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NATIONAL STANDARD

ANSI/CAN/UL/ULC 125:2021

STANDARD FOR SAFETY

Flow Control Valves for Anhydrous Ammonia and LP-Gas

Approved American National Standard
ANSI

ANSI/UL 125-2021

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SCC FOREWORD

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UL Standard for Safety for Flow Control Valves for Anhydrous Ammonia and LP-Gas, ANSI/CAN/UL/ULC 125

Tenth Edition, Dated July 27, 2020

Summary of Topics

This revision of ANSI/CAN/UL/ULC 125 dated August 26, 2021 is issued to reinstate exceptions to clause 8.2, and update references in 8.6 and 8.7.

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

The revised requirements are substantially in accordance with Proposal(s) on this subject dated January 8, 2021.

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ANSI/UL 125-2021

JULY 27, 2020
(Title Page Reprinted: August 26, 2021)

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ANSI/CAN/UL/ULC 125:2021

Standard for Flow Control Valves for Anhydrous Ammonia and LP-Gas

The first through seventh editions were titled Standard for Valves for Anhydrous Ammonia and LP-Gas (Other Than Safety Relief).

First Edition – October, 1956
Second Edition – July, 1973
Third Edition – February, 1974
Fourth Edition – February, 1980
Fifth Edition – March, 1993
Sixth Edition – February, 1997
Seventh Edition – April, 2007
Eighth Edition – June, 2009
Ninth Edition – March, 2014

Tenth Edition

July 27, 2020

This ANSI/CAN/UL/ULC Safety Standard consists of the Tenth Edition including revisions through August 26, 2021.

The most recent designation of ANSI/UL 125 as an American National Standard (ANSI) occurred on August 26, 2021. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, Preface or SCC Foreword.

This standard has been designated as a National Standard of Canada (NSC) on August 26, 2021.

No Text on This Page

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Preface

This is the Tenth Edition of ANSI/CAN/UL/ULC 125, Standard for Flow Control Valves for Anhydrous Ammonia and LP-Gas.

UL is accredited by the American National Standards Institute (ANSI) and the Standards Council of Canada (SCC) as a Standards Development Organization (SDO). ULC Standards is accredited by the Standards Council of Canada (SCC) as a Standards Development Organization (SDO).

This Standard has been developed in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization.

This ANSI/CAN/UL/ULC 125 Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

This joint American National Standard and National Standard of Canada is based on, and now supersedes, the Ninth Edition of UL 125 and ULC/ORD-C125-92 (R2018).

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

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This Edition of the Standard has been formally approved by the UL Standards Technical Panel (STP) on Valves and Safety Relief Valves for Anhydrous Ammonia and LP-Gas, STP 125.

This list represents the STP 125 membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

STP 125 Membership

Name	Representing	Interest Category	Region
Blackwell, Robert	Independent Propane Co	Supply Chain	USA
Fredenburg, Richard	North Carolina Department of Agriculture & Consumer Services	AHJ	USA
Hoffmann, Richard	R A Hoffman Engineering P C, Dba Hoffman & Feige	General	USA

STP 125 Membership Continued on Next Page

STP 125 Membership Continued

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Prusko, Jeffrey	Underwriters Laboratories Inc.	Project Manager – Non-voting	USA
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Swiecicki, Bruce	National Propane Gas Association	General	USA
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Vandini, Thomas	Quality Steel Corp	Producer	USA
Wade, John A.	ULC Standards	STP Chair – Non-voting	Canada
Wolf, Erich	Cavagna North America	Producer	USA
Wolff-Klammer, Edgar	UL LLC	Testing & Standards Org	USA
Zuck, Jim	Marshall Excelsior Corp	Producer	USA

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Web site: ul.org

This Standard is intended to be used for conformity assessment.

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE

INTRODUCTION

1 Scope

1.1 These minimum requirements cover the following types of anhydrous ammonia and liquefied petroleum gas (LP-Gas) valves that are used to control the flow of liquid and/or vapor into and out of containers, or in piping systems between containers, or between containers and utilization equipment, and are for use at temperatures within the range of -40 °C (-40 °F) to 55 °C (130 °F):

a) Shutoff Valves (primary or secondary, and manual or automatic),

b) Excess Flow Valves,

c) Back Pressure Check Valves,

d) Filler Valves,

e) Vapor Return Valves,

f) Actuated Liquid Withdrawal Excess-Flow Valves,

g) Multiple function valves,

h) Internal valve,

i) Emergency shutoff valve,

j) Lever operated transfer valve, and

k) LP-Gas Hose Nozzle Valve.

1.2 Products covered by this Standard are intended to be installed and used in accordance with the applicable Codes and Regulations as determined by the Authority Having Jurisdiction (AHJ), such as, but not limited to:

a) In the United States:

1) Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G-2.1;

2) Liquefied Petroleum Gas Code, NFPA 58; and

3) Utility LP-Gas Plant Code, NFPA 59;

b) In Canada:

a) Propane storage and handling code, CSA B149.2; and

b) Provincial or other Regulations.

1.3 These requirements do not cover shutoff valves of the type commonly referred to as "cylinder valves" used on containers constructed under Department of Transportation (DOT) Specifications. Requirements for these valves are contained in the Standard for Cylinder Valves, UL 1769.

1.4 These requirements do not cover safety relief valves. Requirements for these valves are contained in the Standard for Safety Relief Valves for Anhydrous Ammonia and LP Gas, UL 132 and Safety Relief Valves for Anhydrous Ammonia and Propane, ULC/ORD-C132.

1.5 These requirements do not cover automatic shutoff valves that use electricity to actuate the valve member. Requirements for these valves are contained in the Standard for Electrically Operated Valves, UL 429 and Electrically Operated Valves, CSA-C22.2 No. 139.

1.6 These requirements do not apply to LP-Gas valves for use on containers or in systems for the following:

a) Refrigerated storage systems and

b) Marine and pipeline terminals, chemical plants, natural gas processing plants, refineries or tank farms, where "tank farms" do not include storage at industrial locations.

1.7 These requirements do not apply to valves for anhydrous ammonia for use on containers or in systems for the following:

a) Refrigerated storage systems,

b) Ammonia manufacturing plants,

c) Refrigeration plants where ammonia is used solely as a refrigerant, and

d) Ammonia transportation pipelines.

1.8 Except for such observations as are required to ascertain performance characteristics, the assigning of flow capacity ratings, other than for excess flow valves, is not within the scope of these requirements.

2 Service Pressure Rating

2.1 The service pressure rating of a valve intended for use in anhydrous ammonia service shall not be less than 1.7 MPa (250 psig) and shall not exceed 1/5 of its hydrostatic strength test pressure.

