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NATIONAL STANDARD

ANSI/CAN/UL/ULC 567:2024

STANDARD FOR SAFETY

Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for Petroleum Products and LP-Gas

Approved American National Standard
ANSI

ANSI/UL 567-2024

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SCC FOREWORD

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UL Standard for Safety for Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for Petroleum Products, Anhydrous Ammonia and LP-Gas, ANSI/CAN/UL/ULC 567

Eleventh Edition, Dated January 29, 2021

Summary of Topics

This revision of ANSI/CAN/UL/ULC 567 dated August 12, 2024 includes the following changes:

– Clarification of Product Descriptions: 6.1, 7.5, 8.1, 10.2, 11.1, 11.2, 11.3, 13.1, 19.1, 25.1, 27.1, 27.6, and 27.7;

– Distinguish Rotating Joint from Swivel Joint: 12.3, 12.4, and 13.2;

– Revisions to Operation Test: 15.3, 15.5, Figure 15.4, and 15.6;

– Revisions to Marking Adhesion Test: 23.1, 23.2, 23.3, and 23.4;

– Revisions to Pull Test with Respect to Pipe-connecting Fittings: 20.1.1 and 20.1.3;

– Revisions to Electrical Continuity Test: 12.6;

– Revisions to Endurance Test: 16.2;

– Revision to Marking Section: 27.4 and 27.8;

– Revisions to the Moist Ammonia-Air Stress Cracking Test: 24.2 and Table 24.1;

– Revisions to the Tests of Synthetic Rubber Parts; 21.1.3 and 21.4; and

– Editorial Revisions: 12.2 and 18.3. No change is shown to the French 12.2.

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 February 16, 2024.

attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

ANSI/UL 567-2024

JANUARY 29, 2021
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ANSI/CAN/UL/ULC 567:2024

Standard for Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for Petroleum Products and LP-Gas

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January 29, 2021

This ANSI/CAN/UL/ULC Safety Standard consists of the Eleventh Edition including revisions through August 12, 2024.

The most recent designation of ANSI/UL 567 as an American National Standard (ANSI) occurred on August 12, 2024. 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 12, 2024.

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Preface

This is the Eleventh Edition of ANSI/CAN/UL/ULC 567, Standard for Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for Petroleum Products and LP-Gas.

ULSE 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 567 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 Tenth Edition of UL 567, Fourth Edition of CAN/ULC-S634, Third Edition of CAN/ULC-S644, and ULC/ORD-C567.

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 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 Technical Committee (TC) on Pipe Connectors for Petroleum Products and LP-Gas, TC 567.

This list represents the TC 567 membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

TC 567 Membership

Name	Representing	Interest Category	Region
D. Boyd	BP America Inc	General Interest	USA
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TC 567 Membership Continued

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International Classification for Standards (ICS): 23.040.60

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.

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INTRODUCTION

1 Scope

1.1 This Standard sets forth minimum requirements for emergency breakaway fittings, swivel connectors and pipe-connecting fittings of the threadless compression type. Connectors and fittings covered by these requirements are intended only for the following services.

1.2 A swivel connector is either a hose swivel or swivel joint. The swivel connector will allow radial movement and is constructed for petroleum product, liquefied petroleum gas (LP-Gas) or anhydrous ammonia (NH_3) service.

NOTE: For the purposes of this standard the terms “LP-Gas” and “Propane” are interchangeable.

1.3 An emergency breakaway fitting is used between the outlet of the dispensing device and the hose nozzle valve or lever-operated fuel transfer valve (LP-Gas Service) and separates in the event that the coupling is subjected to an excessive pull force to safeguard against abnormally excessive pull force on the hose assembly and dispenser and to prevent loss of liquid. An emergency breakaway fitting is constructed for petroleum product, liquefied petroleum gas (LP-Gas) or anhydrous ammonia (NH3) service. The fittings are single-break fittings or reconnectable fittings.

