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Metallic Gaskets for Raised-Face Pipe Flanges and Flanged Connections (Double-Jacketed Corrugated and Spiral-Wound)

API STANDARD 601
SEVENTH EDITION, MARCH 1988

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Refining Department

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FOREWORD

This standard is a purchase specification for metallic gaskets for circular raised-face pipe flanges and flanged connections. The standard currently covers double-jacketed corrugated and spiral-wound gaskets. Other types of metallic gaskets may be added in the future if the need arises.

Insofar as possible, the gasket dimensions in this standard are suitable for raised-face flanges as described in ANSI B16.5, API Standard 605, and MSS SP-44 without having the gasket extend into the flange bore (see notes to Tables B-1–B-3 for exceptions).

This standard is based on the knowledge and experience of petroleum refiners and has been developed with the assistance of gasket manufacturers.

This standard requires the purchaser to specify certain details and features. Although it is recognized that the purchaser may desire to modify, delete, or amplify sections of the standard, it is strongly recommended that such modifications, deletions, and amplifications be made by supplementing this standard rather than by rewriting or incorporating sections of this standard into another complete standard.

Suggested revisions are invited and should be submitted to the director of the Refining Department, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005.

IMPORTANT INFORMATION CONCERNING USE OF ASBESTOS OR ALTERNATIVE MATERIALS

Asbestos is specified or referenced for certain components of the equipment described in some API standards. It has been of extreme usefulness in minimizing fire hazards associated with petroleum processing. It has also served as a universal sealing material, compatible with most refining fluid services.

Certain serious adverse health effects are associated with asbestos, among them the serious and often fatal diseases of lung cancer, asbestosis, and mesothelioma (a cancer of the chest and abdominal linings). The degree of exposure to asbestos varies with the product and the work practices involved.

Consult the most recent edition of the Occupational Safety and Health Administration, U.S. Department of Labor, Occupational Safety and Health Standard for Asbestos, Tremolite, Anthophyllite, and Actinolite, 29 *Code of Federal Regulations* Section 1910.1001; the U.S. Environmental Protection Agency, National Emission Standard for Asbestos, 40 *Code of Federal Regulations* Sections 61.140 through 61.156; and the proposed rule by the U.S. Environmental Protection Agency proposing labeling requirements and phased banning of asbestos products, published at 51 *Federal Register* 3738-3759 (January 29, 1986).

There are currently in use and under development a number of substitute materials to replace asbestos in certain applications. Manufacturers and users are encouraged to develop and use effective substitute materials that can meet the specifications for, and operating requirements of, the equipment to which they would apply.

Information concerning safety and health risks and proper precautions with respect to particular materials and conditions should be obtained from the employer, the manufacturer or supplier of that material, or the Material Safety Data Sheet.

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NOTES TO PURCHASER

1. If the purchaser needs a gasket that deviates from the requirements stated in this standard, such deviations shall be stated specifically in the purchase order.
2. If no exception is to be taken to this standard, the purchase order shall specify the following:
 - a. Quantity.
 - b. Flange size (NPS) (see 1.3).
 - c. Class (see 1.3).
 - d. Flange standard (that is, whether gaskets are for API Standard 605, ANSI B16.5, or MSS SP-44 flanges).
 - e. Type (double-jacketed corrugated or spiral-wound).
 - f. Material, if other than standard (see 2.3.1 and 3.3.1 for standard materials):
 1. For double-jacketed corrugated gaskets, special jacket and/or filler material may be specified.
 2. For spiral-wound gaskets, special winding material, filler material, and/or centering and inner-ring material may be specified.
 - g. API Standard 601.
3. For a double-jacketed gasket, the dimensions listed in this standard are suitable for any jacket and filler material in Gasket Group 1 of ANSI B16.5. Double-jacketed corrugated stainless steel gaskets are also suitable for API Standard 605 flanges of Classes 150 and 300 (see 2.3.2).
4. For a spiral-wound gasket, the dimensions listed in this standard are suitable for any metal winding and filler material if the gasket is designed so that a uniform bolt stress (on the nominal root diameter) of 30,000 pounds per square inch (206.82 megapascals) in the flanged joint will compress the gasket to a thickness of 0.130 ± 0.005 inch (3.3 ± 0.1 millimeter). If low-yield metal is employed for either flanges or bolts, special gasket construction may be necessary, and the gasket manufacturer should be consulted.
5. To prevent overcompression damage to high-pressure spiral-wound gaskets caused by high available bolt loading, this standard requires both inner rings and centering rings for spiral-wound gaskets of NPS 24 and larger in Class 900, NPS 12 and larger in Class 1500, and NPS 4 and larger in Class 2500. These inner rings may extend into the bore a maximum of 0.06 inch (1.5 millimeters) under the worst combination of maximum flange bore, eccentric installation, and additive tolerances. Inner rings that are not mandatory must be specified if they are desired by the purchaser.
6. The use of metric bolts with spiral-wound gaskets that conform to this standard may result in interference between bolt threads and the outside diameter of the centering ring.
7. Spiral-wound gaskets for lap-joint flanges are considered special. The purchaser and the manufacturer must agree on the dimensions.