2.2 The service pressure rating of a valve intended for use in LP-Gas service shall not exceed 1/5 of its hydrostatic strength test pressure and shall be in accordance with Table 2.1.

Table 2.1
Service pressure rating of LP-Gas valves

Service	Minimum pressure rating
LP-Gas vapor at operating pressure of 0.9 MPa (125 psig) or less	0.9 MPa (125 psig)
LP-Gas liquid, or vapor at operating pressure over 0.9 MPa (125 psig) and at or below container pressure	1.7 MPa (250 psig)
Higher than container pressure	2.4 MPa (350 psig), or the MAWP, whichever is higher

3 Components

3.1 Except as indicated in 3.2, a component of a product covered by this standard shall comply with the requirements for that component.

3.2 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.

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

3.4 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.

4 Units of Measurement

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

5 Reference Publications

5.1 The documents shown below are referenced in the text of this Standard. Unless otherwise stated elsewhere in this Standard such reference shall be considered to indicate the edition and/or revisions of the document available at the date on which the Committee approved this UL/ULC Standard.

Documents Published by the American Society of Mechanical Engineers (ASME)
3 Park Avenue, New York, NY 10016-5990 U.S.A.
Telephone: 800-843-2763
www.asme.org

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

• ASME B36.10M, Welded and Seamless Wrought Steel Pipe

Documents Published by the American Society for Testing and Materials (ASTM)
100 Barr Harbour Drive, West Conshohocken, PA 19428-2959 U.S.A.
Telephone: (610) 832-9585
www.astm.org

• ASTM B858, Standard Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys

• ASTM G155, Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

• ASTM D1835, Standard Specification for Liquefied Petroleum (LP) Gases

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Document Published by the CSA Group
178 Rexdale Boulevard, Toronto, ON M9W 1R3 Canada
Telephone: (416) 747-4000 or 1-800-463-6727
www.csagroup.org

• CSA B149.2, Propane storage and handling code

• CSA C22.2 No. 139, Electrically operated valves

Document Published by the Compressed Gas Association (CGA)
14501 George Carter Way, Suite 103 Chantilly, VA 20151
Telephone: (703)788-2700
www.cganet.com

• CGA G-2.1, Requirements for the Storage and Handling of Anhydrous Ammonia

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Documents Published by Underwriters Laboratories Inc. (UL)
333 Pfingsten Road, Northbrook, IL 60062-2096, U.S.A.
Telephone: (847) 272-8800
www.ul.com

• UL 132, Safety Relief Valves for Anhydrous Ammonia and LP-Gas

• UL 157, Gaskets and Seals

• UL 429, Electrically Operated Valves

• UL 969, Marking and Labeling Systems

• UL 1769, Cylinder Valves

6 Glossary

6.1 ACTUATED LIQUID WITHDRAWAL EXCESS FLOW VALVE – A type of excess flow valve that must have its mating fitting connected to allow flow of fluid. It is intended to be installed into a container opening to allow for fluid evacuation.

6.2 AUTHORITY HAVING JURISDICTION – The governmental body responsible for the enforcement of any part of this Standard or the official or agency designated by that body to exercise such a function.

6.3 BACK PRESSURE CHECK VALVE – A type of valve that allows fluid flow in only one direction. The amount of flow allowed in the reverse direction is outlined in the seat leakage test. The type of seat material used; i.e. resilient or metal-to-metal, further categorizes back pressure check valves.

6.4 EMERGENCY SHUTOFF VALVE[a] – A shutoff valve incorporating thermal and manual means of closing that also provides for remote means of closing.

[a] Reproduced with permission of NFPA from NFPA 58, Liquefied Petroleum Gas Code, 2020 edition. Copyright© 2019, National Fire Protection Association. For a full copy of NFPA 58, please go to www.nfpa.org.

6.5 EXCESS FLOW CHECK VALVE (or EXCESS FLOW VALVE) – A valve designed to close when the liquid or vapor passing through it exceeds a prescribed flow rate.

6.6 FILLER VALVE – A type of valve connected to a container that is intended under normal operation to allow fluid flow into a container for filling purposes, but not out of the container.

6.7 INTERNAL VALVE[a] – A container primary shutoff that can be closed remotely, which incorporates an internal excess flow valve with the seat and seat disc located within the container so that they remain in place should external damage occur to the valve.

6.8 LEVER OPERATED TRANSFER VALVE – A manual, primary type of shutoff valve that is intended to be used at the end of a transfer hose used during the filling of containers.

6.9 LIQUEFIED PETROLEUM GAS (LP-GAS OR LPG) – Any material having a vapor pressure not exceeding that allowed for commercial propane, as defined in Standard Specification for Liquefied Petroleum (LP) Gases, ASTM D1835, that is composed predominantly of the following hydrocarbons, either by themselves (excluding propylene) or as mixtures: propane, propylene, butane (normal butane or isobutane) and butylenes.

6.10 LP-GAS HOSE NOZZLE VALVE – A lever operated self-closing fuel transfer valve that is used with a LP-Gas dispenser to dispense LP-Gas into a container on a vehicle.

6.11 MULTIPLE FUNCTION VALVE (or MULTIPLE HEAD VALVE) – A valve incorporating several types of valves into a single unit or body.

6.12 SHUTOFF VALVE – A type of valve that incorporates a seat and seat disc member that will close an internal orifice to prevent further flow of fluid through the valve. Shutoff valves are further categorized as primary or secondary, and manual or automatic.

6.13 SHUTOFF VALVE, AUTOMATIC – A type of shutoff valve that uses energy (other than electricity) to open and close the valve member, based upon some external input.

6.14 SHUTOFF VALVE, MANUAL – A type of valve that incorporates a handle, lever, handwheel or other element that anticipates human manipulation of the element to close the valve member.

6.15 SHUTOFF VALVE, PRIMARY – A type of valve that has no seat leakage and suitable for installation where a positive shutoff is required.

6.16 SHUTOFF VALVE, SECONDARY – A type of valve that may exhibit limited seat leakage when tested in accordance with these requirements and is suitable for installation only in branch or bypass piping where a positive shutoff is not essential.

6.17 VAPOR RETURN VALVE – A type of valve intended for vapor use only, which is used to equalize pressure between the supply container and the container being filled.

CONSTRUCTION

7 General

7.1 When a valve is of a design which requires the use of special pipe flanges, gaskets, bolts, or other special fittings or parts for making a proper installation, such parts shall be furnished by the manufacturer with each valve.

7.2 A seat disc shall be attached to its poppet or holder, or otherwise assembled so as to prevent it from becoming dislocated under service conditions. The means to secure the disc shall not rely on cement or adhesive.

