ASME B16.47-2025

(Revision of ASME B16.47-2020)

Large Diameter Steel Flanges

NPS 26 Through NPS 60 Metric/Inch Standard

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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FOREWORD

In November 1980, a task force was appointed within Subcommittee C of the American National Standards Institute (ANSI) B16 Committee to develop a standard for pipe flanges in sizes NPS 26 through NPS 48. Every attempt was made to standardize those dimensions that existed within the industry for the materials covered by ANSI B16.5.

Prompted by suggestions from committee members, the task force was authorized to increase the size range to NPS 60. The first draft was developed in December 1982 to include Class 75 through Class 1500 for the size range NPS 26 through NPS 60. Flange dimensions were based on the Manufacturers Standardization Society, Standard Practice (MSS SP) 44 flanges, except for Class 75 flanges that are ANSI/API 605 flanges.

At the request of the American Petroleum Institute (API), flange dimensions, in accordance with the API Standard 605, were included in the subsequent drafts. Class 1500 flanges were deleted due to a lack of interest in using large-size flanges in that pressure–temperature rating.

The API 605 flanges for Classes 150 and 300 and for sizes NPS 36 and smaller for classes higher than Class 300 are not compatible with the MSS SP-44 flanges. Thus, the MSS SP-44 flanges are designated as Series A flanges, and the API 605 flanges are designated as Series B flanges in this Standard. Materials covered in this Standard are as in ANSI B16.5, except nickel base alloys are excluded. Pressure–temperature ratings are in accordance with ANSI B16.5.

In 1982, American National Standards Committee B16 was reorganized as the American Society of Mechanical Engineers (ASME) B16 Committee operating under procedures accredited by ANSI. Following approval by the Standards Committee and ASME, approval as an American National Standard was given by ANSI on June 12, 1990.

The 1996 edition allowed flanges marked with more than one material grade or specification, revised flange face finish requirements, revised pressure–temperature ratings for several material groups, added permissible flange facing imperfections, added blind flanges for Series B flanges, and included several other revisions. Following approval by the Standards Committee and ASME Boiler and Pressure Vessel Committee, ANSI approved the 1996 edition as an American National Standard on October 3, 1996, with the new designation ASME B16.47-1996.

In 2006, several revisions were made, including use of metric units as primary units, with U.S. Customary units in either parenthetical or separate forms. Mandatory Appendix I was provided after the main text for convenience to cover ratings and dimensions in U.S. Customary units. Inch dimension bolt holes were retained for flanges manufactured to metric dimensions to avoid fit-up problems. Development of metric dimensions was done to reflect the intended precision of the dimension rather than by numerical conversion. For some materials, pressure–temperature ratings were revised to reflect revisions to material strength properties (tensile and yield) listed in the ASME Boiler and Pressure Vessel Code, Section II. Some materials were assigned to different rating tables in order to minimize changes to ratings for commonly used materials. Following the approvals of the Standards Committee and ASME, approval for the revised edition was granted by ANSI on November 6, 2006.

In the 2011 edition, the References section was revised to cover the requirements of material specification editions other than those listed in Mandatory Appendix III. Following approval by the Standards Committee and the ASME Board on PTCS, the 2011 edition was approved as an American National Standard by ANSI on August 17, 2011, with the new designation ASME B16.47-2011.

In the 2017 edition, pressure–temperature ratings for Group 1.18 materials were revised at 650°C (1,200°F). A reference was made to MSS SP-44 for some classes of flanges made with materials having a high yield strength. A forging requirement was made explicit, and references were updated. Following approval by the ASME B16 Standards Committee, the 2017 edition was approved by ANSI as an American National Standard on March 6, 2017, with the new designation ASME B16.47-2017.

In the 2020 edition, the U.S. Customary tables formerly in Mandatory Appendix I were relocated to the main text and redesignated with a "C" suffix (e.g., Table I-1 became Table 3C). Former Mandatory Appendix I was deleted, and the subsequent Mandatory Appendix was redesignated. Cross-references were updated accordingly. In addition, ASME B16.47-2020 added bolt lengths to the dimension tables, new language describing ASME Cases, and Nonmandatory Appendix D. Following approval by the ASME B16 Standards Committee, ASME B16.47-2020 was approved by ANSI as an American National Standard on November 13, 2020.

