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ASME B16.44-2012

[Revision of ASME B16.44-2002 (R2007)]

Manually Operated Metallic Gas Valves for Use in Aboveground Piping Systems Up to 5 psi

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

Three Park Avenue • New York, NY • 10016 USA

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The next edition of this Standard is scheduled for publication in 2017.

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 Web site under the Committee Pages at http://cstools.asme.org/ as they are issued.

Errata to codes and standards may be posted on the ASME Web site under the Committee Pages to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in codes and standards. Such errata shall be used on the date posted.

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The American Society of Mechanical Engineers
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FOREWORD

The B16 Standards Committee was organized in the spring of 1920 and held its organizational meeting on November 21st of that year. The group operated as a sectional Committee (later redesignated as a Standards Committee), under the authorization of the American Engineering Standards Committee [subsequently named American Standards Association (ASA), then the United States of America Standards Institute, and now, the American National Standards Institute (ANSI)]. Sponsors for the group were The American Society of Mechanical Engineers (ASME), Manufacturers Standardization Society of the Valve and Fitting Industry, and the Heating and Piping Contractors National Association (later the Mechanical Contractors Association of America).

The American Gas Association (AGA) determined that standardization of gas valves used in distribution systems was desirable and needed. The AGA Task Committee on Standards for Valves and Shut-Offs was formed and development work commenced in 1958. In 1968, it was determined that a more acceptable document would result if approval were gained from ANSI and to facilitate such action, the AGA Committee became B16 Subcommittee No. 13, later renamed Subcommittee L, which is its current designation. In 1982, the B16 Committee was reorganized as an ASME committee operating under procedures accredited by ANSI. The first standard developed by the Subcommittee was ANSI B16.33.

As a follow-up, the B16.38 standard was subsequently developed to cover larger sizes of gas valves and shut-offs. Starting in about 1965, there was a major increase in the use of plastic piping in gas distribution systems, which made it desirable to have valves and shut-offs of a compatible material. To fill this need, the B16.40 standard was developed.

In 1985, the lack of standards for gas valves for use in gas piping systems downstream from the point of delivery (meter outlet) and upstream of the inlet to gas utilization equipment was brought to the attention of the subcommittee. To fill this need, this Standard was developed.

This Standard has been developed so that users and manufacturers have a common basis valve specification, one that can be readily used to qualify valve designs. Usage by certifying bodies would make it possible for building codes to reference the Standard.

In 2002, the title was changed to clearly match the updated scope and several other revisions were incorporated to bring the standard up to date with the current practices.

In 2012, a new edition was released to introduce a new Mandatory Appendix for the referenced standards. This Mandatory Appendix has also been updated to keep the references relevant and up to date.

Following its approval by the B16 Standards Committee, this Standard was approved as an American National Standard by ANSI on August 21, 2012.

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, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B16 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

As an alternative, inquiries may be submitted via e-mail to: SecretaryB16@asme.org.

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 for the purpose of providing 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, 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 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.

The request for 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.
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. 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 this format will be rewritten in this 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, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B16 Standards Committee.

MANUALLY OPERATED METALLIC GAS VALVES FOR USE IN ABOVEGROUND PIPING SYSTEMS UP TO 5 psi

1 SCOPE

1.1 General

This Standard applies to new valve construction and covers quarter turn manually operated metallic valves in sizes NPS 4¼ and tubing sizes 1¼ O.D. These valves are intended for indoor installation as gas shutoff valves when installed in aboveground fuel gas piping downstream of the gas meter outlet and upstream of the inlet connection to a gas appliance. The valves covered by this Standard are intended for service at temperatures between 32°F (0°C) and 125°F (52°C) at pressure ratings not to exceed 5 psi (0.34 bar). When so designated by the manufacturer, these valves may be installed for service outdoors and/or at temperatures below 32°F (0°C) and/or above 125°F (52°C).

1.2 Applicability

This Standard sets requirements, including qualification requirements, for metallic gas valves for use in gas piping systems. Details of design, materials, and testing in addition to those stated in this Standard that are necessary to meet the qualification and production testing requirements of this Standard remain the responsibility of the manufacturer. A valve used under a code jurisdiction or governmental regulation is subject to any limitation of such code regulations.

1.3 Limitations

This Standard does not apply to manually operated gas valves that are an integral part of a gas appliance. Manually operated gas valves intended for use in a particular appliance are covered in ANSI Z21.15/CGA 9.1.

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 Quality Systems

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

1.6 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 SI 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. Combining values from the two systems constitutes nonconformance with the Standard.

All pressures, unless otherwise specified, are gauge pressures.

2 GENERAL CONSTRUCTION AND ASSEMBLY

2.1 General

Each valve at the time of manufacture shall be capable of meeting the requirements set forth in this Standard. The workmanship employed in the manufacture and assembly of each valve shall provide for the specified gas tightness, reliability of performance, freedom from injurious imperfections, and defects as specified herein.

2.2 End Connections

The valve body shall be provided with wrench flats at ends with tapered pipe threads.

