UL 262

STANDARD FOR SAFETY

Gate Valves for Fire-Protection Service

UL Standard for Safety for Gate Valves for Fire-Protection Service, UL 262

Eighth Edition, Dated February 26, 2004

Summary of Topics

This revision of UL 262 dated July 19, 2023 is being issued to provide clarification for year of manufacture in marking, 29.1.

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated May 26, 2023.

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UL 262

Standard for Gate Valves for Fire-Protection Service

The first edition was covered by two standards titled Outside Screw and Yoke Gate Valves and Inside Screw Valves for Underground Work, numbered UL 262B and UL 262A, respectively.

The second edition was titled Outside Screw and Yoke Gate Valves and numbered UL 262B.

First Edition – March, 1931
Second Edition – August, 1950
Third Edition – June, 1966
Fourth Edition – May, 1973
Fifth Edition – April, 1980
Sixth Edition – November, 1988
Seventh Edition – May, 1994

Eighth Edition

February 26, 2004

This UL Standard for Safety consists of the Eighth Edition including revisions through July 19, 2023.

The Department of Defense (DoD) has adopted UL 262 on August 10, 1989. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Comments or proposals for revisions on any part of the Standard may be submitted to ULSE at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover gate valves intended for installation in piping systems supplying water for fire-protection service. Gate valves covered by these requirements are of the outside-screw-and-yoke type or of the nonrising stem type, the latter for installation either above or below ground.

1.2 The gate valves covered by these requirements are intended for installation and use in accordance with the Standards for:

a) Low Expansion Foam , NFPA 11;

b) Installation of Sprinkler Systems, NFPA 13;

c) Installation of Standpipe and Hose Systems, NFPA 14;

d) Water Spray Fixed Systems for Fire Protection, NFPA 15;

e) Deluge Foam-Water Sprinkler and Foam-Water Spray Systems, NFPA 16;

f) Installation of Centrifugal Fire Pumps, NFPA 20;

g) Water Tanks for Private Fire Protection, NFPA 22; and

h) Installation of Private Fire Service Mains and Their Appurtenances, NFPA 24.

2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this standard shall comply with the requirements for that component.

2.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or

b) Is superseded by a requirement in this standard.

2.3 A component shall be used in accordance with its rating established for the intended conditions of use.

2.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

3 Units of Measurement

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

4 Undated References

4.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

CONSTRUCTION

5 Sizes

5.1 A gate valve of the outside-screw-and-yoke type shall be constructed for use with standard pipe of trade size 1/2 inch or larger. A gate valve of the nonrising stem type shall be constructed for use with standard pipe of trade size 2-1/2 inches or larger.

5.2 Valve sizes refer to the nominal diameter of the waterway through the inlet and outlet connections and to the pipe size for which the connections are intended.

Exception: A 1/2 inch size valve may consist of a 3/4 inch valve assembly having 1/2 inch pipe threads tapped in the metal of the body.

6 Rated Pressure

6.1 A gate valve shall be constructed for a minimum rated pressure of:

a) 175 psig (1206 kPa) for sizes 12 inches (305 mm) or smaller; and

b) 150 psig (1034 kPa) for sizes 14 inches (355 mm) or larger.

7 Bodies and Bonnets

7.1 The body of a valve shall be of the straightway type and shall provide, when the gate is fully open, a waterway diameter equal to or greater than the inside diameter of a mating pipe. The diameter measurement is to be made at points away from projecting lugs used for the seat ring assembly.

Exception: A gate valve providing a waterway having a diameter less than the diameter of the mating pipe is acceptable, if the valve incorporating such a waterway complies with the requirements of the Friction Loss Test for Valves Having Reduced Waterways, Section 25.

7.2 The body and bonnet of a valve shall be made of materials having strength, rigidity, and resistance to corrosion at least equivalent to cast iron or bronze.

7.3 A casting shall be smooth and free from scale, lumps, cracks, blisters, sand holes, and defects of any nature that make it unfit for the intended use. A casting shall not be plugged or filled, but may be impregnated to remove porosity.

7.4 Guides shall be cast integrally with the body. If the gate can be assembled in other than the intended manner, the guides shall be of unequal width, or other equivalent means shall be provided to facilitate correct assembly.

