ASME B16.44-2002
(Revision of ASME B16.44-1995)

# 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

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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, then the United States of America Standards Institute and now, American National Standards Institute). Sponsors for the group were the American Society of Mechanical Engineers, 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 determined that standardization of gas valves used in distribution systems was desirable and needed. The A.G.A. 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 for the American National Standards Institute and to facilitate such action, the A.G.A. 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 user 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.

All request for interpretations or suggestions for revisions should be sent to the Secretary, B16 Standards Committee, The American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

Following its approval by the B16 Standards Committee, this Standard was approved as an American National Standard by ANSI on May 16, 2002.



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# Standardization of Valves, Flanges, Fittings, Gaskets, and Valve Actuators

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

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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.

**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, which 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.



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# 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 $4\frac{1}{4}$ and tubing sizes $1\frac{1}{4}$ 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 the American National Standard/Canadian Gas Association Standard for Manually Operated Gas Valves for Appliances, Appliance Connector Valves, and Hose End Valves, ANSI Z21.15/CGA 9.1.

### 1.4 Convention

For the purpose of determining conformance with this Standard, the convention for fixing significant digits where limits, maximum and minimum values, are specified by "rounding off" as defined in ASTM Practice E 29. This requires that an observed or calculated value shall 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 Annex A.

### 1.6 Units

The values stated in either inch units or metric units are to be regarded separately as standard. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in non-conformance 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 $\frac{3}{8}$, $\frac{1}{2}$, or $\frac{5}{8}$ 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,



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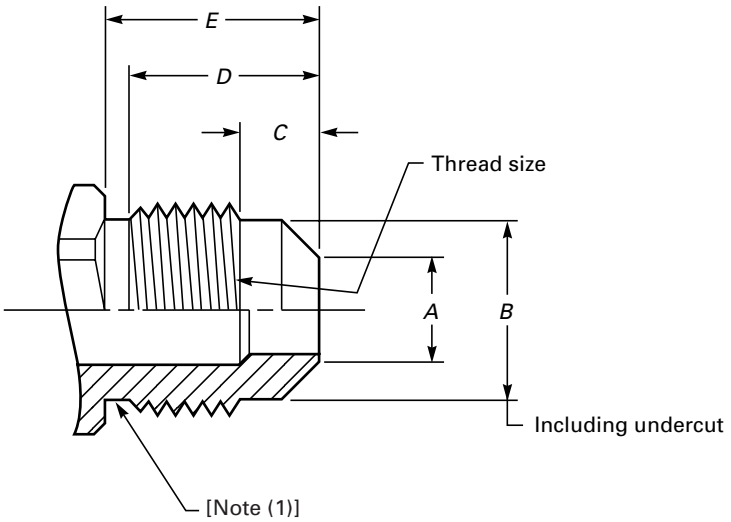


**Table 1 Flare Fitting Dimensions**

| U.S. Customary Units | | | | | | |
|---|---|---|---|---|---|---|
| Tube O.D., in. | Thread Size | Dimension, *A*, in. [Note (2)] | Dimension, *B*, in. [Note (2)] | Dimension, *C*, in. [Note (2)] | Minimun Dimension, *D*, in. [Note (2)] | Dimension, *E*, in. [Note (2)] |
| 3/8 | 5/8–18 UNF | 0.312 | 0.531 | 0.220 | 0.54 | 0.620 |
| 1/2 | 3/4–16 UNF | 0.438 | 0.641 | 0.250 | 0.66 | 0.750 |
| 5/8 | 15/16–16 UN | 0.565 | 0.843 | 0.280 | 0.76 | 0.880 |
| **Metric Units** | | | | | | |
| Tube O.D. | Thread Size | Dimension, *A*, mm [Note (3)] | Dimension, *B*, mm [Note (3)] | Dimension, *C*, mm [Note (3)] | Minimum Dimension, *D*, mm [Note (3)] | Dimension, *E*, mm [Note (3)] |
| 9.5 [3/8 in.] | 5/8–18 UNF | 7.9 | 13.5 | 5.6 | 13.7 | 15.7 |
| 12.7 [1/2 in.] | 3/4–16 UNF | 11.1 | 16.3 | 6.3 | 16.8 | 19.0 |
| 15.9 [5/8 in.] | 15/16–16 UN | 14.3 | 21.4 | 7.1 | 19.3 | 22.3 |

NOTES:
(1) Undercut is optional on 3/4–16 UNF thread and on 15/16–16 UN thread, undercut is required on 5/8–18 UNF thread.
(2) Tolerance: ±0.010 in.
(3) Tolerance: ±0.25 mm.

if provided, shall be securely attached to the valve by the use of threaded fasteners, retaining pins, or their equivalent.