1.4 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) Flammable and Combustible Liquids Code, NFPA 30;

2) Code for Motor Fuel Dispensing Facilities and Garages, NFPA 30A;

3) Liquefied Petroleum Gas Code, NFPA 58; and or

4) Safety Requirements for the Storage and Handling of Anhydrous Ammonia, ANSI/CGA G-2.1 (ANSI K61.1)

b) In Canada:

1) The National Fire Code of Canada; and or

2) Provincial or other Regulations.

1.5 For Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings to be used with gasoline/ethanol blends with nominal ethanol concentrations above 10 %, refer to the Standard for Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), UL 567A, for additional requirements.

1.6 For additional requirements for Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for biodiesel fuel, diesel/biodiesel blends with nominal biodiesel concentrations up to 20 % (B20), refer to the Standard for Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 % (B20), Kerosene, and Fuel Oil, UL 567B for additional requirements.

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 Referenced Publications

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.

UL Standards

UL 330, *Hose and Hose Assemblies for Dispensing Flammable Liquids*
UL 567A, *Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85)*
UL 567B, *Emergency Breakaway Fittings, Swivel Connectors and Pipe-Connection Fittings for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil*
UL 969, *Marking and Labeling Systems*

Other Standards

ASME B1.20.1-2013, *Standard for Pipe Threads, General Purpose (Inch)*
ASTM B858, *Standard Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys*
ASTM D471, *Standard Test Method for Rubber Property – Effect of Liquids*
ASTM D573, *Standard Test Method for Rubber – Deterioration in an Air Oven*
ASTM D1835, *Standard Specification for Liquefied Petroleum (LP) Gases*
CSA C22.2 No. 0.15-15, *Adhesive Labels*
NFPA 30, *Flammable and Combustible Liquids Code*
NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Garages*
NFPA 58, *Liquefied Petroleum Gas Code*
NFC, *National Fire Code of Canada*

Abbreviations

ANSI – American National Standards Institute
ASME – American Society of Mechanical Engineers
ASTM – American Society for Testing and Materials
CSA – CSA Group
NFPA – National Fire Protection Association

5 Glossary

5.1 For the purposes of this standard the following definitions apply:

5.2 ASTM IRM 903 / IRM 903 – High-swelling petroleum base oil described in ASTM D471, Standard Test Method for Rubber Property – Effect of Liquids.

5.3 ASTM REFERENCE FUEL A – 100 % Isooctane

5.4 ASTM REFERENCE FUEL C – A mixture of 50 % Isooctane + 50 % Toluene by volume.

5.5 ASTM REFERENCE FUEL H – A mixture of 85 % ASTM Reference Fuel C + 15 % Anhydrous Denatured Ethanol by volume.

5.6 AUTHORITY HAVING JURISDICTION (AHJ) – 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.

5.7 FITTINGS:

a) PIPE-CONNECTING FITTING – A fitting of the threadless compression seal-ring type for use in the assembly of petroleum product dispensing devices to facilitate connection of piping or tubing. These include straight coupling style, tee, ell, reducer, adapter, and other styles.

b) RECONNECTABLE FITTING – An emergency breakaway fitting designed such that upon separation it is intended to be reconnected and reused when it is not damaged.

c) SINGLE-BREAK FITTING – An emergency breakaway fitting that, upon separation, is not intended to be reconnected and reused.

5.8 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.

5.9 PETROLEUM PRODUCTS – As used herein, means gasoline, gasoline/ ethanol blends containing up to 10 % ethanol, fuel oil, kerosene, and similar liquid motor or heating fuel products.

5.10 PRESSURE INDICATING DEVICE – As used herein, the pressure indicating device means one of the following:

a) An analog gauge having a pressure range such that the test pressure is between 30 % and 70 % of the maximum scale reading of the gauge;

b) A digital pressure transducer, or other digital gauge, that is calibrated over a range of pressure that includes the test pressure; or

c) Other device that is equivalent to the devices in (a) or (b).

5.11 SWIVEL CONNECTOR – A type of swivel categorized as either a hose swivel or swivel joint.

a) HOSE SWIVEL – A swivel connector with one end attached to a hose and the other end to an appurtenance. The hose swivel will allow radial movement of the hose and/or appurtenance to prevent the hose from twisting or having torsional stress.

b) SWIVEL JOINT – A swivel connector installed in a piping system with at least one end attached to a rigid pipe or other appurtenance that is firmly affixed. The swivel joint will allow radial movement of the pipe or other appurtenance attached to the swivel to prevent torsional stress.