7.5 The dimensions of all flanges, flange pipe joints, grooves, and threaded body openings shall conform to the following standards, as applicable or to other national standards that apply where the valve is intended to be installed:

a) Fittings, 3 – 48 inches, (76.2 – 1219 mm) for Water and Other Liquids, Gray Iron and Ductile Iron, ANSI/AWWA C110/A21.10.

b) Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings, ANSI/AWWA C111/A21.11.

c) Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800, ANSI/ASME B16.1.

d) Forged Steel Fittings, Socket Welding and Threaded, ANSI/ASME B16.11.

e) Steel Pipe Flanges for Waterworks Service, 4 – 144 Inches (101.6 – 3657.6 mm), ANSI/AWWA C207, for valves having a maximum rated pressure of 175 psig (1206 kPa); Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys, ANSI/ASME B16.5, for valves having a maximum rated pressure greater than 175 psig (1206 kPa).

7.6 The body and the bonnet of a valve shall be fastened together in a manner that permits access to the internal parts.

7.7 An outside-screw-and-yoke valve shall be constructed so that the hand cannot be jammed between a yoke and the handwheel.

7.8 The load on any bolt, exclusive of the force required to compress the gasket, shall not exceed the minimum tensile strength specified in Table 2 of the Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength, ASTM A307, when the valve is pressurized at the test pressure specified in 27.1. The area of the application of pressure is to be calculated as follows:

a) If a full-face gasket is used, the area of force application is that extending out to a line defined by the inner edge of the bolts.

b) If an "O" ring seal or ring gasket is used, the area of force application is that extending out of the center line of the "O" ring or gasket.

8 Valve Operation Feature

8.1 An outside-screw-and-yoke valve shall be provided with a handwheel to facilitate operation.

8.2 A nonrising stem valve shall be provided with a wrench nut (see Section 14, Wrench Nuts). A flange (see Section 15, Indicator Post Flanges) for connection to an indicator post shall also be provided unless the valve is intended for connection to a roadway box in a field installation.

9 Gates

9.1 The gate for a valve shall be of cast iron or other material having at least equivalent corrosion resistance.

9.2 The central part of a gate for a valve larger than 1 inch (25.4 mm) shall be recessed.

9.3 Any cast iron surface of a gate shall be so constructed as to clear the body seat ring in all positions.

9.4 For a cast iron gate for an iron-bodied valve, guides or links shall be provided to reduce the risk of the gate-ring seating surfaces rubbing on the body or bonnet during operation.

10 Seating Surfaces

10.1 For a valve having a metal-to-metal seating surface, all seating surfaces of the gate and body shall be of bronze or material having at least equivalent corrosion resistance;

10.2 A seating surface that is contacted by a resilient material shall:

a) Be made of bronze or other metal having at least equivalent corrosion resistance, or

b) Have a protective organic coating complying with Tests on Organic Coating Materials for Seating Surfaces, Section 20.

11 Stems

11.1 A stem shall be made of material having strength and resistance to corrosion at least equivalent to bronze or Series 300 stainless steel.

11.1.1 Other materials are permitted to be used when evaluated for strength at least equivalent to bronze and evaluated for corrosion resistance as specified in the Comparative Corrosion Test, Section 20A.

11.2 Stem threads shall be Acme, modified Acme, half "V," or square.

11.3 The connection between a stem and its gate shall be aligned so that the stem is not bound when the gate is seated.

11.4 A stem nut shall be of material having strength, wear resistance, and corrosion resistance at least equivalent to bronze.

11.5 The stem of a nonrising stem valve shall, when the valve is closed, enter the stem nut a distance equal to at least 1-1/4 (31.75 mm) times the outside diameter of the stem.

11.6 A 5-inch (127-mm) or larger outside-screw-and-yoke valve shall be provided with a bronze washer between the yoke and the handwheel, unless the construction of the stem nut does not permit the yoke and handwheel to come into contact.

11.7 The stem of a nonrising stem valve shall be attached to the wrench nut by means such as a square-tapered end or pinning the nut to the stem. If the stem is not provided with a square taper, the means of attachment shall be constructed of material having corrosion resistance at least equivalent to brass, bronze, or stainless steel.