7.3 A brazing material used for joining liquid-confining parts of a valve for LP-Gas shall have a melting point (solidus temperature) of no less than 538 °C (1000 °F). Brazing shall not be used on valves for anhydrous ammonia. See 8.4.

7.4 A valve with socket or butt weld ends shall be constructed so that it is capable of being installed without damaging nonmetallic seats or seals. Instructions for accomplishing this shall accompany each valve.

7.5 Two or more subassemblies intended to be assembled in the field as a unit shall be capable of being joined together without requiring any of the subassemblies to be cut, drilled, or welded.

7.6 The construction of a valve shall be such that parts can be reassembled after being dismantled to the extent provided for routine maintenance.

7.7 A flow control valve that requires bleeding of the product to the atmosphere, such as a vent or bleeder valve, shall be constructed so that the vent or bleeder valve's flow path to atmosphere incorporates an orifice equal or less than a No. 54 [1.4 mm (0.055 in) diameter] drill size.

7.8 A vent or bleeder valve shall have the vent stem retained so that it cannot be removed from the vent or bleeder valve body by reverse rotation.

8 Materials

8.1 An operating or pressure-confining part of a valve shall have the strength and durability to provide reliable service of the part and of the assembly.

8.2 A material other than a valve disc or soft seat, a seal ring, a diaphragm, or a gasket for pressure-confining parts, and external operating parts used to open and close the valve shall have:

a) A minimum melting point (solidus temperature) of not less than 510 °C (950 °F); and

b) A tensile strength of minimum 69 MPa (10,000 psig) at 204 °C (400 °F) for anhydrous ammonia valves, LP-Gas valves that are part of a meter assembly, lever operated transfer valves and LP-Gas hose nozzle valves, and LP-Gas pressure-confining stems or poppets of filler valves and vapor return valves.

Exception No. 1: A handle or lever on a shut off service valve having an inlet connection not greater than 1/2 inch NPT is not required to comply with this requirement. See Impact Test, Section 38.

Exception No. 2: A lever on a hose nozzle valve is not required to comply with this requirement.

8.3 A part in contact with the fluid to be handled shall be resistant to the action of such fluid.

8.4 Ammonia containing minute quantities of water reacts rapidly with cadmium, copper, zinc, and many alloys, especially those of copper base. Only iron, steel, and certain nonferrous alloys, determined to be satisfactory for ammonia service, are to be used in contact with anhydrous ammonia.

8.5 Nonductile cast iron (regular gray iron) shall not be used for bodies or closures for anhydrous ammonia or LP-Gas valves. This does not prohibit the use of nodular iron.

8.6 With reference to 8.2, elastomeric materials shall be subjected to the following tests:

a) Section 31, Accelerated Aging Test;

b) Section 32, Fluid Compatibility Test; and

c) Section 33, Low Temperature Test.

8.7 With reference to 8.2, polymeric materials shall be subjected to the following tests:

a) Section 31, Accelerated Aging Test; and

b) Section 32, Fluid Compatibility Test

Exception: Acetal polymers, chlorotrifluorethylene polymers, tetrafluorethylene, fluorinated ethylene propylene polymers and polyamides of composition polyhexamethylene adipamide or polycaproamide polymers (nylon 6, 6/6 or 6/16) shall only be subjected to the Accelerated Aging Test.

8.8 When corrosion of a part interferes with the proper function of a valve, the part shall be of a corrosion-resistant material or be provided with a corrosion-resistant protective coating.

8.9 A protective coating shall provide resistance against corrosion, to a degree no less than that provided by the protective coatings specified in 8.10.

8.10 Cadmium plating shall have a thickness of no less than 0.008 mm (0.0003 in), and zinc plating shall have a thickness of no less than 0.013 mm (0.0005 in).

Exception: On parts where threads constitute the major portion of the area, the thickness of the cadmium or zinc plating shall be no less than 0.0038 mm (0.00015 in).

8.11 When warping of a casting affects the tightness of liquid-confining joints or the proper fit of parts, the casting shall be stress-relieved to reduce the risk of warping.

8.12 A pressure confining brass part containing more than 15 % zinc shall be subjected to the Moist Ammonia Air Stress Cracking Test, Section 34.

9 Bodies

9.1 A threaded section of a body designed for connection of pipe shall be constructed with a section to serve as a wrench grip.

9.2 Pipe threads shall be in accordance with the Standard for Pipe Threads, General Purpose (Inch), ANSI/ASME B1.20.1.

Exception: Valves intended for use in installations where pipe fittings incorporate other than NPT type threads shall be permitted to be provided with pipe threads complying with a national pipe thread standard compatible with those fittings. The pipe thread type shall be identified in accordance with 42.5.

9.3 Joints in a body constructed of two or more parts shall be prevented from loosening as the result of the turning effort exerted by connecting or disconnecting piping. See the Deformation Test, Section 23.

9.4 A flange of a flange-type valve shall comply with the appropriate American National Standard for Pipe Flanges and Flanged Fittings covering the material from which the flange is made, or it shall be of a design determined by investigation to be appropriate for the application. See 7.2.

9.5 Openings for bolts or screws used for assembly shall not extend through the outer walls of a body into a liquid-handling section.

10 Springs

10.1 A spring shall be guided and arranged to minimize binding, buckling, or other interference with its free movement. When required, ends of a spring shall be closed and squared.

11 Shutoff Valves – All

11.1 A shutoff valve may be of the globe, gate, diaphragm, sliding disc, ball, or lubricated plug type, and may have a resilient or metal-to-metal seat.

11.2 A shutoff valve shall not be equipped with a bypass or with a means to prevent it from closing completely.

Exception: This requirement does not apply to a feature provided to permit a take-off to recirculate fluid or to supply a pilot or other individually controlled outlet.

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

11.4 When packing is used to prevent leakage around a valve stem, and the design is such that it requires the user to adjust or renew the packing during normal usage or as wear occurs, a stuffing box conforming to all of the following shall be used:

a) The stuffing box shall be located so that it is subjected to discharge side pressure,

b) The stuffing box shall be provided with a removable, shouldered, unthreaded follower gland, and shall be provided with a nut or other means for adjusting the gland to maintain pressure on the packing,

c) The stuffing box gland shall be made of corrosion-resistant material, and

d) The stuffing box shall be fully packed prior to shipment of the valve.

11.5 A spring-loaded follower gland shall use a spring made of corrosion-resistant material or be of material provided with a corrosion-resistant protective coating.

11.6 When corrosion of a valve stem is capable of damaging a packing or seal material and result in leakage, the stem shall be of corrosion-resistant material.