2.3 Pipe and Tubing Connections

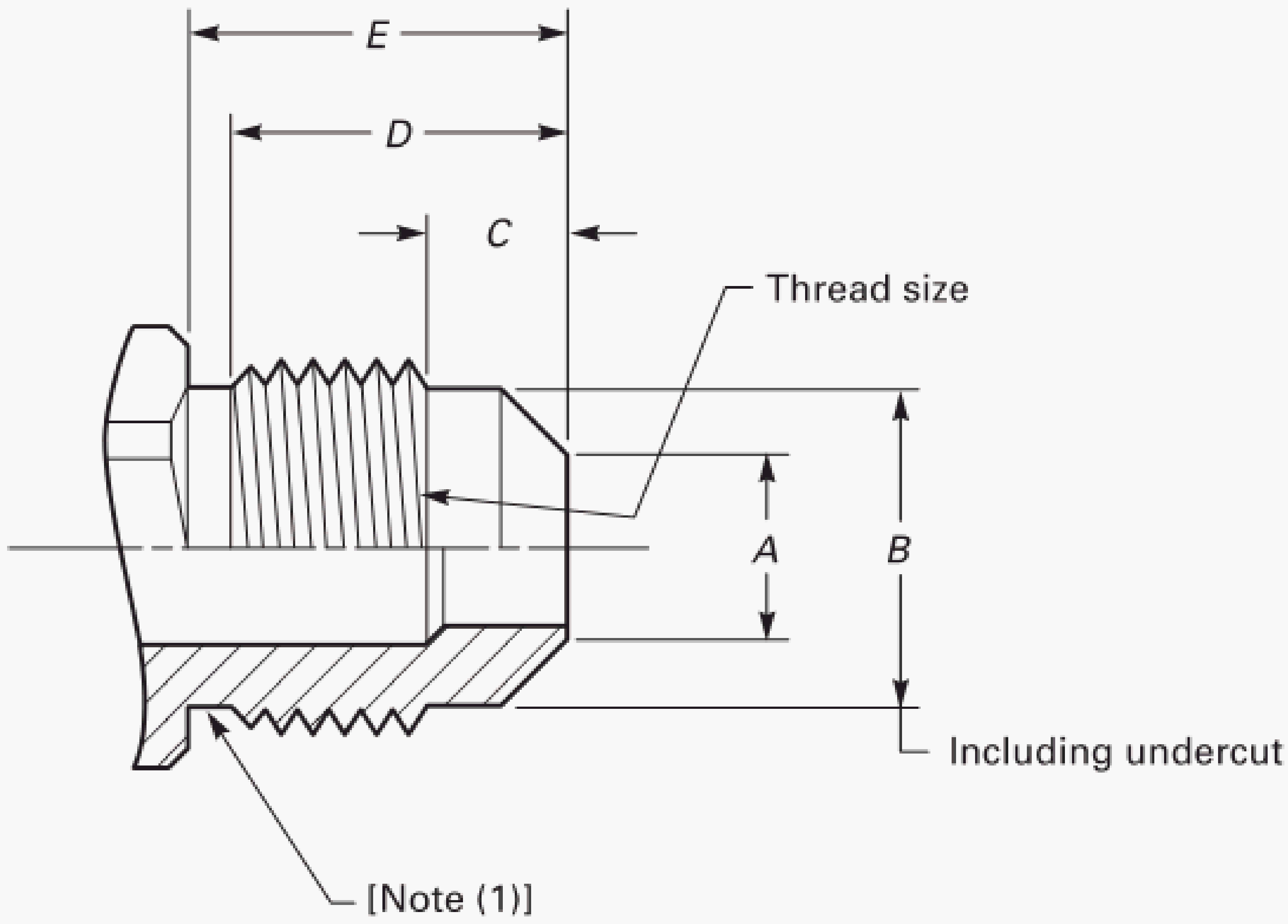
2.3.1 Taper Pipe Threads. Taper pipe threads, when provided, shall be in accordance with ASME B1.20.1.

2.3.2 Flare Tubing Connection. Valves with an inlet and/or outlet for ⅜, ½, or ⅝ O.D. tube shall be in accordance with the flare fitting dimensions shown in Table 1. Other flare sizes shall be made per manufacturer's standards.

2.4 Operating Head

The operating head of the valve shall be a lever, tee, flat, or square head type. Separately attached handles, if provided, shall be securely attached to the valve by

Table 1 Flare Fitting Dimensions



Tube O.D., in. (mm)	Thread Size	Dimension *A*, in. (mm) [Note (2)]	Dimension *B*, in. (mm) [Note (2)]	Dimension *C*, in. (mm) [Note (2)]	Minimum Dimension *D*, in. (mm) [Note (2)]	Dimension *E*, in. (mm) [Note (2)]
$^3/_8$ (9.5)	$^5/_8$–18 UNF	0.312 (7.9)	0.531 (13.5)	0.220 (5.6)	0.54 (13.7)	0.620 (15.7)
$^1/_2$ (12.7)	$^3/_4$–16 UNF	0.438 (11.1)	0.641 (16.3)	0.250 (6.3)	0.66 (16.8)	0.750 (19.0)
$^5/_8$ (15.9)	$^{15}/_{16}$–16 UN	0.565 (14.3)	0.843 (21.4)	0.280 (7.1)	0.76 (19.3)	0.880 (22.3)

NOTES:
(1) Undercut is optional on $^3/_4$–16 UNF thread and on $^{15}/_{16}$–16 UN thread, and is required on $^5/_8$–18 UNF thread.
(2) Tolerance: ±0.010 in. (±0.25 mm)

the use of threaded fasteners, retaining pins, or their equivalent.