12 Stuffing Boxes and Stem Seals

12.1 A valve shall include a stuffing box, or other means for sealing, to prevent leakage at the valve stem.

12.2 A stuffing box, when used, shall be provided with a removable, shouldered, unthreaded follower gland retained by bolts or studs. Bolts or studs employed for retaining a gland for a stuffing box may be of bronze, iron, or steel, but shall in all cases engage nuts or other threaded sections of bronze or other equivalent corrosion resistant material.

12.3 The width of the annular recess in a stuffing box between the stem and the inner wall shall be not less than 22 percent of the diameter of the stem, and in no case less than 1/8 inch (3.2 mm).

12.4 A stem seal employing formed rubber rings shall be constructed to include at least two rings. The bolts and nuts for o-ring type stem seals shall be made of stainless steel, bronze, iron, steel, or other material.

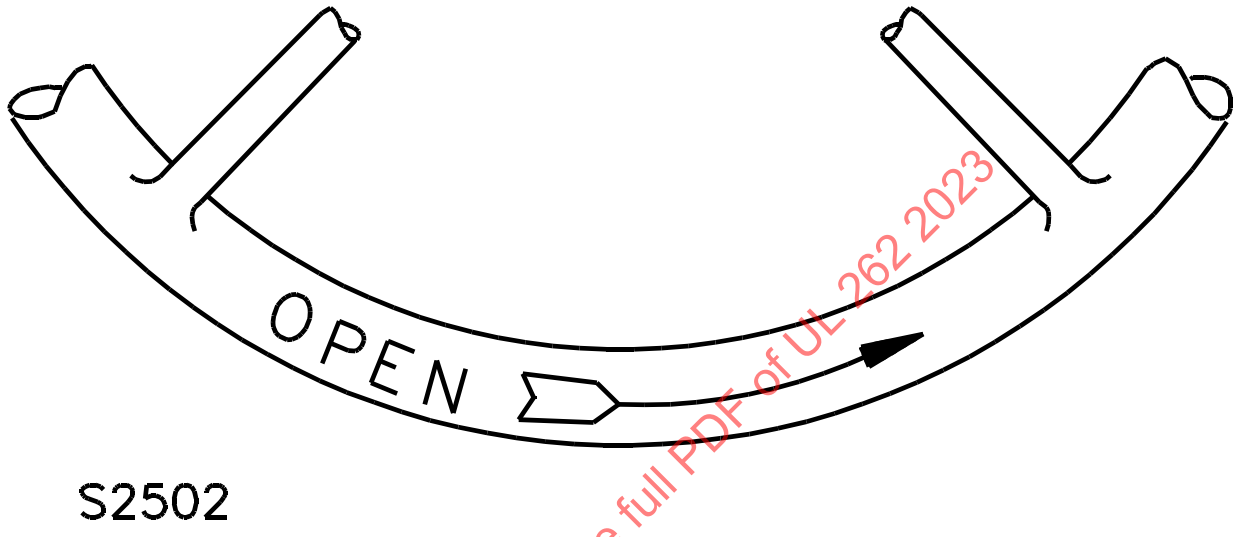
13 Handwheels

13.1 A handwheel shall be constructed to be readily grasped by the hands.

13.2 An arrow showing the direction to turn the handwheel to open the valve, with the word "OPEN" at the feather end or in a break in the shaft, shall be cast on the handwheel and be easily readable. See Figure 13.1.

Figure 13.1

Handwheel detail



13.3 The arrow shall be not less than 1-1/4-inches (32-mm) long for a valve of 2-1/2-inch (64-mm) size and smaller; 2-1/2-inches (64-mm) long for a valve of 3, 4, and 5 inch (76, 102, and 127 mm) size; and 4 inches (102 mm) long for a valve of 6 inch size and larger. If the shaft is broken to admit the word "OPEN," the sum of the parts of the arrow shall have a length at least three-fourths as long as that specified for the unbroken arrow.