11.7 A valve stem shall be constructed so that it is incapable of being completely withdrawn from the valve by reverse rotation. Threads of a valve stem shall not enter a stuffing box recess.

11.8 For shutoff valves and shutoff valve portion of filler valves with handwheels that incorporate a screw type stem design, the handwheel and valve stem shall be so constructed so that it shall not fracture, break, crack or have stem threads stripped, in the open and closed position when subjected to the Valve Stem Torque Test, Section 39.

Exception: Valves that open by a 1/4 turn are not subjected to the test in Section 39.

12 Shutoff Valves – Automatic

12.1 An automatic shutoff valve shall not be equipped with means for manually latching the valve in the open position in a manner that prevents the valve from functioning as a shutoff.

12.2 When a mechanically actuated indicator is provided to show whether the main valve is open or shut, it shall be visible from a distance of at least 1.52 m (5 ft).

12.3 An automatic shutoff valve shall be normally closed and shall close independently of the energy supplied by the flowing anhydrous ammonia or LP-Gas. The anhydrous ammonia or LP-Gas is not prohibited from being used to exert supplementary forces on the valve seat.

13 Excess Flow Valves

13.1 An excess flow valve shall be designed with a means to allow for equalization of pressures. If a hole is provided for this purpose, the area of the bypass hole shall not exceed that of a No. 60 size drill [1.02 mm (0.040 in) diameter]. Metal-to-metal seating surfaces, a controlled depression in the poppet, or other design methods, are permitted to be used as a means to allow for equalization of pressures.

14 Back Pressure Check Valves

14.1 Back pressure check valves include types which may be referred to as back pressure check or line check valves. They may be provided with a resilient or metal-to-metal seat.

14.2 Back pressure checks may be provided with hydrostatic relief valves and shall be tested in accordance with the Start-To-Discharge Pressure Test, Section 40.

15 Filler Valves

15.1 A filler valve shall incorporate one of the following:

a) Two back pressure check valves,

b) A single back pressure check valve,

c) A positive shutoff valve with an internal back pressure check valve,

d) A positive shutoff valve with an internal excess flow valve or

e) A shutoff valve in between two back pressure check valves.

15.2 When a filler valve is constructed in accordance with 15.1 (a) or (e) the upper back pressure check valve of a filler valve shall be of the spring-loaded resilient-seat type.

15.3 A filler valve of the type specified by 15.1 (a) or (e) shall be designed to permit replacement of the resilient seat used in the upper back pressure check valve.

15.4 A filler valve shall be threaded for connection of a hose coupling and shall be provided with a threaded closure cap. A resilient gasket shall be incorporated in the valve to permit the making of a gas-tight joint when the hose coupling, or closure cap is tightened in place. Closure cap gaskets shall be retained in the valve body.

15.5 A filler valve shall incorporate a weak section that breaks off in case of excessive stress and leaves the internal mechanism intact and operative. See the Weak Section Strength Test, Section 30.

15.6 When a filler valve incorporates a shutoff valve, it shall comply with 26.4 when the direction of flow is out of the container.

15.7 When a filler valve is constructed in accordance with 15.1(e), the shutoff valve portion shall allow flow into the container, when in a closed position at a pressure not greater than 862 kPa (125 psig).

16 Vapor Return Valves

16.1 A vapor return valve shall incorporate a combination upper back pressure check valve and excess flow valve.

16.2 An excess flow valve provided in the assembly of a vapor return valve shall be designed with a bypass to allow for equalization of pressures. The area of the bypass hole shall not exceed that of a No. 60 size drill [1.02 mm (0.040 in) diameter].

16.3 The upper back pressure check valve of a vapor return valve shall be of the spring-loaded resilient-seat type.

16.4 A vapor return valve shall be designed to permit replacement of the resilient seat used in the upper back pressure check valve.

16.5 A vapor return valve shall be threaded for connection of a hose coupling and shall be provided with a threaded closure cap. A resilient gasket shall be incorporated in the valve to permit the making of a gas-tight joint when the hose coupling, or closure cap is tightened in place. Closure cap gaskets shall be retained in the valve body.

16.6 A vapor return valve shall incorporate a weak section that breaks off when subjected to excessive stress and leaves the internal mechanism intact and operative. See the Weak Section Strength Test, Section 30.

17 Actuated Liquid Withdrawal Excess-Flow Valves

17.1 An actuated liquid withdrawal excess-flow valve shall be provided with the following:

a) An inlet connection of 3/4 in NPT or greater;

b) An excess flow valve on the container half of the valve;

c) A weak section on the container half of the valve that breaks off in case of excessive stress and leaves the internal mechanism and excess flow valve intact and operative. See Weak Section Strength Test, Section 30; and