In the 2025 edition, a new bolting material has been added to Table 2 and the table's Note (5) revised accordingly. Pressure–temperature ratings have been revised throughout the tables, and a new table for duplex materials has been introduced. Definitions of "may, "shall," and "should" have been added, and references have been updated. Following

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approval by the ASME B16 Standards Committee, ASME B16.47-2025 was approved by ANSI as an American National Standard on March 4, 2025.

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In addition, the committee may post errata on the committee web page. Errata become effective on the date posted. Users can register on the committee web page to receive email notifications of posted errata.

This Standard is always open for comment, and the committee welcomes proposals for revisions. Such proposals should be as specific as possible, citing the paragraph number, the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent background information and supporting documentation.

Cases

(a) The most common applications for cases are

(1) to permit early implementation of a revision based on an urgent need

(2) to provide alternative requirements

(3) to allow users to gain experience with alternative or potential additional requirements prior to incorporation directly into the Standard

(4) to permit the use of a new material or process

(b) Users are cautioned that not all jurisdictions or owners automatically accept cases. Cases are not to be considered as approving, recommending, certifying, or endorsing any proprietary or specific design, or as limiting in any way the freedom of manufacturers, constructors, or owners to choose any method of design or any form of construction that conforms to the Standard.

(c) A proposed case shall be written as a question and reply in the same format as existing cases. The proposal shall also include the following information:

(1) a statement of need and background information

(2) the urgency of the case (e.g., the case concerns a project that is underway or imminent)

(3) the Standard and the paragraph, figure, or table number

(4) the editions of the Standard to which the proposed case applies

(d) A case is effective for use when the public review process has been completed and it is approved by the cognizant supervisory board. Approved cases are posted on the committee web page.

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ASME B16.47-2025
SUMMARY OF CHANGES

Following approval by the ASME B16 Standards Committee and ASME, and after public review, ASME B16.47-2025 was approved by the American National Standards Institute on March 4, 2025.

In ASME B16.47-2025, titles of complementary tables have been editorially revised to indicate the applicable system of units. ASME B16.47-2025 also includes the following changes identified by a margin note, **(25)**. The Record Numbers listed below are explained in more detail in the "List of Changes in Record Number Order" following this Summary of Changes.

Page	*Location*	*Change (Record Number)*
2	1.13	Added *(22-2279)*
2	2.2	Second sentence revised *(22-2279)*
2	2.4	Revised *(21-1888)*
2	2.5.3	Revised *(21-1888)*
4	5.3.4	Last sentence deleted *(21-1888)*
5	5.3.5	Second sentence of subpara. (a) revised *(22-2279)*
11	Table 1	Revised *(21-1888, 23-2374)*
13	Table 2	(1) A320-L7M added and Note (5) revised *(22-651)*
		(2) Note (7) deleted and subsequent notes renumbered *(21-1888)*
14	Table 3	Revised *(21-1888, 22-2277, 23-2374)*
15	Table 3C	Revised *(21-1888, 23-2374)*
16	Table 4	Revised *(21-1888, 22-2277, 23-2374)*
17	Table 4C	Revised *(21-1888, 23-2374)*
18	Table 5	Revised *(21-1888, 22-2277, 23-2374)*
19	Table 5C	Revised *(21-1888, 23-2374)*
20	Table 6	Revised *(21-1888, 22-2277, 23-2374)*
21	Table 6C	Revised *(21-1888, 23-2374)*
22	Table 7	Revised *(21-1888, 23-2374)*
23	Table 7C	Revised *(21-1888, 23-2374)*
24	Table 8	Revised *(21-1888, 23-2374)*
25	Table 8C	Revised *(21-1888, 23-2374)*
26	Table 9	Revised *(21-1888, 23-2374)*
27	Table 9C	Revised *(21-1888, 23-2374)*
28	Table 10	Revised *(21-1888, 23-2374)*
29	Table 10C	Revised *(21-1888, 23-2374)*
30	Table 11	Revised *(21-1888, 23-2374)*
31	Table 11C	Revised *(21-1888, 23-2374)*
32	Table 12	Revised *(21-1888, 23-2374)*
33	Table 12C	Revised *(21-1888, 23-2374)*
34	Table 13	Revised *(21-1888, 23-2374)*
35	Table 13C	Revised *(21-1888, 23-2374)*