13.4 The outside diameter of a handwheel shall be not less than the sizes specified in Table 13.1.

Table 13.1
Minimum handwheel diameters

Nominal valve size		Diameter of handwheel	
Inches	(mm)	Inches	(mm)
1/2, 3/4	(12.7, 19)	2-5/8	(67)
1	(25.4)	2-5/8	(67)
1-1/4	(32)	3	(76)
1-1/2	(38.1)	3-1/4	(83)

Table 13.1 Continued on Next Page

Table 13.1 Continued

Nominal valve size		Diameter of handwheel	
Inches	(mm)	Inches	(mm)
2	(51)	3-1/2	(89)
2-1/2	(64)	4-3/8	(121)
3	(76)	6	(152)
3-1/2	(89)	7	(178)
4	(102)	8	(203)
5	(127)	10	(254)
6	(152)	11	(279)
8	(203)	13	(330)
10	(254)	15	(381)
12	(305)	16	(406)
14	(356)	17	(432)
16	(406)	18	(457)

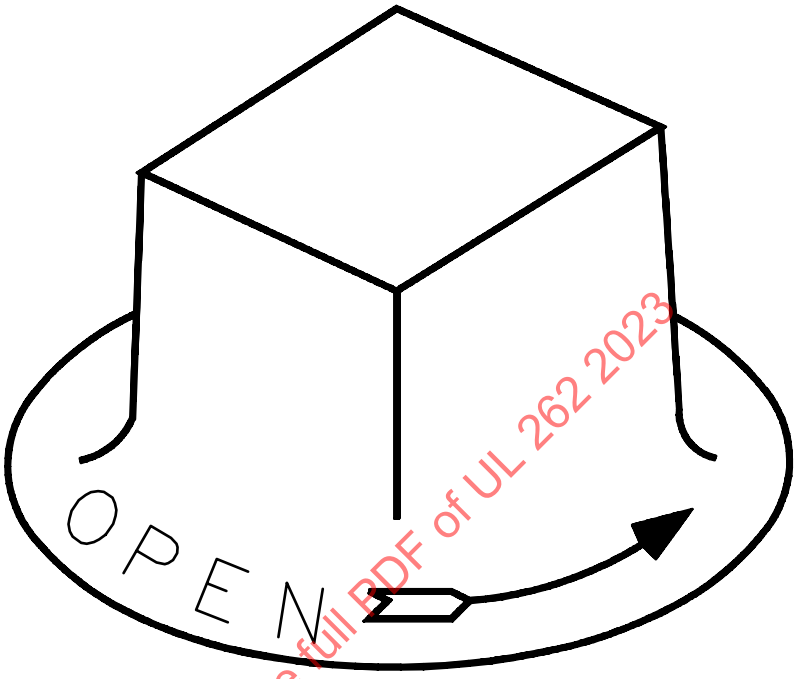
14 Wrench Nuts

14.1 The wrench nut for a nonrising stem valve shall be made of material having strength and resistance to corrosion at least equivalent to cast iron. It shall be fitted to the end of the stem and shall be secured by a means such as a nut, pin, key, or cap screw.

14.2 A wrench nut shall be 1-15/16-inches (49-mm) square at the top and 2-inches (51-mm) square at the base of a section 1-3/4-inches (45-mm) high. The nut shall include a flanged base upon which shall be cast an arrow at least 2-inches (51-mm) long, showing the direction of opening and the word "OPEN " in distinct letters at least 1/2 inch (12.7 mm) high. See Figure 14.1.

