

ANSI/MSS SP-44-2016



Steel Pipeline Flanges

Standard Practice
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This MSS Standard Practice was developed under the consensus of the MSS Technical Committee 110 and the MSS Coordinating Committee. In addition, this Standard Practice was approved by an ANSI/MSS Consensus Committee and ANSI as an American National Standard. The content of this Standard Practice is the resulting efforts of competent and experienced volunteers to provide an effective, clear, and non-exclusive standard that will benefit the industry as a whole. This MSS Standard Practice describes minimal requirements and is intended as a basis for common practice by the manufacturer, the user, and the general public. The existence of an MSS Standard Practice does not in itself preclude the manufacture, sale, or use of products not conforming to the Standard Practice. Mandatory conformance to this Standard Practice is established only by reference in other documents such as a code, specification, sales contract, or public law, as applicable. MSS has no power, nor does it undertake, to enforce or certify compliance with this document. Any certification or other statement of compliance with the requirements of this Standard Practice shall not be attributable to MSS and is solely the responsibility of the certifier or maker of the statement.

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The SI (metric) units and U.S. customary units in this Standard Practice are regarded separately as the standard and may not be technically equivalent; each should be used independently of the other. Combining or converting values or tolerances between the two systems may result in non-conformance with this Standard Practice.

This Standard Practice has been substantially revised from the previous 2010 edition. It is suggested that if the user is interested in knowing what changes have been made, that direct page by page comparison should be made of this document and that of the previous edition.

Non-toleranced dimensions in this Standard Practice are nominal unless otherwise specified.

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FOREWORD

The Manufacturers Standardization Society originally developed this Standard Practice in response to the continued requests for steel pipe flanges for pipeline use, particularly in sizes larger than those covered by ANSI Standard B16.5 on Steel Pipe Flanges and Flanged Fittings. The line pipe is uniquely characterized by high-strength, cold worked, thin-wall of the carbon steel grade, which necessitates special considerations for the welding end of the flanges.

The size and pressure class range was originally NPS 26 through NPS 36 in pressure classes customarily designated in ANSI Standard B16.5 as 300, 400, 600, and 900 lb. The 1970 edition deleted the slip-on flanges for lack of demand, and added a 150 lb. Class and coverage for NPS 12 through NPS 24. Additional coverage was also necessitated by the advent of the use of line pipe of grades having minimum specified yield strength higher than the 52,000 psi maximum contemplated at the time of initial development, and therefore still thinner walls.

In some instances, this advent widened the differential between the tensile properties of the flange steel versus that of the mating pipe steel. This, in turn necessitated greater flexibility in the selection of hub dimensions, so that various combinations of material-strength and flange-dimensions could be utilized to supply the flanges. Section 5 on Flange Design was introduced at this point, and is one of the key features of this Standard Practice. The 1972 edition included the coverage of blind flanges in all pressure classes and clarification of text requirements for better understanding and usage under the more diverse conditions.

The 1975 edition expanded the size range above NPS 36. The drilling templates for the Class 150 flanges of the NPS 38 and larger sizes continued the previous philosophy of adopting the drilling template of the Class 125 of ANSI/ASME Standard B16.1. However, the drilling templates of the Class 300 flanges of the NPS 38 and larger sizes did not continue the adoption of the Class 250 of ANSI/ASME Standard B16.1 drilling templates, nor did the NPS 38 and larger sizes of Classes 400, 600, and 900 continue the extrapolation of ANSI/ASME B16.5 drilling templates; instead, these drilling templates were necessarily designed more compactly because of the increased loads. While these flanges are designated by the customary ANSI Standard Class 150, 300, 400, 600, and 900, their use is almost entirely confined to cross country transmission pipelines at atmospheric temperatures. The flanges have been designed primarily for use at their cold ratings which conform to the ANSI/ASME Standard B16.5 ratings of 100 °F, and are intended primarily for attachment to relatively thin-wall, high-strength cold worked pipe, and high-strength butt-welding fittings in pipeline service at temperatures of 450 °F and lower. However, flanges forged of other materials are capable of pressure temperature ratings as specified in Section 2.1.

The 1981 edition brought the document into closer editorial alignment with ANSI/ASME B16.5. However, out of recognition of the successful experience of the pipeline industry, room temperature ratings were extended to 250 °F. Users are cautioned that when these flanges are bolted to valves and used at temperatures between 100 °F and 450 °F, the rating of the valve may not be as high as the flange.