2.5 Operation

The valve shall require one-quarter turn from the full closed position to the full open position, or from the full open position to the full closed position.

2.6 Position Indication

The valve shall be so constructed that the operator can visually determine that the valve is in the open or closed position. When the valve is in the closed position, the operating lever or flow indicator shall be perpendicular to the longitudinal axis of the valve.

2.7 Tamperproof Features

Where valves are specified to be tamperproof, they shall be designed and constructed to minimize the possibility of the removal of the core of the valve with other than specialized tools (i.e., tools other than common wrenches, pliers, etc.).

2.8 Automatic Compensation

The valve may be provided with automatic means to compensate for displacement of lubricant(s) or for wear that may occur and result in internal or external leakage. Such a valve shall be designed to prevent unseating of the rotor if accidentally jammed, for example, against a supporting or adjoining structure (such as floors or walls).

3 MATERIALS

3.1 Materials for Valve Bodies, Plugs, Bonnets, Unions, and Other External Parts Excluding Handles

Materials known to be acceptable for compliance with this Standard are listed in Table 2. Other metallic materials may be used when the product incorporating them meets the requirements of the Standard.

3.2 Lubricants and Sealants

Lubricants and/or sealants shall be resistant to the action of fuel gases such as natural, manufactured, and LP gases. The valve manufacturer is responsible for the selection of lubricants and sealants, and for the determination of their suitability for service conditions enumerated in section 1.

Table 2 Materials for Valve Bodies, Plugs, Bonnets, Unions, and Other External Parts Excluding Handles

Material	ASTM Specifications
Cast brass	B584 Alloy UNS C83600, Alloy UNS C84400
Cast bronze	B62
Cast iron	A126 Class B, A48 Class 30
Ductile iron	A395, A536 Grade 60-40-18, or Grade 65412
Forged brass	B283 Alloy UNS C37700
Malleable iron	A47, A197
Rod brass	B16 Alloy UNS C36000
Sintered brass	B282 or MPIF Standard 35 Code CZP-3002 or CZP-2002
Steel	A108, A505, or A569

3.3 Seating and Stem Seal Materials

3.3.1 Elastomer Components — Air Aging. Elastomer parts that are exposed to fuel gas shall be made from materials that, following 70-hr air aging in accordance with ASTM D573 at 212°F (100°C), meet the elongation, tensile and hardness property requirements of paras. 3.3.1.1 and 3.3.1.2.

3.3.1.1 Tensile tests shall be conducted on six dumbbells in accordance with ASTM D412. Three dumbbells shall be air aged 70 hr in accordance with ASTM D573 at 212°F (100°C). The dumbbells shall have a thickness of 0.08 in. ± 0.008 in. (2.0 mm ± 0.2 mm). The average of the three individual tests for the aged dumbbells shall exceed 60% retention of ultimate elongation and 60% retention of tensile strength at break. The average of the three individual tests for the non-aged dumbbells shall be the basis for percent retention calculation.

3.3.1.2 Hardness tests shall be conducted using specimens in accordance with ASTM D395, Type 2. Three specimens shall be air aged 70 hr in accordance with ASTM D573 at 212°F (100°C). The average of the three individual tests for the aged specimens shall not show a hardness change of more than ± 10 Shore hardness points relative to the average hardness of the non-aged specimens.

3.3.2 Elastomer Components — Swell Test. Elastomer parts that are exposed to fuel gas shall be made from materials that, after 70-hr exposure in n-hexane at 73°F (23°C), in accordance with ASTM D471, meet the volume change, elongation, and tensile property requirements of paras. 3.3.2.1 and 3.3.2.2.

3.3.2.1 Volume change tests shall be conducted using six specimens in accordance with ASTM D471, Section 8. Three specimens shall be exposed for 70 hr at 73°F (23°C) in n-hexane in accordance with ASTM D471. The average of the three individual n-hexane tests shall not show an increase in volume of more than 25% or a decrease in volume of more than 1%. The average of the three tests for the non-aged specimens shall be the basis for the percent retention change calculation.

3.3.2.2 Tensile tests shall be conducted on six dumbbells in accordance with ASTM D412. Three of the tensile tests shall be conducted on dumbbells exposed in n-hexane at 73°F (23°C) for 70 hr in accordance with ASTM D471. The dumbbells shall have a thickness of 0.08 in. ± 0.008 in. (2.0 mm ± 0.2 mm). The average of the three individual n-hexane tests shall exceed 60% retention of ultimate elongation and 60% retention of tensile strength at break. The average of the three tests for the non-aged specimens shall be the basis for the percent volume change calculation.

3.3.3 Elastomer Components — Compression Set. Elastomer parts that may be exposed to fuel gas shall be made from materials having a compression set of no more than 25% after 22 hr at 212°F (100°C), in specimens in accordance with ASTM D395, para. 5.2.