Figure 14.1

Wrench nut



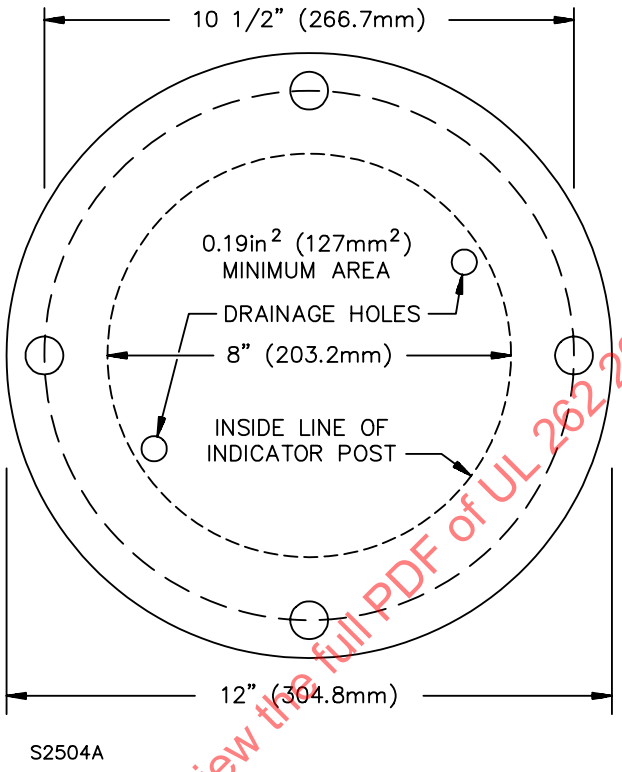
15 Indicator Post Flanges

15.1 A nonrising stem type valve intended for connection to an indicator post shall have a flange cast on the bonnet for attaching an indicator post to the valve, or have an intermediate annular flange of standard dimensions arranged for bolting to a supporting flange cast integral with the bonnet.

15.2 The flange intended for connection to an indicator post shall be circular or square and shall have the major dimensions and bolt-hole locations as shown in Figure 15.1. The flange shall be of material having the strength, rigidity, and resistance to corrosion equivalent to 5/8 inch (15.9 mm) thick cast iron and shall be drilled for four 5/8 inch (15.9 mm) bolts.

Figure 15.1

Indicator post flange



15.3 The flange intended for connection to an indicator post shall be provided with at least two holes, each having a minimum area of 0.19 square inches (127 mm^2), for drainage of the indicator post. The drain holes may be constructed to allow plugging if a watertight construction is required for specific field installations.

PERFORMANCE

16 General

16.1 Representative samples of each size gate valve shall be subjected to the tests described in these requirements. Test bars of metal used in castings and additional samples of parts constructed of nonmetallic materials, such as rubber seal rings, are required for physical and chemical tests.

17 Metallic Materials Test

17.1 Specimen bars of metals used shall be prepared from the same heat or run of metal used in making the bodies and bonnets of valve samples submitted for investigation and test. The specimen bars shall conform to the minimum physical property requirements of the latest edition of the applicable ASTM or nationally recognized specifications.

18 10-Day Moist Ammonia Air Stress Cracking Test

18.1 After being subjected to the conditions described in 18.2 – 18.4, a brass part containing more than 15 percent zinc when examined using 25X magnification shall:

a) Show no evidence of cracking; or

b) Comply with the Leakage Test, in Section 24, if there is evidence of cracking.

18.2 Each test sample is to be subjected to the physical stresses normally imposed on or within a part as the result of assembly with other components. Such stresses are to be applied to the sample prior to and maintained during the test. Samples with threads, intended to be used for installing the product in the field, are to have the threads engaged and tightened to the torque specified in Table 18.1. Teflon tape or pipe compound are not to be used on the treads.

Table 18.1
Torque requirements for threaded connections

Nominal thread size		Torque	
Inches	(mm)	Pound-inches	(N·m)
1	(25.4)	1200	(135.6)
1-1/4	(32)	1450	(163.8)
1-1/2	(38)	1550	(175.1)
2	(51)	1650	(186.4)
2-1/2	(64)	1750	(197.7)
3	(76)	1800	(203.4)

18.3 Three samples are to be degreased and then continuously exposed in a set position for ten days to a moist ammonia-air mixture maintained in a glass chamber approximately 12 by 12 by 12 inches (305 by 305 by 305 mm) having a glass cover.

18.4 Approximately 600 ml of aqueous ammonia having a specific gravity of 0.94 is to be maintained at the bottom of the glass chamber below the samples. The samples are to be positioned 1-1/2 inches (38.1 mm) above the aqueous ammonia solution and supported by an inert tray. The moist ammonia-air mixture in the chamber is to be maintained at atmospheric pressure and at a temperature of 93°F (34°C).

19 Elastomeric Parts (Except Gaskets) Test

19.1 An elastomeric part used to provide a seal shall have the following properties when tested as specified in the Standard for Gaskets and Seals, UL 157:

a) For silicone rubber (having poly-organo-siloxane as its constituent characteristic), a minimum tensile strength of 500 psi (3.4 MPa) and a minimum ultimate elongation of 100 percent.

b) For natural rubber and synthetic rubber other than silicone rubber, a minimum tensile strength of 1500 psi (10.3 MPa) and minimum ultimate elongation of 150 percent; or a minimum tensile strength of 2200 psi (15.2 MPa) and a minimum ultimate elongation of 100 percent.

c) Those properties relating to maximum tensile set; minimum tensile strength and elongation after oven aging; and hardness after oven aging, all as specified in UL 157. The maximum service temperature used to determine the oven time and temperature for oven aging is considered to be 60°C (140°F).