CONSTRUCTION

6 General

6.1 Petroleum products shall be constructed for an operating pressure of not less than 50 psig (340 kPa) for the fluid confining portion of the device and 0.5 psig (3.45 kPa) for the vapor confining portion of the device, when provided, and an ultimate rupture pressure of not less than five times the design pressure.

6.2 A swivel connector or emergency breakaway fitting for use with anhydrous ammonia or LP-Gas shall be designed for an operating pressure of not less than 350 psig (2413 kPa) and an ultimate rupture pressure of not less than five times the design pressure.

6.3 An emergency breakaway fitting shall be constructed to separate in the event that the coupling is subjected to a pull force not less than 100 lbf (445 N), and not to exceed 350 lbf (1557 N) for petroleum product service and 400 lbf (1779 N) for anhydrous ammonia or LP-Gas Service.

6.4 A hose assembly provided with an integral swivel connector for petroleum product service shall comply with the applicable requirements in the Standard for Hose and Hose Assemblies for Dispensing Flammable and Combustible Liquids, UL 330.

7 Materials

7.1 Materials in contact with the fluid to be handled shall be inherently resistant to being adversely affected by such fluid.

7.2 A synthetic rubber part shall not show any signs of cracking or other damage following exposure to -40°F (-40°C). See the Low Temperature Test, Section 22.

7.3 A part made of drawn-brass or machined from bass rod in which the zinc content exceeds 15 % shall be capable of withstanding, without cracking, the Moist Ammonia-Air Stress Cracking Test, Section 24, for copper and copper alloys.

7.4 A copper or a copper-alloy part shall not be used where it is in contact with dissimilar metals such as aluminum, unless one of the parts is coated with chromium or other equivalent metallic coating to preclude electrolytic action. A coating shall have a thickness of not less than 0.0002 in (0.005 mm).

7.5 If atmospheric corrosion of a ferrous material part will interfere with the proper function of the product, the part shall be provided with a corrosion-resistant protective coating.

7.6 A protective coating shall provide resistance against corrosion to a degree not less than that provided by the protective coatings specified in 7.7.

7.7 Cadmium plating shall have a thickness of not less than 0.0003 in (0.0076 mm) and zinc plating shall have a thickness of not less than 0.0005 in (0.013 mm), except on parts where threads constitute the

major portion of the area, in which case the thickness of the cadmium or the zinc plating shall not be less than 0.00015 in (0.0038 mm).

7.8 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, shall be used in contact with anhydrous ammonia.

8 Swivel Connectors and Emergency Breakaway Fittings

8.1 A product for use with petroleum products shall provide electrical continuity from end-to-end, so that when it is installed, continuity is provided for grounding of static charges. Such continuity shall be inherent in the construction and shall not be accomplished by a jumper wire.

9 Pipe-Connecting Fittings

9.1 A seal ring of a fitting shall not be exposed to physical damage when the sealing nut is tightened.

9.2 A fitting shall provide electrical continuity across the fitting for grounding of static charges. Such continuity shall be inherent in the construction and shall not be accomplished by a jumper wire.

9.3 A fitting for the connection of pipe or tubing shall be made to provide strength at least equal to that of a fitting constructed from one of the materials indicated in Table 9.1. The wall thickness shall not be less than that specified under the appropriate column.