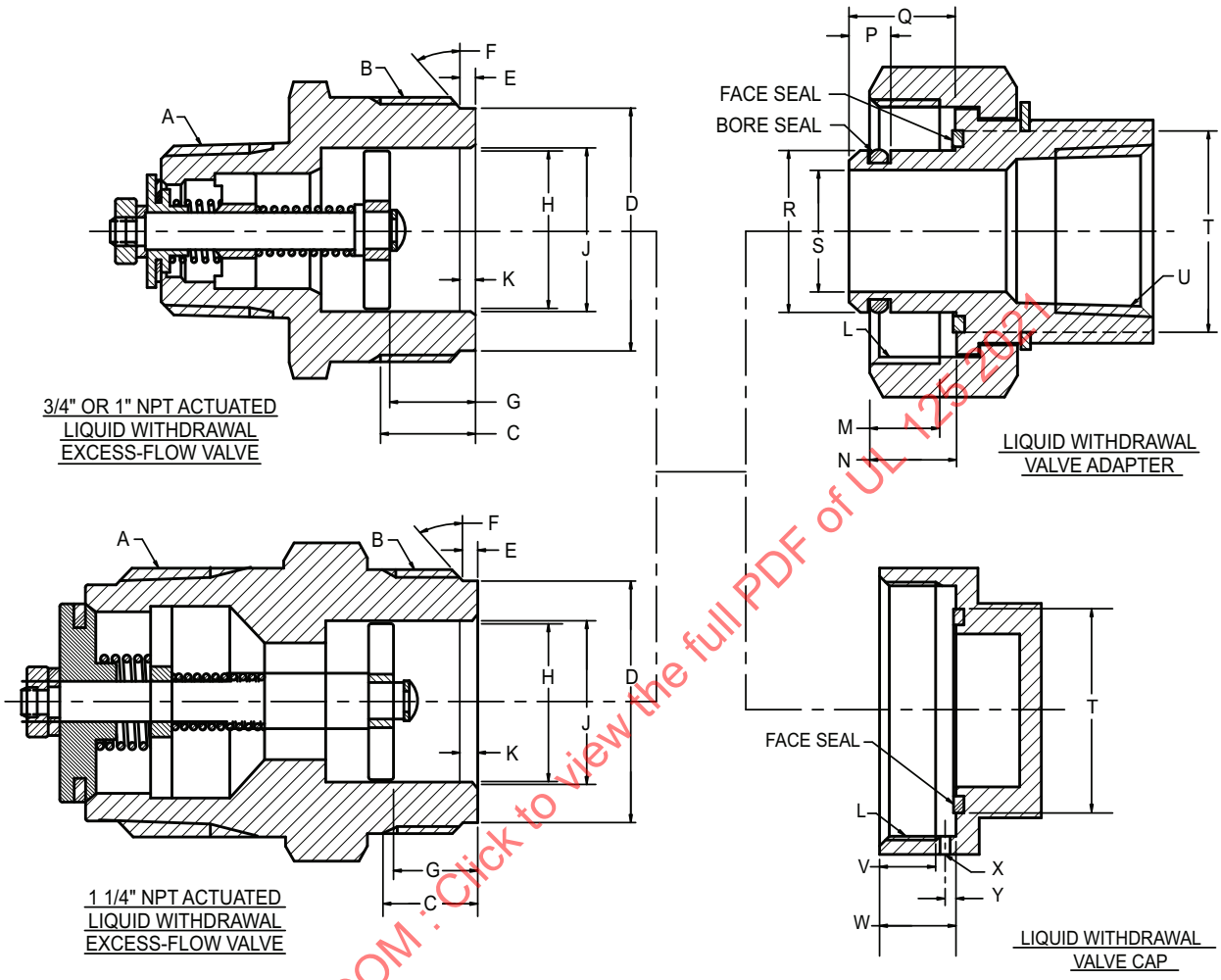
d) An outlet connection compatible with Figure 17.1 that shall not allow the valve to be opened with a pipe nipple. (Dimensions noted are composite or envelope dimensions and are not intended to be complete design dimensions.)

17.2 The excess flow valve shall be designed with a bypass to allow for equalization of pressures. The area of the bypass hole shall not exceed that of a No. 60 size drill [1.02 mm (0.040 in) diameter].

17.3 An actuated liquid withdrawal excess-flow valve shall incorporate means for obtaining a leak-tight connection before fluid is capable of flowing. See Positive Seal Test, Section 25.

Figure 17.1

Actuated liquid withdrawal excess-flow valve



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

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Figure 17.1 (Continued)

Figuer 17.1 (Cont'd)

3/4" and 1-1/4" Liquid Withdrawal Valve		
Tank Thread	A	3/4-14 NPT-RH-EXT or 1-11 1/2 NPT-RH-EXT or 101/4-11 1/2 NPT-RH-EXT
Adapter Thread	B	1 5/8-12 UN-2A-RH-EXT Major Dia. 1.6118 – 1.6232 Pitch Dia. 1.5632 – 1.5691 Minor Dia. 1.524 Max
Full Thread	C	.475 Min.
Thread Relief Dia.	D	1.485 ±.005
Thread Cutback	E	.087 ±.005
Thread Relief Angle	F	45° ±5°
Actuator Depth	G	.471 Min.
Bore Diameter	H	1.002 ± .002
Seal Lead-in Dia.	J	1.050 ±.010
Seal Lead-in Length	K	.115 ±.035
Valve Adapter		
Adapter Nut/Cap Thread	L	1 5/8-12 UNF-2B-RH-INT Minor Dia. 1.5350 – 1.5530 Pitch Dia. 1.5709 – 1.5785 Major Dia. 1.625 Min.
Full Thread	M	.397 Min.
Nut Extension	N	.467 ±.010
Bore Seal Groove Location	P	.300 Max.
Adapter Body Nose Length	Q	.657 ±.005
Adapter Nose Diameter	R	.996 ±.002
Bore Diameter	S	.750 ±.010
Face Seal Groove O.D.	T	1.450 Max.
Adapter Body Thread	U	3/4-14 NPT-RH-INT
Valve Cap		
Adapter Nut/Cap Thread	L	1 5/8-12 UNF-2B-RH-INT Minor Dia. 1.5350 – 1.5530 Pitch Dia. 1.5709 – 1.5785 Major Dia. 1.625 Min.
Full Thread	V	0.335 Min.
Bore Depth	W	.467 ±.010
Vent Hole Diameter	X	.050 Min.
Vent Hole Location	Y	.100 Max.
Face Seal Groove O.D.	T	1.450 Max.
NOTE – All dimensions are in inches unless otherwise noted.		

18 Multiple Function Valves

18.1 When two or more valves, are assembled together as one unit, the entire assembly is, for the purpose of these requirements, to be considered and tested as one valve.

18.2 Each valve type in the assembly shall meet the requirements for that valve type.

18.3 When a relief valve is provided in the assembly of the multiple function valve, the relief valve shall comply with the relief valve requirements for the container to which the multiple function valve is intended to be installed, with all other valves in the assembly in a closed position.

18.4 Separate relief valves that can be threaded into a multiple function valve shall be flow rated in the multiple function valve.

19 Internal Valves

19.1 An internal type valve, for which the mating flange is provided as part of the container in which the valve is to be installed, is not required to comply with 7.2.

19.2 An internal valve shall meet the requirements of Shutoff Valves – All, Section 11.

19.3 An internal valve shall incorporate means for manual quick-closing actuation of the valve member, (such as by a lever, handle, or actuator), a remote means of closure, and an internal excess flow valve or excess flow feature. The construction may incorporate a means for thermal actuation.

19.4 An internal valve shall meet the requirements for primary shutoff in the Exception to the Seat Leakage Test, 26.2.

19.5 Internal valves, which are actuated by pump differential pressure, shall be constructed to close when the loss of pump actuation differential pressure reaches a predetermined point.

19.6 If the internal valve assembly incorporates a fusible link or other member that will provide thermal actuation, the link, or thermal assembly shall not have a rated melting point (actuation point) exceeding 121 °C (250 °F). The link or assembly shall comply with the Thermal Link Operation Test, Section 35. Links made of fusible materials shall not be painted, nor shall they have any finishes applied after manufacture of the element unless it was subjected to the fusible link operation test with such painting or coating.

20 Emergency Shutoff Valves

20.1 An emergency shutoff valve shall have a pressure rating not less than 1724 kPa (250 psig) and comply with the requirements of Shutoff Valves – All, Section 11, for primary service.

