ASME B16.34-2017
(Revision of ASME B16.34-2013)

Valves — Flanged, Threaded, and Welding End

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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

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The American Society of Mechanical Engineers
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FOREWORD

In December 1969, American National Standards Committee B16 changed its name from Standardization of Pipe Flanges and Fittings to Standardization of Valves, Fittings, and Gaskets, reflecting American National Standards Institute (ANSI) approval of a broadened scope for the B16 Committee. At the same meeting, the committee approved a plan for the organization of a subcommittee to develop a new standard for steel valves with other than flanged ends. Subsequently, B16 Subcommittee 15 was appointed and held its first meeting in December 1970.

Historically, in the development of standards and pressure–temperature ratings for steel valves, the various rating classes for flanges provided an obviously logical basis for valve ratings. Steel valves with flanges of standard dimensions, many also offered in buttwelding-end versions, were given the same pressure–temperature ratings as the flanges. In 1949, a new edition of the Standard, then designated B16e-1949, was published, in which a table covering wall thickness requirements for weld end valves had been added. In 1964, the Manufacturer's Standardization Society of the Valve and Fittings Industry developed and published Standard Practice SP-66, covering pressure–temperature ratings of steel buttwelding-end valves. MSS SP-66 introduced a new method for establishing ratings by making ratings a function of the mechanical strength properties of the body material at all temperatures. Following the publication of MSS SP-66, B16 activated Subcommittee 4 for the purpose of studying the general subject of pressure–temperature ratings and developing rational criteria for such ratings.

In the B16 charge to Subcommittee 15, it was established that the new Standard would replace MSS SP-66 and also remove the reference to buttwelding-end valves from B16.5. Flanged-end valves would continue to be covered in B16.5 but on a fully specified basis, rather than as an add-on.

As the work of the subcommittee got underway, concurrent action was initiated in Subcommittee 3 for revision of B16.5. Subsequent operations of Subcommittees 3 and 15 were closely coordinated to provide assurance that the new Standard and the revised B16.5 would be compatible.

A key and basic issue of mutual concern in this coordination was the matter of pressure–temperature ratings. It was necessary to incorporate the SP-66-type ratings in the new Standard, but at the same time also to provide ratings equivalent to those in B16.5 covering the buttwelding equivalents of flanged-end valves. Subcommittee 4 had made definitive recommendations for revisions in the flange ratings and it was obviously desirable to rationalize the two types of ratings as they would appear side by side in the new Standard.

The results of these efforts appear herein in the form of pressure–temperature ratings tables. The method of computing the ratings is detailed in Nonmandatory Appendix B. The ratings differ from the pre-1968 B16.5 ratings because they are now calculated as a function of the mechanical properties of the pressure boundary materials, in contrast to the empirical basis used previously. A change in the SP-66-type rating (herein designated Special Class) discontinues the application of a plasticity factor at elevated temperatures which, in the opinion of the committee, could not be justified in dimension-sensitive valves.

Other innovations include the coverage of forged or fabricated body valves and an increase in detailed coverage by pressure–temperature ratings from 17 materials in B16.5 to 24 material groups in the new Standard and in the revised B16.5. Dimensional requirements were refined and augmented to give the designer more latitude and the user more assurance of adequacy. A number of the innovations have had trial use and at least some degree of acceptance, as they have been taken from the section on valve requirements developed and published by the ASME Boiler and Pressure Vessel Code to cover valves used in nuclear power plants. A section on valve testing eliminates uncertainties on such points as seat test requirements and stem seal testing.

Approval for the 1973 edition of the Standard by ANSI was granted in October 1973.

In December 1973, a reorganization of the subcommittee structure for B16 was approved. Subcommittee 15 was redesignated as Subcommittee N and was assigned responsibility for all steel valves. Work began to include coverage for flanged-end valves in ANSI B16.34. The 1977 edition contained flanged-end valve requirements formerly in ANSI B16.5. The rating procedures of B16.5 were adopted and made applicable to Standard Class buttwelding-end valves. The method of deriving ratings was revised. Major changes were made in the method for determining ratings for austenitic stainless steel valves and ratings for Class 150 valves for all materials. The pressure–temperature tables and materials groups were rearranged and revised using data from the reference Sections of the ASME Boiler and Pressure Vessel Code through the Summer 1975 Addenda. A number of clarifying and editorial revisions were also made in order to improve the text. It was also resolved that frequent minor changes in pressure–temperature ratings because of revisions to the reference material

strength property tables should be avoided and that, as a general guide, such changes should not be considered unless resulting ratings would be changed by an amount in excess of 10%.