Page	*Location*	*Change (Record Number)*
36	Table 14	Revised *(21-1888, 23-2374)*
37	Table 14C	Revised *(21-1888, 23-2374)*
38	Table 15	Revised *(21-1888, 23-2374)*
39	Table 15C	Revised *(21-1888, 23-2374)*
40	Table 16	Revised *(21-1888, 23-2374)*
41	Table 16C	Revised *(21-1888, 23-2374)*
42	Table 17	Revised *(21-1888, 23-2374)*
43	Table 17C	Revised *(21-1888, 23-2374)*
44	Table 18	Revised *(21-1888, 23-2374)*
45	Table 18C	Revised *(21-1888, 23-2374)*
46	Table 19	Revised *(21-1888, 23-2374)*
47	Table 19C	Revised *(21-1888, 23-2374)*
48	Table 20	(1) Revised *(21-1888, 23-2374)*
		(2) For Class 150, working pressure at 400°C corrected by errata to 5.5 bar *(22-203)*
49	Table 20C	Revised *(21-1888, 23-2374)*
50	Table 21	Revised *(21-1888, 22-2277, 23-2374)*
51	Table 21C	Revised *(21-1888, 23-2374)*
52	Table 22	Revised *(21-1888, 23-2374)*
53	Table 22C	Revised *(21-1888, 23-2374)*
54	Table 23	Revised *(21-1888, 23-2374)*
55	Table 23C	Revised *(21-1888, 23-2374)*
56	Table 24	Revised *(21-1888, 23-2374)*
56	Table 24C	Revised *(21-1888, 23-2374)*
57	Table 25	Revised *(21-1888, 22-2277, 23-2374)*
58	Table 25C	Revised *(21-1888, 23-2374)*
59	Table 26	Revised *(21-1888, 23-2374)*
60	Table 26C	Revised *(21-1888, 23-2374)*
61	Table 27	Revised *(21-1888, 23-2374)*
62	Table 27C	Revised *(21-1888, 23-2374)*
63	Table 28	Revised *(21-1888, 23-2374)*
64	Table 28C	Revised *(21-1888, 23-2374)*
65	Table 29	Added and subsequent tables redesignated *(21-1888, 23-2374)*
65	Table 29C	Added and subsequent tables redesignated *(21-1888, 23-2374)*
69	Table 32	Formerly Table 31; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
71	Table 32C	Formerly Table 31C; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
73	Table 33	Formerly Table 32; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
75	Table 33C	Formerly Table 32C; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
77	Table 34	Formerly Table 33; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
79	Table 34C	Formerly Table 33C; subheadings under "Minimum Thickness of Flange, t_f" editorially revised

Page	*Location*	*Change (Record Number)*
81	Table 35	Formerly Table 34; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
83	Table 35C	Formerly Table 34C; subheadings under "Minimum Thickness of Flange, tt_f" editorially revised
85	Table 36	(1) Formerly Table 35; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
		(2) Minimum thickness for a weld neck flange of nominal pipe size 30 corrected by errata to 149.4 mm *(22-99)*
87	Table 36C	Formerly Table 35C; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
89	Table 37	Formerly Table 36; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
91	Table 37C	Formerly Table 36C; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
93	Table 38	Formerly Table 37; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
95	Table 38C	Formerly Table 37C; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
97	Table 39	Formerly Table 38; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
99	Table 39C	Formerly Table 38C; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
101	Table 40	Formerly Table 39; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
103	Table 40C	Formerly Table 39C; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
105	Table 41	Formerly Table 40; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
107	Table 41C	Formerly Table 40C; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
109	Table 42	Formerly Table 41; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
111	Table 42C	Formerly Table 41C; subheadings under "Minimum Thickness of Flange, t_f" editorially revised
114	Mandatory Appendix I	Updated *(23-2265)*
118	Table A-1	(1) Title editorially revised
		(2) Under Temperature, °C, first entry revised *(21-1888)*
		(3) Ceiling pressures for Classes 300 through 900 revised *(22-2110)*
119	Table A-1C	(1) Formerly Table A-2; designator and title editorially revised
		(2) Under Temperature, °F, first entry revised *(21-1888)*
		(3) Ceiling pressures for Classes 300 through 900 revised *(22-2110)*
123	Table D-1	Editorially reformatted

LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
21-1888	Revised paras. 2.4, 2.5.3, and 5.3.4 as well as Table 1, Table 2, Tables 3 though 28 (Tables 3C through 28C), and Table A-1 [Table A-1C (formerly Table A-2)]. Updated references in Mandatory Appendix I.
22-99	Errata correction. See Summary of Changes for details.
22-203	Errata correction. See Summary of Changes for details.
22-651	Added bolting material to Table 2.
22-2110	Revised ceiling pressures for Classes 300 through 900 in Table A-1 [Table A-1C (formerly Table A-2)].
22-2277	In notes of Tables 3 through 6, 21, and 25, revised metric temperatures to the nearest degree.
22-2279	Added para. 1.13 to define “may,” “shall,” and “should.” Revised “must” to “shall” in second sentence of paras. 2.2 and to “should” in second sentence of para. 5.3.5(a).
23-2265	Updated the references.
23-2374	Revised materials in Table 1 and pressure values and notes in Tables 3 through 28 (Tables 3C through 28C). Added Table 29 (Table 29C) for Group 2.13 materials.

LARGE DIAMETER STEEL FLANGES NPS 26 Through NPS 60 Metric/Inch Standard

1 GENERAL

1.1 Scope

This Standard covers pressure–temperature ratings, materials, dimensions, tolerances, marking, and testing for pipe flanges in sizes NPS 26 through NPS 60. Included are flanges with rating class designations 75, 150, 300, 400, 600, and 900 with requirements given in both SI (Metric) and U.S. Customary units, with diameter of bolts and flange bolt holes expressed in inch units.

This Standard is limited to

(a) flanges made from cast or forged materials

(b) blind flanges made from cast, forged, or plate materials (see Tables 1 and 2)

Also included in this Standard are requirements and recommendations regarding flange bolting, flange gaskets, and flange joints.

1.2 Flange Series

This Standard provides two series of flange dimensions. Series A specifies flange dimensions for general use flanges. Series B specifies flange dimensions for compact flanges that, in most cases, have smaller bolt circle diameters than Series A flanges. These two series of flanges are, in general, not interchangeable. The user should recognize that some flanged valves, equipment bolted between flanges, and flanged equipment may be compatible with only one series of these flanges.

1.3 References

Codes, standards, and specifications, containing provisions to the extent referenced herein, constitute requirements of this Standard. These references are listed in Mandatory Appendix I.

1.4 Time of Purchase, Manufacture, or Installation

The pressure–temperature ratings in this Standard are applicable upon its publication to all flanges within its scope that otherwise meet its requirement. For unused flanges maintained in inventory, the manufacturer of the flange may certify conformance to this edition, provided that it can be demonstrated that all requirements of this edition have been met. Where such components were installed in accordance with the pressure–temperature ratings of an earlier edition of this Standard, those ratings are applicable, except as may be governed by the applicable code or regulation.

1.5 User Accountability

This Standard cites responsibilities that are to be assumed by the flange user in the areas of, for example

(a) application

(b) installation

(c) system pressure testing

(d) operation

(e) material selection

1.6 Quality Systems

Requirements relating to the product manufacturer's quality system program are described in Nonmandatory Appendix C.

1.7 Relevant Units

This Standard states values in both SI (Metric) and U.S. Customary units. As an exception, diameter of bolts and flange bolt holes are expressed in inch units only. These systems of units are to be regarded separately as standard. Within the text, the U.S. Customary units are shown in parentheses. The values stated in each system are not exact equivalents; therefore, it is required that each system of units be used independently of the other. Except for diameter of bolts and flange bolt holes, combining values from the two systems constitutes nonconformance with the Standard.

1.8 Selection of Materials

Criteria for selection of materials suitable for particular fluid service are not within the scope of this Standard.

1.9 Convention

For determining conformance with this Standard, the convention for fixing significant digits where limits (maximum and minimum values) are specified shall be as defined in ASTM Practice E29. This requires that an observed or calculated value be rounded off to the