### 2.5 Operation

The valve shall require 1/4 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 Tamper-Proof Features

Where valves are specified to be tamper-proof, 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).



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

| Material | ASTM Specifications |
|---|---|
| Cast Brass | B 584 Alloy UNS C83600, Alloy UNS C84400 |
| Cast Bronze | B 62 |
| Cast Iron | A 126 Class B, A 48 Class 30 |
| Ductile Iron | A 395, A 536 Grade 60-40-18, or Grade 65412 |
| Forged Brass | B 283 Alloy UNS C37700 |
| Malleable Iron | A 47, A 197 |
| Rod Brass | B 16 Alloy UNS C36000 |
| Sintered Brass | B 282 or MPIF Standard 35 Code CZP 3002, or CZP 2002 |
| Steel | A 108, A 505, or A 569 |

## 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 para. 1 of this Standard.

### 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 D 573 at 212°F (100°C), meet the elongation, tensile and hardness property requirements of 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 D 412. Three dumbbells shall be air aged 70 hr in accordance with ASTM D 573 at 212°F (100°C). The dumbbells shall have a thickness of 2.0 ± 0.2 mm (0.08 ± 0.008 in.). 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 D 395, Type 2. Three specimens shall be air aged 70 hr in accordance with ASTM D 573 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 D 471, 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 D 471, Section 8. Three specimens shall be exposed for 70 hr at 73°F (23°C) in n-hexane in accordance with ASTM D 471. 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 D 412. 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 D 471. The dumbbells shall have a thickness of 2.0 ± 0.2 mm (0.08 ± 0.008 in.). 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, which 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 D 395, para. 5.2.

**3.3.4 PTFE Materials.** Polytetrafluoroethylene (PTFE) materials shall comply with ASTM D 4894 or D 4895.

### 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 for 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 section. Valve ends shall be sealed with appropriate



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**Table 3 Minimum Flow Capacity**

| End Connection [Note (1)] | Minimum Gas Flow at Reference Condition | |
|---|---|---|
| | $ft^3/hr$ [Note (2)] | $m^3/hr$ |
| 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 | .60 |
| 5/16 O.D. Tube | 32 | .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.

fittings. The valve shall then be exposed for 96 hr to a salt spray (fog) test as specified in ASTM B 117. 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 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 7. For valves with one pipe connection and one tubing connection, the lesser of the two torque limits specified in Table 7 shall apply.

## 4 MARKING

### 4.1 General

The required markings shall be legible and applied so 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.

**Table 4 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 |
| 3 NPS | 1,400 | 148 |
| 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 |

### 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 Tamper-Proof

The designation T for tamper-proof construction, where tamper-proof 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).



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### 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 of the following tests. The valve shall not leak when tested as outlined under the following methods of test.

**5.2.1 External Leakage.** With the valve in the open position with the outlet sealed, an internal air pressure of, first, 2 in. (5 cm) water column and 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 3.

**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 the Instrument Society of American Standard, Control Valve Capacity Test Procedure, 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 4.

**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 tested according to the type and size of the connection, as specified in Table 4. 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 ± 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.