3.3.4 Polytetrafluoroethylene (PTFE) Materials. PTFE materials shall comply with ASTM D4894 or D4895.

3.4 Temperature Resistance

The materials used for valve bodies, plugs, bonnets, unions, and other external parts, excluding handles, shall have a solidus temperature in excess of 800°F (427°C). Seals and lubricants are exempt from this requirement.

3.5 Corrosion Resistance

3.5.1 Indoor Atmosphere. Those parts that are provided with automatic compensation for wear shall be corrosion resistant with respect to indoor atmosphere (i.e., humidity and airborne contaminants such as chloride and ammonia).

3.5.2 Salt Spray. Valves designated by the manufacturer for outdoor use shall meet the requirements of this paragraph. Valve ends shall be sealed with appropriate fittings. The valve shall then be exposed for 96 hr to a salt spray (fog) test as specified in ASTM B117. Salt spray (fog) testing temperature shall be maintained between 92°F and 97°F (33°C and 36°C). The saline solution shall consist of 5% sodium chloride and 95% distilled water by weight. Following the salt spray (fog) test, the valve shall be removed from the chamber and examined with the unaided eye. The valve shall not show signs of corrosion or other deterioration that affects the function of the valve. Following the salt spray test, the valve shall pass the leak tests specified in paras. 5.2.1 and 5.2.2 and shall open and close on application of a torque not to exceed that specified in Table 3. For

Table 3 Operating Torque Values

End Connections Pipe/Tubing Size	Valves Designed for Use of Tools for Opening and Closing, lbf-in. (N·m)	Valves Incorporated an Integral Handle, lbf-in. (N·m)
$\frac{1}{4}$ NPS	90 (10.2)	15 (1.7)
$\frac{3}{8}$ NPS	120 (13.6)	20 (2.3)
$\frac{1}{2}$ NPS	156 (17.6)	45 (5.1)
$\frac{3}{4}$ NPS	216 (24.4)	45 (5.1)
1 NPS	276 (31.2)	45 (5.1)
$1\frac{1}{4}$ NPS	360 (40.7)	60 (6.8)
$1\frac{1}{2}$ NPS	480 (54.2)	80 (9.0)
2 NPS	600 (67.8)	100 (11.3)
$2\frac{1}{2}$ NPS	1,080 (122.0)	125 (14.1)
3 NPS	1,500 (169.5)	250 (28.2)
4 NPS	1,800 (203.4)	300 (33.9)
$\frac{1}{4}$ through $\frac{5}{16}$ O.D. tube	60 (6.8)	10 (1.1)
$\frac{3}{8}$ through $\frac{7}{16}$ O.D. tube	120 (13.6)	20 (2.3)
$\frac{1}{2}$ through $\frac{9}{16}$ O.D. tube	156 (17.6)	45 (5.1)
$\frac{5}{8}$ O.D. tube	216 (24.4)	45 (5.1)
$\frac{3}{4}$ through 1 O.D. tube	276 (31.2)	45 (5.1)

valves with one pipe connection and one tubing connection, the lesser of the two torque limits specified in Table 3 shall apply.

4 MARKING

4.1 General

The required markings shall be legible and applied so that they will be readily visible and of a permanent nature, such as by embossing, etching, or equivalent means. Adhesive labels are not acceptable for this purpose.

4.2 Name

The manufacturer's name or trademark shall be shown. Where space permits, the designation "B16.44" shall be added. The use of the prefix "ASME" to the B16.44 designation is optional. The B16.44 identification mark designates that the valve was manufactured in conformance with this Standard.

4.3 Pressure Rating

Marking for pressure rating shall be shown on the head, stem, or body.

EXAMPLE:

2G for 2 psi (0.14 bar) valves
5G for 5 psi (0.34 bar) valves

4.4 Tamperproof

The designation "T" for tamperproof construction, where tamperproof features are not easily identifiable without disassembling the valve, shall be shown on the head, stem, or body.

4.5 Date Code

Each valve shall bear a permanent date code marking. The date code must identify the date of manufacture or assembly within a 31-day period.

5 DESIGN QUALIFICATIONS

5.1 General

Unless otherwise specified herein, each test shall be conducted using a new, unused valve at a temperature of 73°F ± 15°F (23°C ± 8°C).

5.2 Gas Tightness

Gas tightness tests shall be conducted on randomly selected production valves of each size and of each basic valve design. One new, unused valve shall be subjected to both internal and external leakage tests. The valve shall not leak when tested as outlined under the methods in paras. 5.2.1 and 5.2.2.

5.2.1 External Leakage Test. With the valve in the open position with the outlet sealed, an internal air pressure of 2 in. (5 cm) water column, then 1.5 times the pressure rating shall be applied to the inlet of the valve.

The valve shall be immersed in a bath containing water at a temperature of 73°F ± 15°F (23°C ± 8°C) for a period of 15 sec. Leakage, as evidenced by the flow (breaking away) of bubbles, shall not be permitted. Other means of leak detection may be used provided the methods can be shown to be equivalent.

5.2.2 Internal Leakage Test. The valve shall then be turned to the closed position with the outlet open and the test in para. 5.2.1 repeated.