Metallic Gaskets for Raised-Face Pipe Flanges and Flanged Connections (Double-Jacketed Corrugated and Spiral-Wound)

SECTION 1—GENERAL

1.1 Scope

1.1.1 This standard is a purchase specification for metallic, flat, ring-shaped gaskets for use in circular, raised-face, flanged pipe joints as described in ANSI B16.5, API Standard 605, and MSS SP-44. Two types of gaskets are covered: double-jacketed corrugated gaskets and spiral-wound gaskets. Nominal sizes correspond to the nominal pipe sizes (NPS) in ASME B36.10M and to the pipe outside diameter (OD), in inches, when NPS is beyond the scope of ASME B36.10M. Certain sizes of these gaskets cannot be used with all flange types or flange bores (see 1.2.1 and Appendix B).

1.1.2 This standard provides dimensions for double-jacketed corrugated and spiral-wound gaskets for use with all sizes and classes of raised-face steel pipe flanges conforming to ANSI B16.5, API Standard 605, and MSS SP-44 (see Appendix A), except the following:

- a. Class 75, all sizes.
- b. NPS 3½, all classes.

1.2 Flange Facing and Bore

1.2.1 GENERAL

Gaskets of some sizes cannot be used with all types of flanges or with flanges that have unusually large bores because the gaskets will extend into the flange bore (see Tables B-1–B-3 for limitations).

1.2.2 ANSI B16.5 FLANGES

Gaskets of the sizes and classes listed in Table 1 are suitable for slip-on, threaded, welding-neck, or other raised-face flanges of any bore covered by ANSI B16.5, subject to the limitations listed in Table 1 and Appendix B. The sizes and classes listed in Table 1 are also suitable for raised-face flanged nozzles (long welding necks) that have the facing dimensions of ANSI B16.5 flanges. Spiral-wound gaskets of the dimensions listed in this standard are not suitable for NPS ½, NPS ¾, and NPS 1 slip-on and threaded flanges because they will extend into the bore. Spiral-wound gaskets of other sizes and

Table 1—Gaskets

Class	Flange Size (NPS)	Gasket Type
150–1500	½–24	Double jacketed
2500	½–12	Double jacketed
150–1500	1¼–24	Spiral wound
2500	1–12	Spiral wound

classes are subject to the limitations on the bore of flanges noted in Table B-1. (See Note 5, Notes to Purchaser.)

1.2.3 API STANDARD 605 FLANGES

Gaskets manufactured to this standard are suitable for raised-face flanges of any bore described in API Standard 605 for Classes 150–900 (see Table B-2). Dimensions are not provided for either double-jacketed or spiral-wound gaskets for Class 75 flanges because Class 75 flanges do not have sufficient bolting strength; gaskets that conform to ANSI B16.21 should be used. (See Note 5, Notes to Purchaser.)