20.2 An emergency shutoff valve shall incorporate means for manual quick-closing actuation of the valve member (such as by a lever, handle, or actuator), a remote means of closure, and a means for thermal actuation.

20.3 An emergency shutoff valve shall comply with the requirements for primary shutoff valves in the Seat Leakage Test, 26.2.

20.4 The thermal actuation member, (fusible link, or other thermal assembly) of an emergency shutoff valve shall not have a rated melting point (actuation point) exceeding 121 °C (250 °F). The link or assembly shall comply with the Thermal Link Operation Test, Section 35. Links made of fusible materials shall not be painted, nor shall they have any finishes applied after manufacture of the element unless it was subjected to the fusible link operation test with such painting or coating.

20.5 An emergency shutoff valve shall not be equipped with means for manually latching the valve in the open position in a manner that prevents the valve from functioning through thermal or remote actuation.

20.6 When a mechanically actuated indicator is provided on an emergency shutoff valve to show whether the main valve is open or shut, it shall be visible from a distance of at least 1.52 m (5 ft).

20.7 An emergency shutoff valve shall close independently of the energy supplied by the flowing anhydrous ammonia or LP-Gas. The anhydrous ammonia or LP-Gas is not prohibited from being used to exert supplementary forces on the valve seat.

21 Lever Operated Transfer Valves and LP-Gas Hose Nozzle Valves

21.1 Lever operated transfer valves and LP-Gas hose nozzle valves shall have a pressure rating not less than 2413 kPa (350 psig), and meet the requirements of Shutoff Valves – All, Section 11, for primary service.

21.2 Lever operated transfer valves and LP-Gas hose nozzle valves shall be of the normally closed type. They shall be lever-operated or otherwise incorporate means that will allow the valve to be quick closing, such as by lever action or use of a handle that moves 90° or less (1/4 revolution).

21.3 A LP-Gas hose nozzle valve shall be self-closing upon removal of the manual force, automatic release of the operating lever, or release of the latch-open mechanism.

21.4 A LP-Gas hose nozzle valve shall provide a guard or other means to protect the free end of an operating lever and to prevent opening of the valve or damage to an operating part if the valve is dropped. A guard shall be of such strength as to permit operation of the valve subsequent to its being subjected to the Drop Test, Section 37.

21.5 A LP-Gas hose nozzle valve shall incorporate mating threads to a filler valve.

PERFORMANCE

22 General

22.1 Representative samples of each type of valve are to be subjected to the tests described in these requirements. When a series of shutoff or backpressure check valves are to be investigated in which the valves differ in size only, and all sizes have the same pressure rating, three representative samples are to be chosen to include the largest, smallest, and one intermediate size. Additional samples of parts constructed of nonmetallic materials, such as seal materials and valve seat discs, are required for physical and chemical tests.

Exception: This does not apply to the number of samples required for the Moist Ammonia Air Stress Cracking Test, Section 34. See 34.2.

22.2 Leakage tests up to 34.47 MPa (5000 psig) are to use a source of aerostatic pressure such as air or nitrogen. Leakage tests greater than 34.47 MPa (5000 psig) may be conducted using a source of hydrostatic pressure such as water or other liquid.

22.3 Water or other liquid may be used for developing the required pressure in a hydrostatic pressure strength test.

22.4 All leakage and hydrostatic pressure strength tests are to be maintained for at least 1 min.

22.5 The investigation is to be limited to the service conditions for which the product is intended, such as the fluid handled and the pressure of the fluid. In the case of lubricated plug type valves, this includes the

addition of sealant and periodic adjustment of the lubrication plug in accordance with instructions specified by the manufacturer.

22.6 Pressure measuring devices shall be calibrated over the range that they are used. The test pressure measured shall be not less than 20 % or more than 80 % of the full-scale reading of the device used.

Exception: The test pressure is allowed to be less than 20 % and more than 80 % of the full-scale reading of the measuring device, when calibration indicates that there is no loss of accuracy in the measured value.

23 Deformation Test

23.1 Joints in a valve shall not leak, nor shall there be evidence of loosening of joints, distortion, or other damage resulting from the stress imposed on pipe-threaded sections when tested in accordance with these requirements.

23.2 The sample valve used in this test is to be rigidly anchored or otherwise supported. A length of Schedule 80 pipe, sufficient to provide for wrench engagement, is to be connected to a female pipe threaded section of the body. The male pipe threads shall have pipe joint sealing compound or polytetrafluoroethylene (PTFE) tape applied to them first or be coated as specified by the manufacturer. Each pipe is then to be tightened across the valve body to the torque specified by the manufacturer or in Table 23.1, or whichever is greater.

23.3 After the torque force has been applied to each connected pipe, the test sample is to be subjected to the External Leakage Test, Section 24.

23.4 Upon removal of the pipe from the test sample, the assembly is to be examined for loosening of body joints.

Table 23.1
Torque requirements for pipe connections

Pipe size, nominal inches[a]	Outside diameter, inches	(mm)	Torque, lb-in	(N·m)
1/8	0.4	(10.3)	150	(17)
1/4	0.5	(13.7)	250	(28)
3/8	0.7	(17.2)	450	(51)
1/2	0.8	(21.3)	800	(90)
3/4	1.1	(26.7)	1000	(113)
1	1.3	(33.4)	1200	(136)
1-1/4	1.7	(42.2)	1450	(164)
1-1/2	1.9	(48.3)	1550	(175)
2	2.4	(60.3)	1650	(186)
2-1/2	2.9	(73.0)	1750	(198)
3	3.5	(88.9)	1800	(203)
4	4.5	(114.2)	1900	(214)

[a] Welded and Seamless Wrought Steel Pipe, ANSI/ASME B36.10M.

24 External Leakage Test

24.1 A valve in the "as-received" condition or after being subjected to the Deformation Test, Section 23 condition, shall be free from leakage through stem or body seals or other joints, and shall not show evidence of porosity in castings when tested as described in 24.2 at any aerostatic pressure between 0 and 1.5 times the rated service pressure of the valve.

24.2 During this test, the inlet of the sample valve is to be connected to a source of aerostatic pressure. The outlet shall be blocked or plugged. A positive shutoff valve and a pressure-measuring device that complies with 22.6 are to be installed in the pressure supply piping. The pressure-measuring device is to be installed between the shutoff valve and the sample under test. While under the applied aerostatic test pressure, the sample is to be submerged in water to detect leakage, or all joints and body casting surfaces are to be brushed with a soap and water mixture or other leak-detection solution.

Exception: For internal valves, each sample shall be connected to a suitable pressure vessel and the vessel pressurized with the internal valve outlet plugged.