Approval for the 1977 edition of the Standard by ANSI was granted on June 16, 1977.

In 1979, work began on the 1981 edition. Materials coverage was expanded. Nickel alloys and other alloys were added. Bolting rules were revised to accommodate special alloy bolting for the new materials. Revisions were included to clarify requirements for rotary motion valves, e.g., ball valves and butterfly valves. Wafer-type valves were specifically identified. Other clarifying and editorial revisions were made in order to improve the text.

Following approvals by the Standards Committee and Secretariat, approval for the 1981 edition was granted by ANSI on August 14, 1981.

During 1985, revisions were proposed that added requirements for socket welding-end and threaded-end valves. The inclusion of requirements for these valves increased the scope of the Standard. Also, the listings for nickel alloy and other alloy valves materials were expanded. Rules for threaded body joints were added, and wafer-type valve body rules improved.

Following approvals by the Standards Committee and ASME, approval for the 1988 edition was granted by ANSI on February 24, 1988.

During 1993 and carrying over into 1994, revisions offered included multiple material marking and an improved interpolation procedure. New materials were added and the pressure–temperature rating tables were recalculated in accordance with Nonmandatory Appendix B using the latest data available from the reference ASME Boiler and Pressure Vessel Code sources. An appendix was added covering nonmandatory requirements for a quality system program.

Following the approvals of the Standards Committee and ASME, approval for the new edition was granted by ANSI on October 3, 1996.

Work started in 1999 to revise the Standard to include metric units as the primary reference units while maintaining U.S. Customary units in either parenthetical or separate forms. The goal is to delete the U.S. Customary units in a future revision. All pressure–temperature ratings have been recalculated using data from the latest edition of the ASME Boiler and Pressure Vessel Code, Section II, Part D. As a result, some materials have been shifted to other material groups and some changes were made to some valve ratings within material groups. Because of diminished interest for flanged end valves conforming to ASME Class 400, they are not specifically listed in this revision. Flanges for Class 400 will continue to be listed in B16 flange standards. Provisions were made to allow Class 400 valves to be furnished as intermediate rated valves. Numerous requirement clarifications and editorial revisions were also made.

Work started in 2007 to revise the Standard. Metric units remained the primary reference units with U.S. Customary units in either parenthetical or separate forms shown as in the earlier edition. Pressure–temperature ratings, in some cases, were revised, and new materials were added, all in keeping with the material properties provided in the latest edition of the ASME Boiler and Pressure Vessel Code, Section II, Part D. A number of requirement clarifications and editorial revisions were also made.

Following the approvals of the Standards Committee and ASME, approval for the 2009 edition was granted by ANSI on June 18, 2009.

Work started in 2009 to correct material listings with the material groups. Additionally, ASME B16.47 was added as a reference, and flanged-end valves coverage was expanded to NPS 50. A number of requirement clarifications and editorial revisions were also made.

Following the approvals of the Standards Committee and ASME, approval for the 2013 edition was granted by ANSI on February 19, 2013.

For 2017, valves up to NPS 60 are covered; a reference has been added for materials manufactured to other editions; and changes have been made to allowable materials. Pressure–temperature tables were also updated for consistency with the 2017 editions of ASME B16.5 and ASME B16.47.

This revision was approved by the American National Standards Institute on March 9, 2017.

ASME B16 COMMITTEE
Standardization of Valves, Flanges, Fittings, and Gaskets

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

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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.

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.

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INTRODUCTION

An American National Standard is intended as a basis for common practice by the manufacturer, the user, and the general public. The existence of an American National Standard does not in itself preclude the manufacture, sale, or use of products not conforming to the standard. Mandatory conformance is established, for example, by reference to the standard in a code, specification, sales contract, or public law.