Table 9.1
Material and Wall Thickness of Fittings

ANSI/ASME B1.20.1 Pipe size of fitting, nominal inches	Wall thickness, steel other than castings				Wall thickness, cast steel or malleable iron			
	Pipe fitting,		Tube fitting,		Pipe fitting,		Tube fitting,	
	inches	(mm)	inches	(mm)	inches	(mm)	inches	(mm)
1/4	0.088	(2.24)	0.078	(1.98)	0.095	(2.41)	0.085	(2.16)
3/8	0.091	(2.31)	0.081	(2.06)	0.100	(2.54)	0.090	(2.29)
1/2	0.109	(2.77)	0.099	(2.51)	0.105	(2.67)	0.095	(2.41)
3/4	0.113	(2.87)	0.103	(2.62)	0.120	(3.05)	0.110	(2.79)
1	0.133	(3.38)	0.123	(3.12)	0.134	(3.40)	0.124	(3.15)
1-1/4	0.140	(3.56)	0.130	(3.30)	0.145	(3.68)	0.135	(3.43)
1-1/2	0.145	(3.68)	0.135	(3.43)	0.155	(3.94)	0.145	(3.68)
2	0.154	(3.91)	0.144	(3.66)	0.173	(4.39)	0.163	(4.14)
2-1/2	0.203	(5.16)	0.193	(4.70)	0.210	(5.33)	0.200	(5.08)
3	0.216	(5.49)	0.206	(5.23)	0.231	(5.87)	0.221	(5.61)

9.4 A fitting shall permit insertion of a pipe or a tube a distance equal to at least 1.5 times the outside diameter of the pipe or tube for which it is intended.

9.5 The distance specified in 9.4 shall be measured from the inserted end of the pipe or tube to the outside face of the seal nut after tightening to the torque specified in Table 9.2.

Table 9.2
Tightening Torque for Pipe-Connecting Fittings

Nominal pipe or tube size,		Tightening torque,	
inches	(mm)	pound-inches	(N·m)
1/8	(6)	150	(17)
1/4	(8)	600	(68)
3/8	(10)	700	(79)
1/2	(15)	850	(96)
3/4	(20)	1000	(113)
1	(25)	1200	(136)
1-1/4	(32)	1450	(164)
1-1/2	(40)	1550	(175)
2	(50)	1650	(186)
2-1/2	(65)	1750	(198)
3	(80)	1800	(203)
4	(100)	1900	(215)
Coaxial connection		600	(68)

9.6 A fitting of the tee or ell form shall be constructed with integral stops or shall be otherwise constructed to limit the distance the pipe or tube can be inserted into the fitting, thus preventing a restriction in the passage.

10 End Connections

10.1 Both ends of a swivel connector or emergency breakaway fitting shall be provided with pipe threads for connection of pipe or of pipe fittings, or with coaxial connections and shall be constructed with a section to serve as wrench flats. The minimum width of the flat surfaces shall be determined in accordance with Table 10.1.

Table 10.1
Width of Flat Surfaces

Nominal pipe size,		Raised flat surface,[a]		Unraised flat surface,	
inches	(mm)	inch	(mm)	inches	(mm)
1/2	(15)	1/4	(6.4)	11/16	(17.5)
3/4	(20)	1/4	(6.4)	3/4	(19.1)
1	(25)	1/4	(6.4)	3/4	(19.1)
1-1/4	(32)	9/32	(7.1)	1	(25.4)
1-1/2	(40)	5/16	(7.9)	1	(25.4)
2	(50)	5/16	(7.9)	1	(25.4)
2-1/2	(65)	1/2	(12.7)	1	(25.4)
3	(80)	19/32	(15.1)	1-1/4	(31.8)
4	(100)	19/32	(15.1)	1-1/4	(31.8)
Coaxial connection		5/16	(7.9)	1	(25.4)

[a] A raised flat is a surface with a diameter which is greater than the threaded portion of the male end of a swivel connector. The outside surface of the female end of a swivel connector or emergency breakaway fitting shall also be considered to be a raised flat.