5.3 Flow Capacity

5.3.1 General. The valve shall provide a flow not less than that specified in Table 4.

5.3.2 Method of Test. A valve of each size and type shall be tested to verify the flow in a straight run of pipe of the size for which the valve is designated to be connected. The test shall be conducted using a compressible fluid and a technically acceptable procedure such as ANSI/ISA S75.02.

5.4 Strength

5.4.1 Installation Torque. The valve shall be capable of withstanding, without deformation, breakage, or leakage, the turning effort as specified in Table 5.

5.4.2 Method of Test. The torque shall be applied at the wrench grip of the valve adjacent to where it is attached to the piping or tubing. Valves with one pipe connection and one tube connection shall have each end

Table 4 Minimum Flow Capacity

End Connection [Note (1)]	Minimum Gas Flow at Reference Condition, ft^3/hr (m^3/h) [Note (2)]
1/4 NPS	45 (1.27)
3/8 NPS	85 (2.41)
1/2 NPS	150 (4.25)
3/4 NPS	400 (11.33)
1 NPS	670 (18.97)
1 1/4 NPS	1,000 (28.32)
1 1/2 NPS	1,750 (49.55)
2 NPS	3,020 (85.22)
2 1/2 NPS	3,880 (109.90)
3 NPS	6,000 (169.90)
4 NPS	6,780 (192.00)
1/4 O.D. tube	21 (0.60)
5/16 O.D. tube	32 (0.91)
3/8 O.D. tube	50 (1.42)
1/2 O.D. tube	100 (2.83)
5/8 O.D. tube	130 (3.68)
3/4 O.D. tube	187 (5.30)
7/8 O.D. tube	250 (7.08)
1 O.D. tube	330 (9.34)

NOTES:
(1) For values having different size inlet and outlet connections, the valve shall have a minimum gas flow equal to or greater than the more restrictive of the two sizes.
(2) *Reference Conditions.* Minimum gas flow is measured with the valve in the fully open position at an inlet pressure equal to the pressure rating of the valve and a 0.3 in., water column (74.7 Pa) net valve pressure drop. The reported flow rate shall be corrected to conditions of 14.95 psi (103.16 kPa), 70°F (21.1°C), and 0.64 specific gravity.

Table 5 Installation Torque

End Connections	lbf-in. (N·m)
1/4 NPS	220 (24.9)
3/8 NPS	280 (31.6)
1/2 NPS	375 (42.4)
3/4 NPS	560 (63.3)
1 NPS	750 (84.7)
1 1/4 NPS	875 (98.9)
1 1/2 NPS	940 (106.2)
2 NPS	1,190 (134.5)
2 1/2 NPS	1,310 (148.0)
3 NPS	1,400 (148.0)
4 NPS	1,500 (169.5)
1/4 O.D. tube	100 (11.3)
5/16 O.D. tube	125 (14.1)
3/8 O.D. tube	150 (16.9)
7/16 O.D. tube	175 (19.8)
1/2 O.D. tube	200 (22.6)
5/8 O.D. tube	300 (33.9)
3/4 O.D. tube	300 (33.9)
7/8 O.D. tube	350 (40.0)
1 O.D. tube	400 (45.2)

Table 6 Impact Load

End Connections	Torque, lbf-ft (N·m)
1/4 NPS	10.0 (13.6)
3/8 NPS	15.0 (20.3)
1/2 NPS larger	20.0 (27.1)
1/4 O.D. tube	1.5 (2.0)
5/16 through 7/16 O.D. tube	2.0 (2.7)
1/2 O.D. tube	5.0 (6.8)
5/8 O.D. tube	7.0 (9.5)
3/4 O.D. tube	10.0 (13.6)
7/8 O.D. tube	15.0 (20.3)
1 O.D. tube	20.0 (27.1)

tested according to the type and size of the connection, as specified in Table 5. The torque specified shall be applied to the completely assembled valve by attaching it to a Schedule 80 steel pipe fitting with threads conforming to ASME B1.20.1, or aluminum tubing as applicable, of suitable size. Thread lubricants or sealant shall not be used for this test.

The specified torque shall be applied for 15 min ± 1 min. With the turning force still applied, the valve shall then comply with the gas tightness tests specified in paras. 5.2.1 and 5.2.2. The torque shall then be released and the valve removed. There shall be no signs of deformation or breakage, other than local deformation in the area of tool contact (wrench marks). The valve shall then again comply with the gas tightness tests specified in paras. 5.2.1 and 5.2.2.

Leakage at pipe threads resulting from not using thread sealant shall be disregarded.