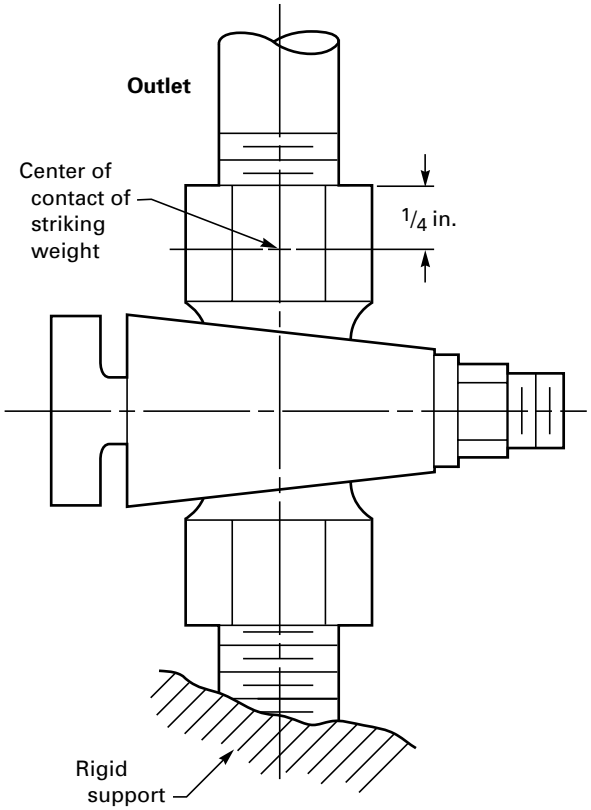


**Fig. 1 Test Device**

**Table 5 Impact Load**

| End Connections | Torque, lbf-ft | Torque, N-M |
|---|---|---|
| 1/4 NPS | 10 | 13.6 |
| 3/8 NPS | 15 | 20.3 |
| 1/2 NPS larger | 20 | 27.1 |
| 1/4 O.D. Tube | 1.5 | 2 |
| 5/16 – 7/16 O.D. Tube | 2 | 2.7 |
| 1/2 O.D. Tube | 5 | 6.8 |
| 5/8 O.D. Tube | 7 | 9.5 |
| 3/4 O.D. Tube | 10 | 13.6 |
| 7/8 O.D. Tube | 15 | 20.3 |
| 1 O.D. Tube | 20 | 27.1 |

### 5.5 Impact Energy Absorption

The valve shall be capable of absorbing the impact energy specified in Table 5 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



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**Table 6 Static Load for Bending Test**

| | Applied Force | |
|---|---|---|
| End Connections | lbf | N |
| 1/4 NPS | 35 | 155 |
| 3/8 NPS | 37.5 | 169 |
| 1/2 NPS | 40 | 178 |
| 3/4 NPS | 42.5 | 189 |
| 1 NPS | 45 | 200 |
| 1 1/4 NPS | 47.5 | 211 |
| 1 1/2 NPS | 62.5 | 278 |
| 2 NPS | 85 | 378 |
| 2 1/2 NPS | 140 | 623 |
| 3 NPS | 190 | 845 |
| 4 NPS | 250 | 1,112 |
| 1/4 O.D. Tube | 1.5 | 8 |
| 5/16 O.D. Tube | 2.5 | 11 |
| 3/8 O.D. Tube | 4.0 | 18 |
| 7/16 O.D. Tube | 5.5 | 24 |
| 1/2 O.D. Tube | 7.5 | 33 |
| 5/8 O.D. Tube | 13.0 | 58 |
| 3/4 O.D. Tube | 24.0 | 107 |
| 7/8 O.D. Tube | 38.0 | 169 |
| 1 O.D. Tube | 60.0 | 267 |

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 4. 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 4.

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 1/4 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 5, 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 visually 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 6 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 1/2 the value specified in Table 4. 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.

### 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 7 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 7 shall apply.

**5.7.2 Method of Test.** The valve shall be opened and closed at a rate no greater than 2 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 7 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.



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**Table 7 Operating Torque Values**

| End Connections Pipe/Tubing Size | Valves Designed for Use of Tools for Opening and Closing | | Valves Incorporated an Integral Handle | |
|---|---|---|---|---|
| | lbf-in. | N-M | lbf-in. | N-M |
| 1/4 NPS | 90 | 10.2 | 15 | 1.7 |
| 3/8 NPS | 120 | 13.6 | 20 | 2.3 |
| 1/2 NPS | 156 | 17.6 | 45 | 5.1 |
| 3/4 NPS | 216 | 24.4 | 45 | 5.1 |
| 1 NPS | 276 | 31.2 | 45 | 5.1 |
| 1 1/4 NPS | 360 | 40.7 | 60 | 6.8 |
| 1 1/2 NPS | 480 | 54.2 | 80 | 9.0 |
| 2 NPS | 600 | 67.8 | 100 | 11.3 |
| 2 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 |
| 1/4 – 5/16 O.D. Tube | 60 | 6.8 | 10 | 1.1 |
| 3/8 – 7/16 O.D. Tube | 120 | 13.6 | 20 | 2.3 |
| 1/2 – 9/16 O.D. Tube | 156 | 17.6 | 45 | 5.1 |
| 5/8 O.D. Tube | 216 | 24.4 | 45 | 5.1 |
| 3/4 – 1 O.D. Tube | 276 | 31.2 | 45 | 5.1 |

5.2. Following para. 5.2 testing, 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 one hour. The valve shall then be closed. During closing the torque shall not exceed twice that shown in Table 7.