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

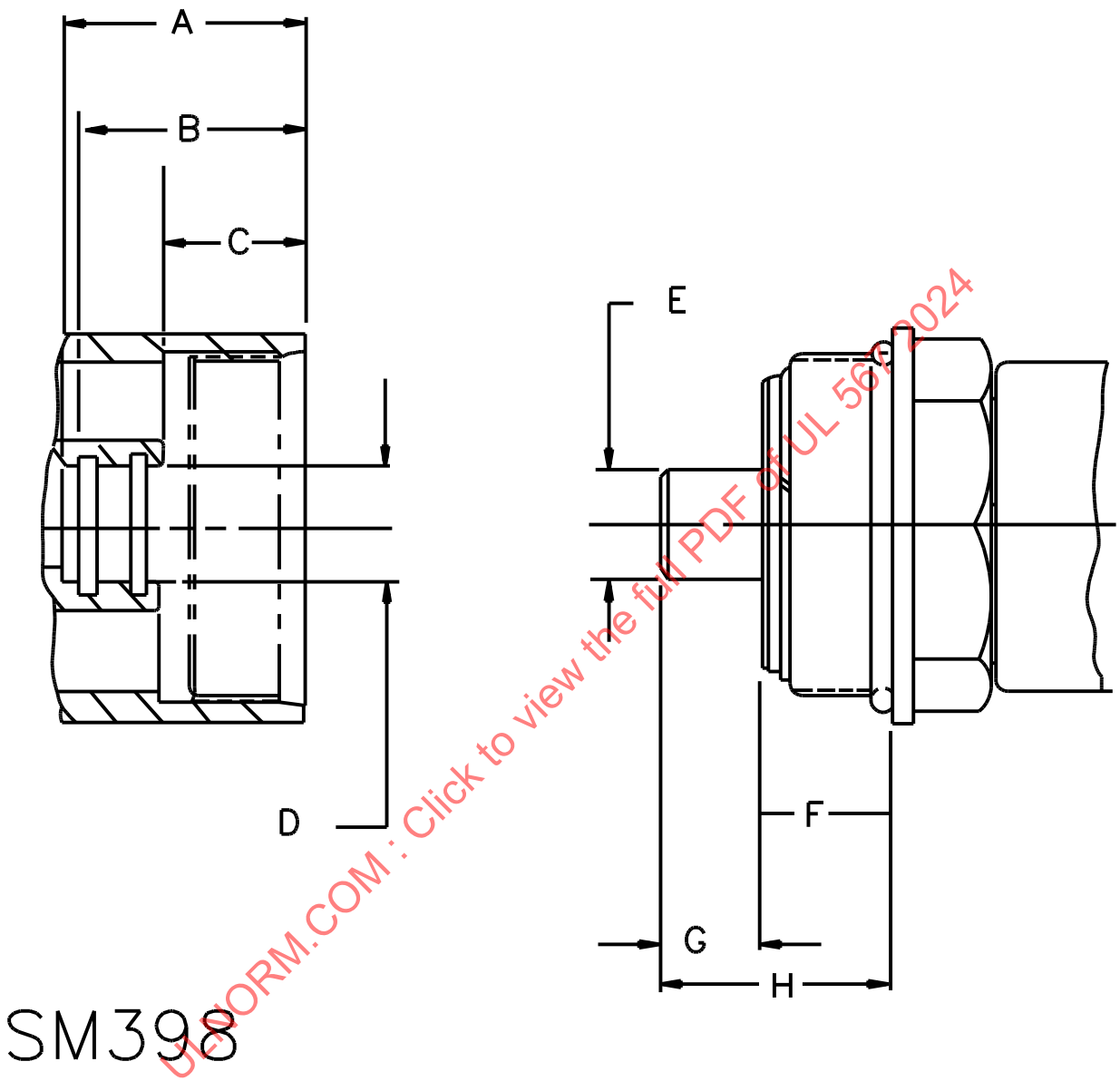
Exception: Products intended for use in installations where pipe fittings incorporate other than NPT type threads shall be permitted to be provided with pipe threads complying with a national pipe thread standard compatible with those fittings. The pipe thread type shall be identified in accordance with 27.7.

10.3 The male connection of a coaxial type fitting shall have a 1-7/8-12 SAE external straight thread. The female connection of a coaxial type fitting shall have a 1-7/8-12 SAE internal straight thread. Coaxial type connections shall also have the dimensions as indicated in Figure 10.1.

10.4 The couplings provided on coaxial type vapor recovery hose assemblies shall have male 1-7/8 – 12-SAE straight threads when the inner hose is intended to dispense the liquid fuel into the vehicle and 1-1/4 inch – 18 SAE Straight, M34 by 1.5 metric thread or 1 inch – 11-1/2 NPT threads, as required when the outer hose is intended to dispense the liquid fuel into the vehicle. All fittings shall be designed to fit the accessories connected to the hose couplings to form a leak tight connection. If the end connections of a vapor recovery fitting do not conform to these requirements or those specified in 10.3, the installation instructions which accompany each fitting shall indicate the specific equipment which shall be connected to the fitting.