The 1990 revision of this SP was required to update the referenced standards list and delete the SI (metric) equivalents.

The 1991 revision of this SP was required to add blind flange machining guidance, flat face requirements and precautionary notes as well as updating of the referenced standards.

The 1996 revision adds a table with permissible imperfections in flange facing finish and clarifies Annex A design criteria. There were several errata, or corrections made to references to other standards. Dimensional tolerances have been changed where necessary to conform to ASME B16.5 and B16.47.

The 2006 revision was required to add SI (metric) equivalent units, notch toughness requirement, new bolting materials and update of reference standards list.

The 2010 revision recognized the existence of ASME B16.47 Series A flanges, which adopted MSS SP-44 dimensions but does not cover the SP-44 high strength materials used in the pipeline industry to match API line pipe of equivalent grades.

In 2014, this Standard Practice (2010 Edition) was ANSI-approved as an American National Standard. This process involved an ANSI/MSS Consensus Committee that was composed of a diverse volunteer group of industry stakeholders with a material interest in the topic of this Standard Practice. This American National Standard edition, ANSI-approved and published in 2015, is substantively consistent with the 2010 MSS-only edition and will utilize this 2010 year in its nomenclature.

In 2016, this Standard Practice was substantially revised and reformatted to include: Defined chemistry limits (added a Table 1 and also removed external references), clarified the "lot" definition, made impact testing at -50 °F mandatory for grades over F42, added requirement for hardness testing, clarified allowable heat treatment methods, changed marking requirements, added tolerances for raised face height and bolt hole diameter, added requirements for Manufacturing Procedure Specification and Inspection and Test Plans, added Figure 4 to illustrate test locations and orientation, removed ring gasket dimensions and referenced ASME B16.20, added Supplementary Requirements SR1 through SR16, updated and renumbered the reference annex, among other substantive and editorial revisions. Moreover, the 2016 edition was ANSI-approved as a Revised American National Standard.

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Manufacturers Standardization Society of the Valve and Fittings Industry

STEEL PIPELINE FLANGES

1. SCOPE

1.1 **General** This Standard Practice covers pressure-temperature ratings, materials, dimensions, tolerances, marking, and testing for steel pipeline flanges. The welding neck type flanges shall be forged steel, and the blind flanges may be made from either forged steel or from steel plate.

1.1.1 Dimensional and tolerance requirements for NPS 10 and smaller are provided by reference to ASME B16.5. When such flanges are produced from materials meeting Table 2 requirements, and meet all other stipulations of this Standard Practice, then they shall be considered as complying therewith.

1.2 References

1.2.1 **Referenced Standards** Standards and specifications adopted by reference in this Standard Practice are shown in Annex E, for convenience of identifying edition number, date, and source of supply.

A flange made in conformance with a prior edition of referenced standards and in all other respects conforming to this Standard Practice, will be considered to be in conformance even though the edition reference may have been changed in a subsequent revision of this Standard Practice.

1.2.2 **Codes and Regulations** A flange used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, the ANSI-approved Code for Pressure Piping, or Governmental Regulations, is subject to any limitation of that code or regulation. This includes any maximum temperature limitation for a material, or rule governing the use of a material at a low temperature.

1.3 **Relevant Units** This Standard Practice 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 (U.S. Customary) only. These systems of units are to be regarded separately as the standard and cannot be combined.

Within the text, the U.S. Customary units are shown in parentheses, combined tables, or in separate tables. The values and tolerances 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 Practice.

2. DENOTATION

2.1 **Pressure-Temperature Ratings** Flanges covered by this Standard Practice shall be designated as one of the following: Class 150, 300, 400, 600, or 900. The pressure-temperature ratings in Table 4 are in SI (metric) and U.S. Customary.

2.2 **Size** The term “NPS”, followed by a dimensionless number, is the designation for a corresponding nominal pipe size. NPS is a separate designation system; however, it has a relation to the reference nominal diameter, “DN”, which is used in international standards. The specific relationship between NPS and DN sizing, for flanges in this Standard Practice, are as follows:

NPS	12	14	16	18	20	22	24	26	28	30	32	34	36
DN	300	350	400	450	500	550	600	650	700	750	800	850	900
NPS	38	40	42	44	46	48	50	52	54	56	58	60	–
DN	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	–

INFORMATIONAL NOTE: The NPS designation is the original and primary system expressed in the body text of this Standard Practice (tables, figures, and annexes are treated separately), based on or in line with referenced “parent” external standards.