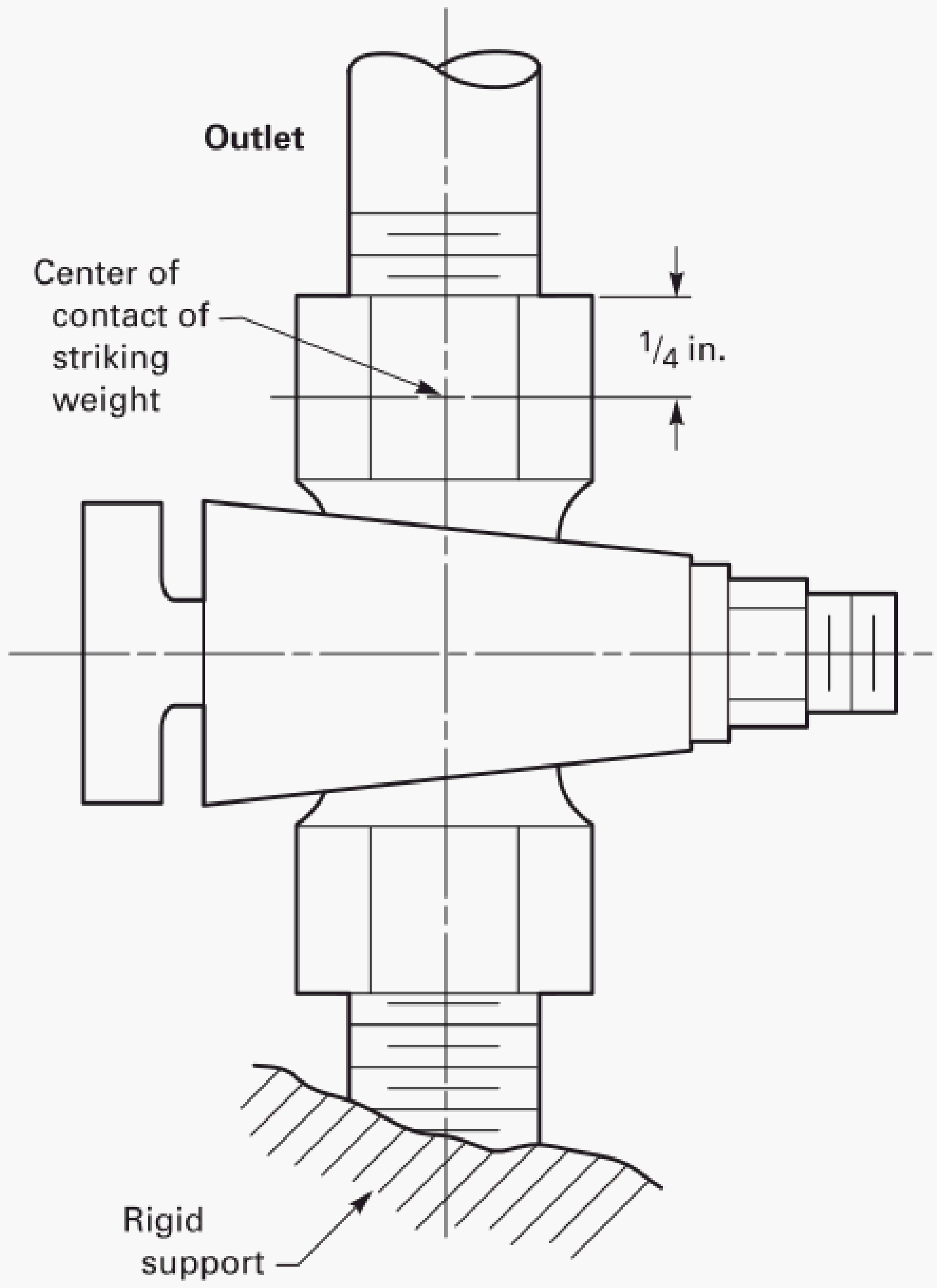
5.5 Impact Energy Absorption

The valve shall be capable of absorbing the impact energy specified in Table 6 without cracking or breaking.

5.5.1 Method of Test. A valve whose inlet is designed for connection to threaded pipe shall be supported by securing it to a close pipe nipple of Schedule 80 pipe or a standard weight pipe coupling, as applicable, mounted on a rigid surface so that the free length of the nipple or coupling is not greater than 1 in. (25 mm). The valve shall be secured to the support with a torque not less than as specified in Table 5. A typical test arrangement is shown in Fig. 1.

A valve whose inlet is designed for connection to semi-rigid tubing shall be mounted on a straight length of steel tubing conforming to SAE J525 and having a wall thickness of 0.035 in. (0.89 mm). The tube fittings supplied with the valve or specified by the manufacturer shall be used and the free length of the supporting tube shall not exceed 1 in. (25 mm). The valve shall be secured to the support with a torque not less than as specified in Table 5.

Fig. 1 Test Device



The outlet end of the valve shall have assembled to it a fitting of the type for which it is designed. The test device shall be arranged so the centerline of the contact between the striking weight and the valve will be approximately ¼ in. from the extreme outlet end of the valve. A typical test arrangement is shown in Fig. 1.

The valve shall then be struck four successive times with the impact energy specified in Table 6, at right angles to the longitudinal centerline of the outlet gasway. The valve shall be rotated 90 deg between each impact. There shall be no cracks or breakage when examined with the unaided eye.

The test shall then be repeated on four additional valves. This provision shall be deemed met when all five valves comply with the test provisions.

5.6 Bending

The valve shall be capable of withstanding the static load specified in Table 7 without leakage.