Figure 10.1

Coaxial type connection



Item	inch	(mm)
A	1.45 min	(36.8 min)
B	1.26 max	(32.0 max)
C	0.78 min	(19.8 min)
D	0.668 – 0.672	(17.0 – 17.1)
E	0.660 – 0.664	(16.8 – 16.9)
F	0.78 max	(19.8 max)
G	0.56 min	(14.2 min)
H	1.31 – 1.45	(33.3 – 36.8)

PERFORMANCE

11 General

11.1 Representative samples of each size and specific construction of the product shall be subjected to the tests described in these requirements. Additional samples of parts constructed of nonmetallic materials are usually required for separate physical and chemical tests.

11.2 External and seat leakage tests on products intended to handle petroleum products shall use a source of aerostatic pressure such as air or nitrogen. When leakage is observed, the tests shall be repeated with kerosene, Soltrol® 170, or other liquid of comparable or lighter viscosity as the test medium.

NOTE Soltrol® is a Registered Trademark of Chevron Phillips Chemical Company LP.

11.3 External and seat leakage tests on products intended to handle LP-Gas shall use a source of aerostatic pressure such as air, nitrogen, or carbon-dioxide gas.

11.4 Water or other liquid may be used to develop the required pressure in the Hydrostatic-Strength Test, Section 19.

11.5 External and seat leakage tests using a gas as the test medium shall be maintained for at least 1 min. External and seat leakage tests using a liquid as the test medium shall be maintained for at least 5 min.

11.6 For the External Leakage, Seat Leakage and Hydrostatic Strength tests, a calibrated pressure indicating device (as described in 5.10), shall be used.

12 Electrical-Continuity Test

12.1 The electrical resistance across a swivel connector, emergency breakaway fitting or a pipe-connecting fitting for use with petroleum products shall not exceed 0.5 MΩ.

12.2 The electrical continuity determination shall be made using a resistance indicating instrument.

12.3 Three samples of a swivel connector as received initially shall be subjected to this test. The same three samples shall be rechecked for electrical continuity during the External Leakage Test, Section 13, while connected to a source of liquid or aerostatic pressure as stated in 11.2 or 11.3. One of the swivel connectors, after having been subjected to the Operation Test, Section 15, and the remaining two samples, for hose swivels, after having been subjected to the Abuse Test, Section 17, shall be rechecked for continuity during the recheck leakage test also while connected to a source of liquid or aerostatic pressure as stated in 11.2 or 11.3. During this test, each swivel joint shall be rotated not less than one complete turn or to extremes of the swivel travel to determine any points of maximum resistance. Swivel joints, as defined in 5.11 (b), shall not be subjected to the Abuse Test.

12.4 For assemblies with more than one swivel joint, continuity shall be measured across the entire assembly while rotating each swivel joint independently.

12.5 Three samples of a pipe-connecting fitting as received initially shall be subjected to this test. Preparatory to this test, each fitting is to be made up with 24- to 36-in (600- to 900-mm) lengths of pipe. The end of the pipe engaged by the fitting shall be without threads and free of burrs, whereas the opposite end shall be provided with pipe threads. The end of the pipe shall be inserted into the fitting a distance of one-half of maximum permitted by the design. Used galvanized pipe with normal surface irregularities, including wrench marks on the fitting-connected ends, shall be used. If the fittings are intended for connection of tubing, seamless drawn Type K copper tubing shall be used in lieu of pipe. An end nut of a

fitting shall be tightened to the torque specified in Table 9.2. These three samples shall be tested for electrical continuity before and during the leakage test while connected to a source of liquid or aerostatic pressure as stated in 11.2 or 11.3.