19.2 The Standard for Gaskets and Seals, UL 157, provides for the testing of either finished elastomeric parts or sheet or slab material. Sheet or slab material is to be tested when the elastomeric parts are O-rings having diameters of less than 1 inch (25.4 mm). The material tested is to be the same as that used in the product, regardless of whether finished elastomeric parts or sheet or slab material is tested.

20 Tests on Organic Coating Materials for Seating Surfaces

20.1 General

20.1.1 Organic coating material used as a seating surface shall show no signs of disbondment or blistering when tested as specified in 20.2 – 20.6, shall show no evidence of base metal corrosion outside the scribed area when tested as specified in 20.3, and shall show no signs of cracking when tested as specified in 20.7.1. For these purposes, "cracking" does not include surface crazing.

20.2 Air oven exposure

20.2.1 Four specimens of combined coating material/base material, each measuring 4 by 4 inches (102 by 102 mm), are to be used for this test. The thickness of the coating material and base material are to be equivalent to the thickness used in valve construction. The specimens are to be prepared in a manner that duplicates valve seat construction (surface roughness, application procedure, and the like).

20.2.2 The specimens are to be subjected to air-oven aging at 100 ±1°C (212 ±2°F), or at the temperature determined in 20.2.4, as appropriate, for 180 days.

20.2.3 Following the exposure, the test specimens are to be visually examined for any evidence of disbondment or blistering of the coating.

20.2.4 If a coating material does not withstand the temperature specified in 20.2.2 without excessive deterioration, an air-oven aging test at a lower temperature for a longer period of time is to be applied. If a coating material is capable of withstanding a higher temperature than that specified in 20.2.2 without excessive deterioration, an air-oven aging test at a higher temperature for a shorter period of time, but not less than 30 days, is to be applied. The duration of exposure is to be calculated from the following equation:

$$D = (184{,}000)e^{-0.0693t}$$

in which:

D is the test duration in days, and

t is the test temperature in °C

20.3 Water immersion

20.3.1 Four specimens of combined coating material/base material, each measuring 4 by 4 inches (102 by 102 mm), are to be used for this test. The thickness of the coating material and base material are to be equivalent to the thickness used in valve construction. The specimens are to be prepared in a manner that duplicates valve seat construction (surface roughness, application procedure, and the like).

20.3.2 On each specimen an "X" is to be scribed with a sharp instrument through the coating material to the base material surface with each scribe 3 ±0.25 inch (76 ±6 mm) long. The scribed test specimens then are to be immersed in distilled water at a temperature of 70 ±1°C (158 ±2°F) for 90 days.

20.3.3 Following the exposure, the test specimens are to be visually examined for any evidence of disbondment or blistering of the coating or any corrosion of base metal outside of the scribed areas.

20.4 Sodium chloride immersion

20.4.1 Four specimens of combined coating material/base material, each measuring 4 by 4 inches (102 by 102 mm), are to be used for this test. The thickness of the coating material and base material are to be equivalent to the thickness used in valve construction. The specimens are to be prepared in a manner that duplicates valve seat construction (surface roughness, application procedure, and the like).

20.4.2 The test specimens are to be immersed in sodium chloride solution (2 percent by weight) at a temperature of 70 ±1°C (158 ±2°F) for 90 days.

20.4.3 Following the exposure, the test specimens are to be visually examined for any evidence of disbondment or blistering of the coating.

20.5 Potassium biphthalate immersion

20.5.1 Four specimens of combined coating material/base material, each measuring 4 by 4 inches (102 by 102 mm), are to be used for this test. The thickness of the coating material and base material are to be equivalent to the thickness used in valve construction. The specimens are to be prepared in a manner that duplicates valve seat construction (surface roughness, application procedure, and the like).

20.5.2 The test specimens are to be immersed in potassium biphthalate solution (pH=4) at a temperature of 70 ±1°C (158 ±2°F) for 90 days.

20.5.3 Following the exposure, the test specimens are to be visually examined for any evidence of disbondment or blistering of the coating.