25 Positive Seal Test

25.1 An actuated liquid withdrawal excess-flow valve shall obtain a leak-tight seal and be free from external leakage before fluid is capable of flowing when tested in accordance with 25.2.

25.2 The inlet of the valve is to be connected to an aerostatic pressure source maintained at 173 kPa (25 psig). The upper body assembly is to be capped. Both parts shall be submerged in a water bath and all trapped air is to be expelled from the parts. The upper body assembly is then to be slowly connected to the valve and observed for bubbles which indicates that a leak-tight seal was not achieved before fluid was capable of flowing. The test shall than be repeated at 690 kPa (100 psig) and 1724 kPa (250 psig) or rated service pressure, whichever is greater.

26 Seat Leakage Test

26.1 The following tests for seat leakage are to be conducted on samples which have previously been subjected to the Deformation Test, Section 23, and the External Leakage Test, Section 24.

26.2 The seat of a shutoff valve intended for primary service, when in the closed position, shall be free from leakage at any aerostatic pressure between 0 and 1.5 times the rated service pressure of the valve.

Exception: Internal valves shall be free from leakage at any aerostatic pressure between 0 and 1.0 times the rated service pressure of the valve.

26.3 The seat of a shutoff valve intended for secondary service, when in the closed position, shall not show a rate of leakage of more than 20 cm^3/s (2 ft^3/h) when subjected to any aerostatic pressure between 0 and 1.5 times the rated service pressure of the valve.

26.4 A back pressure check valve provided with a resilient seat, when in the closed position, shall not leak when subjected to any aerostatic pressure between 138 kPa (20 psig) and 1.5 times the rated service pressure of the valve.

26.5 A back pressure check valve provided with a metal-to-metal seat, when in the closed position, shall not leak at a rate exceeding 0.669 L/min/mm (0.6 cfm/inch) seat circumference when subjected to an aerostatic pressure of 138 kPa (20 psig).

26.6 The seat of the upper back pressure check valve used in the assembly of a filler valve, when in the closed position, shall be free from leakage at any aerostatic pressure between:

a) 69 and 2,588 kPa (10 and 375 psig) or

b) 69 kPa (10 psig) and 1.5 times the rated service pressure of the valve, whichever is greater

The seat of the lower back-pressure check valve used in the assembly of a filler valve shall comply with the leakage requirements of 26.5.

26.7 The seat of the back-pressure check valve used in the assembly of a vapor return valve, when in the closed position, shall be free from leakage at any aerostatic pressure between:

a) 69 and 2,588 kPa (10 and 375 psig), or

b) 69 kPa (10 psig) and 1.5 times the rated service pressure of the valve, whichever is greater.

26.8 Seat leakage tests shall be conducted in accordance with 26.9 – 26.13, based on the design of the valve. A positive shutoff valve and a pressure-measuring device that complies with 22.6 are to be installed in the pressure supply piping. The pressure-measuring device is to be installed between the shutoff valve and the sample under test. While under the applied aerostatic test pressure, observations for leakage are to be made with the open port submerged in water unless otherwise indicated.

26.9 Seat leakage test for a shutoff valve is conducted with the inlet of the sample valve connected to a source of aerostatic pressure, with the valve in the closed position, and with the outlet open.

26.10 Seat leakage test for an internal valve is conducted with the source of pressure applied to the container portion of the valve with the valve member in the closed position and the inlet open.

26.11 Seat leakage test for a back-pressure check valve is conducted with the source of pressure applied in the reverse flow direction.

26.12 Seat leakage test for the back-pressure check valve portion(s) of a filler valve that is constructed in accordance with 15.1 (a) or (e) shall be conducted in two parts. Each back-pressure check valve shall be tested individually, with the other check valve either removed or blocked in an open position. The upper check valve shall comply with 26.6. The lower check valve shall comply with 26.5.

26.13 Seat leakage test for the shutoff valve portion of a filler valve that is constructed in accordance with 15.1(e) shall be conducted in two parts. The first part shall be conducted with the pressure applied in the flow-into-the-container direction, with the valve in a closed position. Leakage shall be observed at the pipe connection port at a pressure not exceeding 862 kPa (125 psig). The second part of the test shall be conducted with the pressure applied in the flow-out-of-the-container direction; with the valve in a closed position and with the check valves either removed or blocked in an open position. The valve shall comply with 26.2 for this second part of the test.

26.14 Compliance with 26.3 and 26.5 is to be determined by connecting a length of tubing to the valve outlet. The open end of this outlet tube is to be located within an inverted graduated cylinder which is calibrated in cc (cubic centimeters). The inverted cylinder is to be closed by a water seal. The apparatus is to be adjusted so that:

a) The end of the outlet tube is located 12.7 mm (0.5 in) above the water level within the inverted graduated cylinder, and

b) The water within and exterior to the graduated cylinder is at the same level.

With these adjustments made, the water level within the graduated cylinder is to be recorded. With the valve in the closed position assumed as the result of normal operation, air or nitrogen at the specified test pressure is to be applied to the valve inlet for a test period of no less than 2 min. During this time, the vertical position of the graduated cylinder is to be adjusted, when required, to maintain the same water level within and exterior to it. At the end of the test period and with the water within and exterior to the graduated cylinder at the same level, the level of water within the graduated cylinder is again recorded. From the change of volume within the graduated cylinder, the leakage rate is to be calculated according to the following formula:

$$R = V \times \frac{60}{m}\left(\frac{520}{460+t} \times \frac{P}{30}\right)$$

in which:

R is the leakage rate in cc (cubic centimeters) of air/h or nitrogen/h;

V is the increase in volume in cc within the graduated cylinder during test;

m is the duration of the test in min;

t is the ambient temperature during test in °F [(1.8 × °C) + 32]; and

P is the barometric pressure during test in Hg (Pa × 1/3400).

26.15 Instead of the method described above, leakage may be measured by a flowmeter installed on the inlet side of the valve under test. The flowmeter is to be capable of indicating accurately, for the test fluid used, the maximum leakage flow rates permitted.

27 Endurance Test

27.1 A shutoff valve shall be capable of complying with the applicable leakage test requirements of 24.1 and 26.2, or 24.1 and 26.3, after being subjected to the number of cycles of opening and closing as specified in Table 27.1, for each type of valve, and under the test conditions described in 27.2 – 27.7. There shall be no sticking of the valve, nor shall the valve become inoperative. Required corrosion protection shall not be impaired. Rotating stem type valves employing the stuffing box design discussed under 11.4 shall be permitted to be adjusted following the endurance conditioning and during leakage testing. Following any adjustment, the valve shall be capable of being opened and closed by hand.