1.2.4 MSS SP-44 FLANGES

Gaskets manufactured to this standard are suitable only for raised-face, welding-neck flanges described in MSS SP-44, whose bore does not exceed the limits of Table B-3. These gaskets are not suitable for use with slip-on flanges. (See Note 5, Notes to Purchaser.)

1.3 Size and Class

1.3.1 A gasket shall be designated by NPS, class, and the dimensional specification of the flange with which it is to be used. Flange sizes and classes are specified in API Standard 605, ANSI B16.5, and MSS SP-44.

1.3.2 A gasket shall be suitable for the same pressure-temperature conditions as the corresponding flange unless otherwise agreed upon by the purchaser and the manufacturer.

1.4 Referenced Publications

The latest edition or revision of the following standards or specifications shall, to the extent specified, form a part of this standard:

ANSI¹

- B16.5 *Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys*
- B16.21 *Nonmetallic Flat Gaskets for Pipe Flanges*

API

- Std 605 *Large-Diameter Carbon Steel Flanges*

ASME²

- B36.10M *Welded and Seamless Wrought Steel Pipe*
- B36.19M *Stainless Steel Pipe*

MSS³

- SP-44 *Steel Pipe Line Flanges*

SECTION 2—DOUBLE-JACKETED GASKETS

2.1 Design

2.1.1 Double-jacketed gaskets shall be made with a filler completely enclosed in a corrugated metal jacket (see illustrations in Tables A-1, A-2, and A-3).

2.1.2 For gaskets NPS 8 and larger, the corrugation pitch shall be a minimum of 0.13 inch (3.2 millimeters) and a maximum of 0.25 inch (6.4 millimeters). For gaskets NPS 6 and smaller, the pitch shall not exceed 0.16 inch (4.0 millimeters).

2.1.3 The jacket metal thickness shall be a minimum of 0.015 inch (0.4 millimeter).

2.1.4 The filler shall be a minimum of 0.06 inch (1.5 millimeter) thick.

2.1.5 Other details of design, including the density of the filler, shall be the manufacturer's standard.

2.2 Dimensions

The inside and outside diameters and the thickness of a double-jacketed gasket (including tolerances) shall conform to Tables A-1, A-2, and A-3 for the NPS, class, and flange standard specified in the purchase order.

2.3 Standard Material

2.3.1 The standard materials shall be a soft carbon steel jacket and a filler of asbestos that has a suitable binder.

2.3.2 A jacket and/or filler of other materials may be specified by the purchaser. All jacket and filler materials are suitable for the dimensions listed in Table A-1. Only the jacket and filler materials of ANSI B16.5,

Gasket Group I, are suitable for the dimensions listed in Tables A-2 and A-3, except that the materials of ANSI B16.5, Gasket Group II, are also suitable for Classes 150 and 300 flanges listed in Table A-2. For other materials, the purchaser shall verify the suitability of the gasket.

2.4 Marking

2.4.1 Double-jacketed gaskets shall be tagged or, if the gasket size permits, marked with waterproof ink, using symbols approximately 0.25 inch (6.4 millimeters) high, as follows (see Figure 1):

- a. Flange size (NPS).
- b. Class.
- c. Jacket material identification abbreviation/number, if the material is other than soft carbon steel (see Table 2).
- d. Filler material identification, if the material is other than asbestos (see Table 2).
- e. Identification (API 601).
- f. Manufacturer's identification (trademark or name).
- g. API 605, for gaskets to be used with flanges conforming to API Standard 605; or SP-44, for gaskets to be used with flanges conforming to MSS SP-44. Gaskets to be used with ANSI B16.5 flanges do not require identification to that standard.

2.4.2 If a gasket is suitable for more than one pressure class, the marking shall include all applicable classes.

2.4.3 The jacket material identification for non-standard materials shall use the material abbreviations/numbers listed in Table 2 or shall spell out the entire name.

¹American National Standards Institute, 1430 Broadway, New York, New York 10018.

²American Society of Mechanical Engineers, 345 East 47th Street, New York, New York 10017.

³Manufacturers Standardization Society of the Valve and Fittings Industry, 127 Park Street, N.E., Vienna, Virginia 22180.