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., mercury (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. mercury (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 para. 5.3 testing, 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 one hour. The valve shall then be closed. During closing the torque shall not exceed twice that shown in Table 7.

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. mercury (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 in., mercury (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 $ft^3/h$ (47 $cm^3/s$). The valve in the open position shall not leak in excess of 2 $ft^3/h$ (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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## 7 REFERENCES

The following is a list of standards and specifications referenced in this Standard showing year of approval.

ANSI Z21.15-97/CGA 9.1-1997, Manually Operated Gas Valves for Appliances, Appliance Connector Valves, and Hose End Valves[1]

Publisher: Canadian Gas Association (CGA), 20 Eglinton Avenue West, P.O. Box 2017, Toronto, Ontario M4R 1K8, Canada

ANSI/ISA S75.02-96, Control Valve Capacity Test Procedures[1]

Publisher: Instrument Society of America (ISA), 67 Alexander Drive, P.O. Box 12277, Research Triangle Park, NC 27709

ASME B1.20.1-1983 (R2001), Pipe Threads, General Purpose (Inch)[1]

Publisher: The American Society of Mechanical Engineers (ASME International), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

ASTM A 47/A 47M-99, Specification for Ferritic Malleable Iron Castings

ASTM A 48/A 48M-00, Specification for Gray Iron Castings

ASTM A 108-99, Specification for Steel Bars, Carbon, Cold Finished, Standard Quality

ASTM A 126-95$^{\epsilon 1}$, Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

ASTM A 197/A 197M-00, Specification for Cupola Malleable Iron

ASTM A 395/A 395M-99, Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures

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ASTM B 117-97, Practice for Operating Salt Spray (Fog) Apparatus

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ASTM B 536-95, Specification for Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Plate, Sheet, and Strip

ASTM B 584-00, Specification for Copper Alloy Sand Castings for General Applications

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ASTM D 412-98a, Test Methods for Vulcanized Rubber and Thermoplastic Rubber and Thermoplastic Elastomers-Tension

ASTM D 471-98$^{\epsilon 1}$, Test Method for Rubber Property-Effect of Liquids

ASTM D 573-99, Test Method for Rubber-Deterioration in an Air Oven

ASTM D 4894-98a, Specification for Polytetrafluoroethylene (PTFE) Granular Molding and Ram Extrusion Materials

ASTM D 4895-98, Specification for Polytetrafluoroethylene (PTFE) Resin Produced From Dispersion

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ISO 9000-2: 1997, Quality Management and Quality Assurance Standards — Part 2: Generic Guidelines for the Application of ISO 9001, ISO 9002, and ISO 9003

ISO 9000-3: 1997, Quality Management and Quality Assurance Standards — Part 3: Guidelines for the Application of ISO 9001 to the Development, Supply, and Maintenance of Software

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



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ISO 9001: 1994, Quality Systems — Model for Quality Assurance in Design, Development, Production, Installation, and Servicing

ISO 9002: 1994, Quality Systems — Model for Quality Assurance in Production and Servicing

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Publisher: International Organization for Standardization (ISO), 1 Rue de Varembé, Case Postale 56, CH-1211, Genève 20, Switzerland/Suisse

MPIF Standard 35-97, Materials Standards for P/M Structural Parts

Publisher: Metal Powder Industries Federation (MPIF), 105 College Road, E, Princeton, NJ 08540

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



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# NONMANDATORY ANNEX 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 Control (ASQC) as American National Standards that are identified by a prefix "Q" replacing the prefix "ISO." Each standard of the series is listed in para. 7.



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

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Pipe Threads, General Purpose (Inch) . . . . . B1.20.1-1983 (R1992)
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Cast Copper Alloy Solder Joint Pressure Fittings . . . . . B16.18-2001
Metallic Gaskets for Pipe Flanges: Ring-Joint, Spiral-Wound, and Jacketed . . . . . B16.20-1998
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Orifice Flanges . . . . . B16.36-1996
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Malleable Iron Threaded Pipe Unions . . . . . B16.39-1998
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Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300 . . . . . B16.42-1998
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