ASME B16.47-2020
(Revision of ASME B16.47-2017)

# 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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(Revision of ASME B16.47-2017)

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## NPS 26 Through NPS 60
## Metric/Inch Standard

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers
Two Park Avenue • New York, NY • 10016 USA

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The next edition of this Standard is scheduled for publication in 2024.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. Periodically certain actions of the ASME B16 Committee may be published as Cases. Cases and interpretations are published on the ASME website under the Committee Pages at http://cstools.asme.org/ as they are issued.

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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 ASME B16.47-2020, the U.S. Customary tables formerly in Mandatory Appendix I have been relocated to the main text and redesignated with a "C" suffix (e.g., Table I-1 is now Table 3C). Former Mandatory Appendix I has been deleted, and the subsequent Mandatory Appendix has been redesignated. Cross-references have been updated accordingly. In addition, this edition includes a new Nonmandatory Appendix D and new language describing ASME Cases, and bolt lengths have been added to the dimension tables. Following approval by the ASME B16 Standards Committee, this revision to the 2017 edition was approved by ANSI as an American National Standard on November 13, 2020, with the new designation ASME B16.47-2020.

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(The following is the roster of the Committee at the time of approval of this Standard.)

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# CORRESPONDENCE WITH THE B16 COMMITTEE

**General.** ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions or a case, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B16 Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990
http://go.asme.org/Inquiry

**Proposing Revisions.** Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

**Proposing a Case.** Cases may be issued to provide alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Standard and the paragraph, figure, or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Standard to which the proposed Case applies.

**Interpretations.** Upon request, the B16 Standards Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B16 Standards Committee.

Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at http://go.asme.org/InterpretationRequest. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she may e-mail the request to the Secretary of the B16 Standards Committee at SecretaryB16@asme.org, or mail it to the above address. The request for an interpretation should be clear and unambiguous. It is further recommended that the Inquirer submit his/her request in the following format:

| | |
|---|---|
| Subject: | Cite the applicable paragraph number(s) and the topic of the inquiry in one or two words. |
| Edition: | Cite the applicable edition of the Standard for which the interpretation is being requested. |
| Question: | Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. Please provide a condensed and precise question, composed in such a way that a “yes” or “no” reply is acceptable. |
| Proposed Reply(ies): | Provide a proposed reply(ies) in the form of “Yes” or “No,” with explanation as needed. If entering replies to more than one question, please number the questions and replies. |
| Background Information: | Provide the Committee with any background information that will assist the Committee in understanding the inquiry. The Inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information. |

Requests that are not in the format described above may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

Moreover, ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Standard requirements. If, based on the inquiry information submitted, it is the opinion of the Committee that the Inquirer should seek assistance, the inquiry will be returned with the recommendation that such assistance be obtained.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

**Attending Committee Meetings.** The B16 Standards Committee regularly holds meetings and/or telephone conferences that are open to the public. Persons wishing to attend any meeting and/or telephone conference should contact the Secretary of the B16 Standards Committee.

# ASME B16.47-2020
# SUMMARY OF CHANGES

Following approval by the ASME B16 Standards Committee and ASME, and after public review, ASME B16.47-2020 was approved by the American National Standards Institute on November 13, 2020.

In ASME B16.47-2020, the U.S. Customary tables formerly in Mandatory Appendix I have been relocated to the main text and redesignated with a "C" suffix (e.g., Table I-1 is now Table 3C). Former Mandatory Appendix I has been deleted, and the subsequent Mandatory Appendix has been redesignated. Cross-references have been updated accordingly. In addition, this edition includes the following changes identified by a margin note, **(20)**. 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)* |
|---|---|---|
| 1 | 1 | Title revised *(18-869)* |
| 1 | 1.1 | Title revised *(18-869)* |
| 2 | 1.12 | Added *(18-869)* |
| 4 | 4.2.9 | Added *(18-869)* |
| 5 | 6.1.1 | Revised *(19-1684)* |
| 6 | 6.5.2 | Added and subsequent paragraph redesignated *(18-1108)* |
| 6 | 7.1 | Subparagraphs (a) and (b) revised *(19-1684)* |
| 6 | 7.2 | In-text table revised *(19-1684)* |
| 6 | 7.3.1 | Revised *(19-1684)* |
| 6 | 7.3.2 | Subparagraphs (a) and (b) revised *(19-1684)* |
| 7 | 7.4 | Revised *(19-1684)* |
| 8 | Figure 1 | U.S. Customary values added |
| 9 | Figure 2 | U.S. Customary values added |
| 10 | Figure 3 | U.S. Customary values added |
| 11 | Table 1 | For Material Group 1.15, "Forgings" entry revised *(20-887)* |
| 36 | Table 14 | (1) Forgings material revised *(20-887)*<br>(2) For 600°C, 625°C, and 650°C, working pressures revised *(20-887)* |
| 37 | Table 14C | (1) Forgings material revised *(20-887)*<br>(2) For 1,100°F, 1,150°F, and 1,200°F, working pressures revised *(20-887)* |
| 66 | Table 29 | Tolerances revised *(18-1108)* |
| 67 | Table 29C | Tolerances revised *(18-1108)* |
| 68 | Table 30 | Revised |
| 68 | Table 30C | Former Table I-28 revised |
| 69 | Table 31 | Revised |
| 71 | Table 31C | Former Table I-29 revised |
| 73 | Table 32 | Revised |
| 75 | Table 32C | Former Table I-30 revised |
| 77 | Table 33 | Revised |
| 79 | Table 33C | Former Table I-31 revised |

| *Page* | *Location* | *Change (Record Number)* |
|---|---|---|
| 81 | Table 34 | Revised |
| 83 | Table 34C | Former Table I-32 revised |
| 85 | Table 35 | Revised |
| 87 | Table 35C | Former Table I-33 revised |
| 89 | Table 36 | Revised |
| 91 | Table 36C | Former Table I-34 revised |
| 93 | Table 37 | Revised |
| 95 | Table 37C | Former Table I-35 revised |
| 97 | Table 38 | Revised |
| 99 | Table 38C | Former Table I-36 revised |
| 101 | Table 39 | Revised |
| 103 | Table 39C | Former Table I-37 revised |
| 105 | Table 40 | Revised |
| 107 | Table 40C | Former Table I-38 revised |
| 109 | Table 41 | Revised |
| 111 | Table 41C | Former Table I-39 revised |
| 112 | Table 42 | Spelling of “coarse” corrected by errata |
| 113 | Mandatory Appendix I | References updated |
| 122 | Nonmandatory Appendix D | Added *(18-1108)* |

# LIST OF CHANGES IN RECORD NUMBER ORDER

| Record Number | Change |
|---|---|
| 14-2169 | Revised para. 5.3.4 to reference para. 5.4.2 and Nonmandatory Appendix B. |
| 17-655 | Revised General Note (g) in Tables 31 through 41 (Tables 31C through 41C) to address reducing flanges or pressure taps made in blind flanges for testing, vents, or drains. |
| 18-869 | Revised titles of Section 1 and para. 1.1 and added new paras. 1.12 and 4.2.9 to provide guidance on ASME Cases. |
| 18-1108 | Added new para. 6.5.2 and Nonmandatory Appendix D so that information on minimum bolt length matches that in ASME B16.5. |
| 19-1684 | Revised metric dimensions to align with U.S. Customary dimensions. |
| 20-887 | Revised Tables 1 and 14 (14C) to add a material nomenclature change from A182 Gr. F91 to A182 Gr. F91 Type 1. |

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

## (20) 1 GENERAL

### (20) 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