Connections designed for threaded pipe shall be assembled with Schedule 40 pipe. Connections designed for tubing shall be assembled with steel tubing conforming to SAE J525 and having a wall thickness of 0.28 in. (0.7 mm). All connections shall be tightened using one-half the value specified in Table 5. The outlet of the assembly shall be capped and the inlet connected to an air pressure system. This assembly shall be placed across two horizontal supports spaced so that the assembly is supported 12 in. (30.5 cm) on each side of the centerline of the valve. The appropriate static load shall then be symmetrically applied to the valve body with the valve oriented in the least favorable position. While being subjected to this load, the valve shall be checked for evidence of external leakage with soap solution with the test assembly under an air pressure of 1.5 times the rated pressure of the valve. The load shall be removed and the assembly shall then be subjected to the gas tightness test specified in paras. 5.2.1 and 5.2.2.

Table 7 Static Load for Bending Test

End Connections	Applied Force, lbf (N)
¼ NPS	35.0 (155)
⅜ NPS	37.5 (169)
½ NPS	40.0 (178)
¾ NPS	42.5 (189)
1 NPS	45.0 (200)
1¼ NPS	47.5 (211)
1½ NPS	62.5 (278)
2 NPS	85.0 (378)
2½ NPS	140.0 (623)
3 NPS	190.0 (845)
4 NPS	250.0 (1 112)
¼ O.D. tube	1.5 (8)
5/16 O.D. tube	2.5 (11)
⅜ O.D. tube	4.0 (18)
7/16 O.D. tube	5.5 (24)
½ O.D. tube	7.5 (33)
⅝ O.D. tube	13.0 (58)
¾ O.D. tube	24.0 (107)
⅞ O.D. tube	38.0 (169)
1 O.D. tube	60.0 (267)

5.7 Continued Operation

5.7.1 General. A new, unused valve shall be subjected to and comply with paras. 5.2.1 and 5.2.2. The valve shall then completely open and close on application of a torque not to exceed that specified in Table 3 after being continuously operated for ten consecutive cycles. The rate of operations shall not exceed two cycles per minute. A cycle shall consist of one opening and one closing of the valve. Upon completion of the ten cycles, the valve shall be subjected to and comply with paras. 5.2.1 and 5.2.2. For valves with one pipe connection and one tubing connection, the lesser of the two torque limits specified in Table 3 shall apply.

5.7.2 Method of Test. The valve shall be opened and closed at a rate no greater than two cycles per minute. Following the gas tightness test, the valve shall also be capable of completely opening and closing when a torque not greater than that specified in Table 3 is applied to the valve handle in a direction to open it completely, and then in the direction to close the valve.

5.8 Temperature Range

A valve shall be operable at metal temperatures of 32°F (0°C) or the manufacturer's designated minimum operating temperature, and 125°F (52°C) or the manufacturer's maximum designated operating temperature, without affecting the capability of the valve to control the flow of gas. The manufacturer's designated minimum or maximum operating temperature(s) must be lower than or equal to 32°F (0°C) or greater than or equal to 125°F (52°C), respectively.

5.8.1 Minimum Operating Temperature Test. A new, unused valve shall be tested in accordance with para. 5.2. Following testing as per para. 5.2, the valve, in the open position, shall be placed in a chamber maintained at the manufacturer's specified minimum operating temperature; this temperature shall be maintained for at least 1 hr. The valve shall then be closed. During closing the torque shall not exceed twice that shown in Table 3.

With the valve in the closed position and maintained at the manufacturer's designated minimum operating temperature, the inlet shall be subjected to a test pressure of 1.5 times the pressure rating until equilibrium conditions are attained. The leakage rate shall be measured and shall not exceed 50 cc/hr of air corrected to standard conditions of 30.0 in. Hg (1.02 bar) pressure and 60°F (15.5°C) temperature.

The valve shall then be opened with the outlet sealed. The leakage rate shall again be measured and shall not exceed 50 cc/hr of air corrected to 30.0 in. Hg (1.02 bar) pressure and 60°F (15.5°C) temperature.

5.8.2 Maximum Operating Temperature Test. A new, unused valve shall be tested in accordance with para. 5.2. Following testing as per para. 5.2, the valve, in the open position, shall be placed in a chamber maintained at the manufacturer's designated maximum operating temperature, provided it is above 125°F (52°C). After the valve body has attained the specified maximum operating temperature, this temperature shall be maintained for at least 1 hr. The valve shall then be closed. During closing the torque shall not exceed twice that shown in Table 3.

With the valve maintained at the manufacturer's designated maximum operating temperature in the closed position, the inlet shall be subjected to a test pressure of 1.5 times the pressure rating until equilibrium conditions are attained. The leakage rate shall be measured and shall not exceed 50 cc/hr of air corrected to standard conditions of 30.0 in. Hg (1.02 bar) pressure and 60°F (15.5°C) temperature.

The valve shall then be opened after the outlet has been sealed. The leakage rate shall again be measured and shall not exceed 50 cc/hr of air corrected to 30.0 inHg (1.02 bar) pressure and 60°F (15.5°C) temperature.

5.9 Elevated Temperature Test

Two valves of each size and type shall be tested while connected to an air supply at a pressure equal to the rated pressure of the valve.

One valve shall be tested in the closed position with the outlet open to atmosphere. The other valve shall be tested in the open position with the outlet sealed. Both valves shall be placed in a chamber and held at 785°F ± 10°F (418°C ± 6°C) for 30 min. The valves shall then be removed and allowed to cool to room temperature. When tested with the inlet pressurized at the rated pressure of the valve, the valve in the closed position shall not leak in excess of 6 ft^3/hr (47 cm^3/s). The valve in the open position shall not leak in excess of 2 ft^3/hr (16 cm^3/s).