Table 27.1
Number of cycles for shutoff valve types

Valve type	Number of cycles
Manual Valves	6,000
Internal Valves or Emergency Shutoff Valves, with or without Actuators, and automatic closing, manual reset valves	6,000
Lever Operated Fuel Transfer Valves	30,000
LP-Gas Hose Nozzle Valves and All Other Shutoff Valves With Actuators, and Automatic Shutoff Valves	100,000

27.2 The samples used for this test are to have previously been subjected to the Deformation Test, Section 23, the External Leakage Test, Section 24, and the Seat Leakage Test, Section 26.

27.3 A shutoff valve for use only with LP-Gas that has a pressure rating of 1.7 MPa (250 psig) or higher, or one for use with either LP-Gas or anhydrous ammonia, is to be tested with the valve outlet plugged, the valve body filled with n-hexane, and the valve inlet subjected to a pressure of 1.7 MPa (250 psig). If the shutoff valve for LP-Gas service has a rating of 0.9 MPa (125 psig), the test is conducted with n-hexane and the valve inlet subjected to a pressure of 0.9 MPa (125 psig).

27.4 A shutoff valve for use only with anhydrous ammonia is tested without a liquid.

27.5 An endurance test is to be conducted at a rate no faster than 10 times/min. For a shutoff valve, the closing torque is to be consistent with the size of the handwheel, wrench, or other means used to operate the valve. Shutoff valves with an adjustable packing nut are allowed one adjustment during the endurance test.

27.6 A flow control valve provided with a vent or bleeder valve shall be subjected to this test. The vent or bleeder valve is to be subjected to 1500 cycles of opening and closing of the vent or bleeder valve with 0.7 MPa (100 psig) aerostatic pressure applied to the vent or bleeder valve inlet. The test is to be conducted manually and with a closing torque sufficient to stop air flow.

27.7 The appropriate tests for external and seat leakage, as described under the External Leakage Test, Section 24, and the Seat Leakage Test, Section 26, are to be conducted immediately following the Endurance Test.

28 Hydrostatic Strength Test

28.1 A valve shall be capable of withstanding, without rupture or permanent distortion, a hydrostatic pressure of 5 times the rated service pressure of the valve. See Service Pressure Rating, Section 2.

28.2 The samples previously subjected to the Deformation Test, Section 23, and the Endurance Test, Section 27, are to be connected to a source of hydrostatic pressure. A positive shutoff valve and a pressure-measuring device that complies with 22.6 are to be installed in the hydrostatic pressure supply piping. The pressure-measuring device is to be installed in the piping between the shutoff valve and the sample under test.

29 Operation Test

29.1 General

29.1.1 An excess flow valve shall operate at no more than 10 % above, nor less than 20 % below the rated closing flow capacity specified by the manufacturer and shall close automatically at a pressure differential across the valve of no more than 103 kPa (15 psig) during the operation tests described below. Compliance with these requirements shall be determined by taking the average of the trials and samples in the vertical, horizontal, and inverted fluid flow directions.

29.1.2 Three samples of each size and style of valve are to be subjected to these tests. A valve intended for use only with liquid is to be tested with water, otherwise the tests are to be made both with air and with water. Except as indicated in 29.1.3, separate tests are to be run with each sample installed in vertical, horizontal and inverted fluid flow direction through the excess flow valve. The tests with air are to be made without piping or other restriction connected to the outlet of the test sample.

Exception: An excess flow valve in a POL (CGA 510) fitting, or a fitting having an inlet connection not greater than 1/2 inch NPT is permitted to have only a vapor rating and not be subjected to this test using water.

29.1.3 A valve intended for installation in one position (flow direction) only may be tested only in that position.

29.1.4 An excess flow valve used in the assembly of a filler valve shall close automatically at a pressure differential of no more than 138 kPa (20 psig) when tested as described in 29.1.5.

29.1.5 Three samples of each size of valve are to be subjected to these tests. The tests are to be conducted with air, and separate tests are to be run with each sample mounted vertically and horizontally. The tests are to be conducted as described in 29.2.1 – 29.2.3, with a filler valve hose coupling connected to the test sample and with the upper back pressure check valve held in the open position.

29.1.6 An excess flow valve used in the assembly of a vapor return valve shall close automatically at a pressure differential of no more than 138 kPa (20 psig) when tested as described in 29.1.7.

29.1.7 Three samples of each size of valve are to be subjected to these tests. The tests are to be conducted with air, and separate tests are to be run with each sample mounted vertically and horizontally. The tests are to be conducted as described in 29.2.1 – 29.2.3, with a vapor return valve hose coupling connected to the test sample so as to hold the back-pressure check valve in the open position.

29.2 Air tests

29.2.1 The test with air is to be conducted by utilizing a properly designed and calibrated flowmeter, connected to an air supply source of adequate capacity and pressure. A gas, other than air, may be used.

29.2.2 The test sample is to be connected to the outlet of the flowmeter. A manometer or calibrated pressure measuring instrument having a resolution not greater than 3 kPa (0.5 psig) is to be installed on the upstream side of the test sample to indicate the closing pressure.

29.2.3 The test is conducted by slowly increasing the flow of air through the flowmeter until the check valve closes. At the instant before closing, the maximum flow rate and the closing pressure are to be recorded. With some flowmeters, the rate of flow at closing must be calculated. At least two trials shall be conducted with each sample in each flow direction.

29.3 Water tests

29.3.1 The test with water is to be conducted using a liquid flowmeter (or equivalent) installed in a piping system having the pressure to provide the required flow. The system is to include an inlet piezometer or pipe at least one pipe size larger than the valve to be tested, with a flow control valve connected between the flowmeter and piezometer. A hose or hydrostatic relief valve, or both, may be used to reduce the effect of the pressure shock when the excess flow valve closes.

29.3.2 The test sample is to be connected to the outlet end of the piezometer. A manometer or calibrated pressure measuring instrument as noted in 29.2.2 is to be connected to a pressure takeoff on the upstream side of the test sample to indicate the closing pressure. The connection may have a length of rubber hose between the pressure measuring instrument and the pressure take-off, with a valve installed at this point to permit bleeding air from the system.

29.3.3 Prior to the test, the flow control valve is to be opened slightly, with the bleed valve at the pressure measuring instrument, if provided, open, to eliminate air from the system. The bleed valve is then to be closed. The test is conducted by slowly increasing the flow until the check valve closes. During the test, the pressure measuring instrument is to be positioned at the same level as the test sample. At the instant before closing, the rate of flow and closing pressure are to be recorded. At least two trials shall be conducted with each sample in each flow direction.