gaskets shall at least recover 0.010 inch over the compressed value obtained in the compression test specified in 4.6.2.3.

4.6.2.5 In order to test the gaskets ranging in size from 1/2 to 8 inches inclusive, approximately the size plates shall be used as specified in table V.

Table V - Plate sizes used for testing series 150, 300, 400, 600, 900, 1500, and 2500 gaskets.

Compression plate Dimensions[2, 3]		Maximum gasket size tested on plates (ASA gaskets)						
Diameter	Thickness	Series 150	Series 300	Series 400	Series 600	Series 900	Series 1500	Series 2500
Inches	Inches							
Upper 4-1/2 Lower 4-1/2	3 2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2
Upper 9 Lower 9	3 2-1/2	6	6	6	6	6	6	5
Upper 14-1/2 Lower 14-1/2	3 2-1/2	10	10	10	10	10	10	8
Upper 19 Lower 19	3 2-1/2	16 o.d.	16 o.d.	16 o.d.	14 o.d.	12	12	10
Upper 21-1/2[1] Lower 21-1/2[1]	3 2-1/2	16 o.d.	18 o.d	18 o.d.	18 o.d.	12	12	12

[1]Not currently available at Engineering Experiment Station, Annapolis, Md.
[2]An additional small ball and socket test head shall be used to distribute the load equally over the test plates.
[3]Gaskets may be tested on plates having dimensions which differ from those specified, provided the loading and deflections are within the limits of table I through IV and provided that sample gaskets so tested will meet the requirements of this specification when tested at the Naval Engineering Experimental Station, Annapolis, Md.

4.6.3 Chemical analyses. - The samples selected in accordance with 4.6.3 shall be subjected to a chemical analyses to determine conformance with 3.3.1.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. -

5.1.1 Level A. - Gaskets shall be packaged in accordance with method III of Specification MIL-P-116 (see 6.2).

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5.1.1.1 Intermediate packaging. - Gaskets shall be packaged in quantities specified by the bureau or agency concerned in containers conforming to Specification PPP-B-566, PPP-B-636, PPP-B-676, MIL-B-4229 at the option of the contractor. Box closures shall conform to the applicable box specification and the appendix thereto. Gross weight shall not exceed the limitations of the applicable box specification.

5.1.2 Level C. - Gaskets shall be preserved and packaged in accordance with the manufacturer's commercial practice.

5.2 Packing. -

5.2.1 Level A. - Gaskets, packaged in accordance with level A or C as specified (see 6.2) shall be packed in overseas type wood cleated fiberboard, nailed wood, wirebound wood, corrugated or solid fiber, wood cleated paper overlaid, or wood cleated plywood boxes conforming to Specification PPP-B-591, PPP-B-621, PPP-B-585, PPP-B-636, class 3, MIL-B-10377 or PPP-B-601, respectively, at the option of the contractor. Shipping containers shall have caseliners conforming to Specification MIL-L-10547 and shall be closed and sealed in accordance with the appendix thereto. Caseliners for boxes conforming to Specification PPP-B-636 may be omitted provided all joints and corners of the boxes are sealed with minimum 1-1/2 inch wide sensitive tape conforming to Specification PPP-T-76. Box closures shall be as specified in the applicable box specification or appendix thereto. The gross weight of wood boxes shall not exceed 200 pounds; fiber boxes shall not exceed the weight limitations of the applicable box specification.

5.2.2 Level B. - Gaskets, packaged in accordance with level A or C as specified (see 6.2) shall be packed in domestic type wood cleated fiberboard, nailed wood, wirebound wood, cleated plywood or wood cleated paper overlaid boxes or class 2 fiber boxes conforming to Specification PPP-B-591, PPP-B-621, PPP-B-585, PPP-B-636, PPP-B-601, or MIL-B-10377, respectively, at the option of the contractor. Box closures shall be as specified in applicable box specification or appendix thereto. The gross weight of wood boxes shall not exceed 200 pounds; fiberboard boxes shall not exceed the weight limitation of the applicable box specification.

5.2.3 Level C. - Gaskets, packaged in accordance with level A or C as specified (see 6.2) shall be packed in a manner to insure safe delivery and acceptance at destination. Shipping containers shall comply with the Uniform Freight Classification Rules or other regulations applicable to the mode of transportation.

5.3 Marking. - In addition to any special marking specified in the contract or order or herein, interior and exterior shipping containers shall be marked in accordance with Standard MIL-STD-129.

6. NOTES

6.1 Intended use. - Refills are intended to be used with existing rings onboard ships and type II gaskets are not to be ordered except where rings are not available.

6.2 Ordering data. - Procurement documents should specify the following:

(a) Title, number, and date of this specification.
(b) Type, series and size of gaskets required and for type I gaskets, the type of flange with which gaskets are to be used (see 1.2 and 3.2.1).
(c) Whether refills or complete gaskets are required. If refills are required, specify the inside and outside dimensions (see 3.2.2.1).
(d) Quantity per unit and intermediate package (see 5.1.1 and 5.1.1.1).
(e) Selection of applicable level of preservation, packaging and packing (see 5.1 and 5.2).

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6.3 Qualification. - With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in Qualified Products List QPL-21032, whether or not such products have actually been so listed by that date.

6.3.1 The attention of suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government, tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products covered by this specification may be obtained from the Chief of the Bureau of Ships, Department of the Navy, Washington 25, D. C.

6.4 Superseding data. - This specification replaces that part of Specification MIL-G-16265A covering class a and b (in part) gaskets, as follows:

MIL-G-16265A	MIL-G-21032
Class a	Type I
Class b (in part)	Type II

Classes b (in part) and c of Specification MIL-G-16265A have been replaced by types I and II of Specification MIL-G-0016265B(SHIPS) and gaskets for Navy flanges should be purchased under Specification MIL-G-0016265B(SHIPS).

Notice. - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Preparing activity:
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