It should be noted, specifically regarding this Standard, that certain requirements reflecting the general application of valves in a wide variety of services may not be considered to be appropriate for some valves whose application is known and which may incorporate certain features found by successful experience to be satisfactory. A specific case in point is that involving valves developed and used in gas and petroleum product pipelines. Conformance of such valves to the existing API 6D may by itself be sufficient to satisfy requirements of federal rules and regulations established by the Department of Transportation, Office of Pipeline Safety Operations. Another specific case is that involving valves used in instrument systems under an applicable piping code. Conformance of such valves to the requirements of an existing piping code may by itself be sufficient to satisfy jurisdictional rules and regulations.

This edition of ASME B16.34 states values in both Metric and U.S. Customary units of measurement. These systems of units are to be regarded separately. The values stated in each system are not exact equivalents; therefore each system shall be used independently of the other. Combining values from the two systems constitutes nonconformance with this Standard.

ASME B16.34-2017
SUMMARY OF CHANGES

Following approval by the ASME B16 Committee and ASME, and after public review, ASME B16.34-2017 was approved by the American National Standards Institute on March 9, 2017.

ASME B16.34-2017 includes the following changes identified by a margin note, **(17)**.

Page	*Location*	*Change (Record Number)*
2	1.6	Added new para. 1.6; former para. 1.6 redesignated as para. 1.7 *(14-1125)*
2	2.1.1	Subparagraph (a) revised *(11-2234)*
3	2.1.6	Subparagraph (c)(1) revised and (c)(3) added *(14-1125)*
6	5.2.1	Revised *(16-715)*
6	6.1.1	Revised *(16-701)*
6	6.1.2	Subparagraph (c) revised *(14-1124)*
23	Table 1	(1) In Material Group No. 2.2, tenth row added, and former eleventh row deleted *(13-1486)* (2) Material Group No. 2.8 revised *(14-1384)*
75	Table 2-2.8	(1) A995 Gr. 6A revised to A995 Gr. CD3MN *(14-1384)* (2) A995 Gr. 1B revised to A995 Gr. CD4MCuN *(14-1384)* (3) A351 Gr. CE8MN revised to A995 Gr. CE8MN *(14-1384)*
112	Table 3A	(1) Under Class 900, entry for 710 mm revised *(12-2084)* (2) Rows for 1320 mm through 1500 mm added *(11-2234)*
116	Table 3B	Rows for 51.00 in. through 60.00 in. added *(11-2234)*
129	Table VI-1	In second column, third, sixth, and ninth entries revised *(11-2234)*
130	Table VI-2	In second column, third, sixth, and ninth entries revised *(11-2234)*
132	Table VII-2-1.1	Under A — Standard Class, eighth entry under Class 1500 revised *(16-716)*
137	Table VII-2-1.5	Under A — Standard Class, third entry under Class 900 and second entry under Class 1500 revised *(16-716, 15-2360)*
144	Table VII-2-1.10	Under A — Standard Class, thirteenth entry under Class 600 revised *(15-2360)*
164	Table VII-2-2.2	A182 Gr. F317H, A240 Gr. 317H, and A312 Gr. TP317H deleted *(13-1486)*

167	Table VII-2-2.4	Under A — Standard Class, for 1,050°F, entry under Class 300 revised *(15-2360)*
171	Table VII-2-2.6	Under B — Special Class, for 1,350°F, entry under Class 1500 revised *(15-2360)*
175	Table VII-2-2.8	(1) A995 Gr. 6A revised to A995 Gr. CD3MN *(14-1384)* (2) A995 Gr. 1B revised to A995 Gr. CD4MCuN *(14-1384)* (3) A351 Gr. CE8MN revised to A995 Gr. CE8MN *(14-1384)*
210	Mandatory Appendix VIII	(1) First paragraph revised *(10-532)* (2) ASTM A351 and ASTM A995 revised *(14-1384)* (3) MSS SP-134 added *(14-1125)*
215	Table A-1	Entries for NPS 52 through NPS 60 added *(11-2234)*

LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
10-532	Revised first paragraph in Mandatory Appendix VIII so that other editions of ASTM specifications may be used with ASME B16.34.
11-2234	Revised para. 2.1.1(a) and Tables 3A, 3B, VI-1, VI-2, and A-1 to cover valves up to NPS 60.
12-2084	Revised Table 3A minimum wall thickness for Class 900 valve with 710 mm bore.
13-1486	Revised Tables 1 and VII-2-2.2 to remove Material 317H.
14-1124	Revised para. 6.1.2.
14-1125	Added new para. 1.6 and revised para. 2.1.6(c) by adding subparagraph (c). Added MSS SP-134-2012 to references in Mandatory Appendix VIII.
14-1384	Revised Tables 1, 2-2.8, and VII-2-2.8 to correct ASTM material that does not exist. Updated ASTM A351 and ASTM A995 in Mandatory Appendix VIII.
15-2360	Revised Tables VII-2-1.5, VII-2-1.10, VII-2-2.4, and VII-2-2.6 to align with ASME B16.5 and ASME B16.47.
16-701	Revised para. 6.1.1 to reference Nonmandatory Appendix B, B-4, which addresses interpolation of intermediate minimum wall thickness.
16-715	Revised para. 5.2.1 to reference Section II, Part D, Nonmandatory Appendix A.
16-716	Revised Tables VII-2-1.1 and VII-2-1.5 to be consistent with ASME B16.5.

VALVES — FLANGED, THREADED, AND WELDING END

1 SCOPE

1.1 General

This Standard applies to new construction and covers pressure–temperature ratings, dimensions, tolerances, materials, nondestructive examination requirements, testing, and marking for cast, forged, and fabricated flanged, threaded, and welding end and wafer or flangeless valves of steel, nickel-base alloys, and other alloys shown in Table 1. Wafer or flangeless valves, bolted or through-bolt types, that are installed between flanges or against a flange are treated as flanged-end valves. Alternative rules for NPS $2\frac{1}{2}$ and smaller valves are given in Mandatory Appendix V.

1.2 Applicability

1.2.1 Standards and Specifications. Standards and specifications adopted by reference in this Standard and the names and addresses of the sponsoring organizations are shown in Mandatory Appendix VIII. It is not considered practical to refer to a specific edition of each of the standards and specifications in the individual clause references. Instead, the specific edition references are included in Mandatory Appendix VIII. A product made in conformance with a prior edition of reference standards and in all other respects conforming to this Standard shall be considered to be in conformance even though the edition reference may have been changed in a subsequent revision of this Standard.

1.2.2 Time of Purchase, Manufacture, or Installation. The pressure–temperature ratings included in this Standard are applicable, upon publication, to all valves covered within its scope that meet its requirements. For unused valves, valves that have been maintained in inventory, the manufacturer may certify conformance to this edition provided that it can be demonstrated that all requirements of this edition have been met. However, where such components were installed under the pressure–temperature ratings of an earlier edition of ASME B16.34, those ratings shall apply except as may be governed by an applicable Code or regulation.

1.2.3 User Accountability. This Standard cites duties and responsibilities that are to be assumed by the valve user in the areas of, for example, application, installation, system hydrostatic testing, operation, and material selection.

1.2.4 Quality Systems. Requirements relating to a valve manufacturer's Quality System Program are described in Nonmandatory Appendix C.

1.2.5 Relevant Units. This Standard states values in both SI (Metric) and U.S. Customary units. These systems of units are to be regarded separately as standard. Within the text, the U.S. Customary units are shown in parentheses or in separate tables that appear in Mandatory Appendix VII. 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. Combining values from the two systems constitutes nonconformance with the Standard.

1.3 Selection of Valve Types and Material Service Conditions

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

1.4 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 E29. This requires that an observed or calculated value be rounded off to the nearest unit in the last right-hand digit used for expressing the limit. Decimal values and tolerances do not imply a particular method of measurement.

1.5 Denotation

1.5.1 Pressure Rating Designation. Class followed by a dimensionless number is the designation for pressure–temperature ratings. Standardized designations are as follows:

Class 150 300 600 900 1500 2500 4500

Class 400, an infrequently used flanged-end valve designation, is regarded as an intermediate class designation.