20.6 Sodium carbonate immersion

20.6.1 Four specimens of combined coating material/base material, each measuring 4 by 4 inches (102 by 102 mm), are to be used for this test. The thickness of the coating material and base material are to be equivalent to the thickness used in valve construction. The specimens are to be prepared in a manner that duplicates valve seat construction (surface roughness, application procedure, and the like).

20.6.2 The test specimens are to be immersed in sodium carbonate solution (pH=10) at a temperature of 70 ±1°C (158 ±2°F) for 90 days.

20.6.3 Following the exposure, the test specimens are to be visually examined for any evidence of disbondment or blistering of the coating.

20.7 Impact test

20.7.1 Three specimens of combined coating material/base material as described in 20.2.1, or three samples of the actual part from the valve, are to be tested. The impact apparatus described in the Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact), ASTM D2794, is to be used for this test. Each specimen is to be subjected to an impact of 20 inch-pounds (2.3 J) using the 0.625 inch (15.9 mm) diameter hemispherical head. Following the impact the specimens are to be visually examined, without magnification, for any evidence of coating cracking. If a crack is detected visually, without the aid of magnification, a Holiday test is to be performed to ascertain whether the crack propagates to the substrate. NACE Standard RP0188 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates is to be used for this test.

20A Comparative Corrosion Tests for Stems

20A.1 General

20A.1.1 Other stem materials permitted in 11.1.1 shall not exhibit more general corrosion, more pitting or more cracking compared to bronze material when subjected to corrosive atmospheres of moist air Carbon-Dioxide-Sulfur-Dioxide and Salt-Spray exposures for the same time period, when visually evaluated.

20A.1.2 At least three sample stems fabricated from bronze and other materials shall be placed in each moist carbon dioxide-sulfur dioxide air mixture as specified in Moist carbon dioxide-sulfur dioxide air mixture, 20A.2 and a salt spray exposure as specified in Salt Spray, 20A.3, in the vertical position for periods of 30, 60, and 90 days. After the exposure the samples shall be rinsed with tap water and, if necessary, cleaned with light scrubbing using a scrub brush to reveal the surface of the samples and visually examined.

20A.2 Moist carbon dioxide-sulfur dioxide air mixture

20A.2.1 The samples are to be supported vertically and exposed to a moist carbon dioxide-sulfur dioxide air mixture in a closed glass chamber maintained at 95 plus 2 or minus 3°F (35 plus 1.1 or minus 1.7°C). On five days out of every seven, an amount of carbon dioxide equivalent to 1.0 percent of the volume of the chamber, plus an amount of sulfur dioxide equivalent to 1.0 percent of the volume of the chamber, are to be introduced. Prior to each introduction of gas, the remaining gas-air mixture from the previous day is to be thoroughly purged from the chamber. On the two days out of every seven that this does not occur, the chamber is to remain closed and no purging or introduction of gas is to be provided. A small amount of water (10 ml/0.003 m^3 of chamber volume) is to be maintained at the bottom of the chamber for humidity.

20A.3 Salt spray

20A.3.1 The samples are to be supported vertically and exposed to salt spray (fog) as specified in the Standard Practice for Operating Salt Spray (Fog) Testing Apparatus, ASTM B117, using a 5 percent salt solution.

21 Resilient Seat Material Securement Test

21.1 Resilient seat material of a gate valve shall withstand without separation, tearing, or permanent distortion the waterflow described in 21.2.

21.2 A representative size valve, in the approximately half open position, is to be subjected to a waterflow velocity of 15 feet per second (4.6 m/s) for 1 hour. Following the waterflow, the valve is to be visually examined for separation, tearing, or permanent distortion of the resilient material from the base metal.

21.3 The flow at 15 feet per second (4.6 m/s), as required in 21.2, is based upon the open area in Schedule 40 pipe of the same nominal size as the valve.

22 Resilient Seat Cycling Test

22.1 A gate valve incorporating a resilient seat material shall comply with the Leakage Test, Section 24, following the cycling described in 22.2.

22.2 The valve is to be subjected to 1000 cycles of operation at a maximum rate of 6 cycles of operation per minute, and in all instances the cycles are to be at a rate less than that at which water hammer damage could occur. A cycle of operation is to consist of valve operation from the fully-closed to the fully-