6 MANUFACTURING AND PRODUCTION TESTS

The manufacturer shall use a quality assurance program to qualify raw materials, parts, assemblies, and purchased components. The manufacturer shall test each valve covered by this Standard at 1.5 times the rated pressure for gas tightness to atmosphere (external leakage) and gas tightness through the valve (internal leakage), as defined in para. 5.2.

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MANDATORY APPENDIX I
REFERENCES

The following is a list of standards and specifications referenced in this Standard. Products covered by each ASTM specification are listed for convenience. (See specifications for exact titles and detailed contents.) Materials manufactured to other editions of the referenced ASTM specifications may be used to manufacture valves meeting the requirements of this Standard as long as the valve manufacturer verifies that the material meets the requirements of the referenced edition of the ASTM specification. Unless otherwise specified, the latest edition of ASME publications shall apply.

ASME B1.20.1-1983, Pipe Threads, General Purpose (Inch)

Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900 (www.asme.org)

ANSI Z21.15-97/CGA 9.1-2009, Manually Operated Gas Valves for Appliances, Appliance Connector Valves, and Hose End Valves[1]

Publisher: Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6 (www.csa.ca)

ANSI/ISA S75.02-1996, Control Valve Capacity Test Procedures

Publisher: International Society of Automation (ISA), 67 T. W. Alexander Drive, P.O. Box 12277, Research Triangle Park, NC 27709 (www.isa.org)

ASTM A47/A47M-99 (2009), Specification for Ferritic Malleable Iron Castings

ASTM A48/A48M-03 (2008), Specification for Gray Iron Castings

ASTM A108-07, Specification for Steel Bars, Carbon, Cold Finished, Standard Quality

ASTM A126-04 (2009), Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

ASTM A197/A197M-00 (2011), Specification for Cupola Malleable Iron

ASTM A395/A395M-99 (2009), Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures

ASTM A505-00 (2005), Specification for Steel, Sheet and Strip, Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

ASTM A536-07, Specification for Ductile Iron Castings

ASTM A1011/A1011M-10, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low Alloy With Improved Formability

ASTM B16/B16M-10, Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines

ASTM B62-09, Specification for Composition Bronze or Ounce Metal Castings

ASTM B117-11, Practice for Operating Salt Spray (Fog) Apparatus

ASTM B283-11a, Specification for Copper and Copper-Alloy Die Forgings (Hot-Pressed)

ASTM B536-07, Specification for Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Plate, Sheet, and Strip

ASTM B584-11, Specification for Copper Alloy Sand Castings for General Applications

ASTM D395-03 (2008), Test Methods for Rubber Property-Compression Set

ASTM D412-06a$^{\epsilon 2}$, Test Methods for Vulcanized Rubber and Thermoplastic Rubber and Thermoplastic Elastomers—Tension

ASTM D471-10, Test Method for Rubber Property-Effect of Liquids

ASTM D573-04 (2010), Test Method for Rubber-Deterioration in an Air Oven

ASTM D4894-07, Specification for Polytetrafluoroethylene (PTFE) Granular Molding and Ram Extrusion Materials

ASTM D4895-10, Specification for Polytetrafluoroethylene (PTFE) Resin Produced From Dispersion

ASTM E29-08 (1999), Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

Publisher: American Society for Testing and Materials (ASTM International), 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 (www.astm.org)

ISO 9000:2005, Quality management systems — Fundamentals and vocabulary

ISO 9001:2008, Quality management systems — Requirements

[1] May also be obtained from the American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036.

Publisher: International Organization for Standardization (ISO) Central Secretariat, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Genève 20, Switzerland/Suisse (www.iso.org)

MPIF Standard 35-07, Materials Standards for PM Structural Parts

Publisher: Metal Powder Industries Federation (MPIF), 105 College Road East, Princeton, NJ 08540-6692 (www.mpif.org)

SAE J525-1999, Welded and Cold Drawn Steel Tubing Annealed for Bending and Flaring

Publisher: Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001 (www.sae.org)

NONMANDATORY APPENDIX A
QUALITY SYSTEM PROGRAM

The products manufactured in accordance with this Standard shall be produced under a quality system program following the principles of an appropriate standard from the ISO 9000 series.[1] A determination of the need for registration and/or certification of the product manufacturer's quality system program by an independent organization shall be the responsibility of the manufacturer. The detailed documentation demonstrating program compliance shall be available to the purchaser at the manufacturer's facility. A written summary description of the program utilized by the product manufacturer shall be available to the purchaser upon request. The product manufacturer is defined as the entity whose name or trademark appears on the product in accordance with the marking or identification requirements of this Standard.

[1] The series is also available from the American National Standards Institute (ANSI) and the American Society for Quality (ASQ) as American National Standards that are identified by the prefix "Q," replacing the prefix "ISO." Each standard of the series is listed under References in Mandatory Appendix I.

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B16 AMERICAN NATIONAL STANDARDS FOR PIPING, PIPE FLANGES, FITTINGS, AND VALVES

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