1.5.2 Size. NPS followed by a dimensionless number is the designation for nominal valve size. NPS is related to the reference *nominal diameter*, DN, used in international standards. The relationship is, typically, as follows:

NPS	DN
1/4	8
3/8	10
1/2	15
3/4	20
1	25
1 1/4	32
1 1/2	40
2	50
2 1/2	65
3	80
4	100

For NPS ≥ 4, the related DN = 25 × NPS number.

(17) **1.6 Cryogenic Service**

Valves in cryogenic service shall meet the additional requirements specified in MSS SP-134.

1.7 References

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

2 PRESSURE–TEMPERATURE RATINGS

2.1 General

Pressure–temperature ratings are designated by class numbers. Each class number is further identified as Standard, Special, or Limited Class.

(17) **2.1.1 Rating Designations.** Pressure–temperature ratings are tabulated for Standard and Special Class Pressure Rating Designation numbers 150, 300, 600, 900, 1500, 2500, and 4500 in Table 2-1.1 through Table 2-3.19 in metric units and in Mandatory Appendix VII in U.S. Customary units. Ratings for Limited Class are determined by the method in Mandatory Appendix V.[1]

(a) Flanged-end valves shall be rated only as Standard Class. Flanged-end valves larger than NPS 60 are beyond the scope of this Standard.

(b) Class 4500 applies only to welding-end valves.

(c) A class designation greater than Class 2500 or a rating temperature greater than 538°C (1,000°F) applied to threaded-end valves is beyond the scope of this Standard.

(d) Threaded and socket welding-end valves larger than NPS 2 1/2 are beyond the scope of this Standard.

(e) Except as provided in para. 2.5, the tabulated ratings are the maximum allowable working pressures, expressed as gage pressure, at the temperatures shown.

(f) Ratings intermediate to tabulated values are determined by linear interpolation between temperatures within a class number or between class numbers, except that for flanged-end valves interpolation between tabulated classes is not permitted. A further exception is that Class 400 valves having ASME B16.5 or ASME B16.47 flanged ends shall use the intermediate rating method of para. 2.1.5.

(g) In all cases, valves shall be constructed so that the body, bonnet or cover, body bolting, and bonnet or cover bolting meet the 38°C (100°F) pressure rating requirements for the designated pressure class or pressure–temperature rating. However, pressure–temperature ratings for the valve may be otherwise limited by construction details or material design considerations, in which case the requirements of paras. 4.3.3 and 7.2.6 shall be met.

2.1.2 Standard Class Valves. Valves conforming to the requirements of this Standard, except for those meeting the additional requirements of section 8 for Special Class valves or of Mandatory Appendix V for Limited Class valves, shall be designated Standard Class valves. Ratings shall not exceed the values that are listed in Table 2-1.1 through Table 2-3.19 with an identifying label "A — Standard Class."

2.1.3 Special Class Valves. Threaded- or welding-end valves that conform to all the requirements of para. 2.1.2, and in addition have successfully passed the examinations required by section 8, may be designated Special Class valves. Pressure–temperature ratings shall not exceed the values that are listed in Table 2-1.1 through Table 2-3.19 with an identifying label "B — Special Class." Special Class ratings shall not be used for flanged-end valves.

2.1.4 Limited Class Valves. Welding- or threaded-end valves NPS 2 1/2 and smaller that conform to the requirements of Mandatory Appendix V may be designated Limited Class valves. Pressure–temperature ratings shall not exceed the values calculated in accordance with Mandatory Appendix V. Limited Class ratings shall not be used for flanged-end valves.

2.1.5 Intermediate Rated Valves. A Standard Class or Special Class welding- or threaded-end valve or a Standard Class 400 flanged-end valve may be assigned an intermediate pressure–temperature rating or Class in accordance with para. 6.1.4, provided all other applicable requirements of this Standard are met. Correspondingly, an intermediate pressure rating or

[1] Throughout this Standard the metric unit used for pressure is *bar* where 1 bar is equivalent to 0.1 MPa. Use of the term bar for pressure is an aid in distinguishing between values for pressure and stress where stress values are given in MPa units. This also recognizes the common usage of the term bar for pressure in International Standards for piping components such as valves and fittings.