12.6 Three samples of an emergency breakaway fitting, as received initially shall be subjected to this test. The same three samples shall be rechecked for electrical continuity during the External Leakage Test, Section 13, while connected to a source of liquid or aerostatic pressure as stated in 11.2 or 11.3. Two of the samples, after having been subjected to the Abuse Test, Section 17, shall be rechecked for continuity during the External Leakage Test, Section 13, also while connected to a source of liquid or aerostatic pressure as stated in 11.2 or 11.3. For vapor recovery fitting samples, only the liquid path is to be pressurized for this test.

12.7 If an emergency breakaway fitting incorporates a swivel mechanism, an additional sample is to be subjected to this test. The same sample, after having been subjected to the Operation Test, Section 15, shall be rechecked for continuity during the External Leakage Test, Section 13, also while under the pressure of the test liquid. During this test, the fitting shall be rotated at least one complete turn or to extremes of the swivel travel to determine any points of maximum resistance.

12.8 If an emergency breakaway fitting is of the reconnectable fitting type, three additional samples shall be subjected to this test. The same three samples shall be rechecked for continuity during the External Leakage Test, Section 13, under the pressure of the test liquid. One of the samples, after having been subjected to the Endurance Test, Section 16, and the remaining two samples after having been subjected to the Drop Test, Section 18, shall be rechecked for continuity during the recheck external leakage test also while connected to a source of liquid or aerostatic pressure as stated in 11.2 or 11.3.

13 External Leakage Test

13.1 A product shall not leak when subjected to a liquid or aerostatic pressure of 1.5 times its maximum design pressure when tested as described below. Vapor confining components are subjected to an aerostatic pressure of 0.75 psig (5.17 kPa). See 11.2 and 11.3.

13.2 A swivel connector shall comply with 13.1 before and after having been subjected to the Operation Test, Section 15, and the Abuse Test, Section 17. Swivel joints, as defined in 5.11 (b), shall not be subject to the Abuse Test.

13.3 An emergency breakaway fitting shall comply with 13.1 before and after having been subjected to the Abuse Test, Section 17.

13.4 An emergency breakaway fitting of the reconnectable type, shall also comply with 13.1 before and after having been subjected to the Endurance Test, Section 16. An emergency breakaway fitting of the reconnectable type shall also comply with 13.1 before and after having been subjected to the Drop Test, Section 18.

13.5 An emergency breakaway fitting which incorporates a swivel mechanism, shall comply with 13.1 before and after having been subjected to the Operation Test, Section 15.

13.6 The samples of swivel connectors, emergency breakaway fittings or pipe-connecting fittings, when subjected to the Electrical-Continuity Test, Section 12, shall be used. Otherwise, samples shall be prepared as described in 12.3 and 12.5. Connections shall be made using the torque values indicated in Table 9.2.

13.7 Each test sample shall be connected to a source of liquid or aerostatic pressure, and the opposite end shall be closed. A positive shutoff valve, and a pressure indicating device, as described in 5.10, shall be installed in the pressure supply piping. The pressure indicating device shall be installed between the

shutoff valve and the test sample. In the case of swivel connectors or emergency breakaway fittings designed for handling LP-Gas, the test sample shall be treated with a leak detecting solution or immersed in water to assist in detecting leaks.

13.8 Each sample pipe-connecting fitting made up with piping shall be placed on horizontal supports 30 in (760 mm) apart. The sample shall then be tested for leakage in this position. While the test sample is under the pressure of the test liquid, sufficient load shall be placed on the fitting to cause maximum deflection of the connected pipe as permitted by the fitting design. While in the deflected position, the fitting shall be observed for leakage as described in 13.7.

14 Seat Leakage Test

14.1 An emergency breakaway fitting shall not leak past the seats when subjected to any liquid or aerostatic pressure between 0 and 1.5 times its maximum design pressure when tested as described below. See 11.2 and 11.3. This test shall only be conducted on the liquid path for vapor recovery products.

14.2 An emergency breakaway fitting of the reconnectable type shall comply with 14.3 before and after having been subjected to the Endurance Test, Section 16. An emergency breakaway fitting of the reconnectable type shall also comply with 13.1 before and after having been subjected to the Drop Test, Section 18.

14.3 Both halves of an uncoupled sample of the fitting shall be connected to a source of liquid or aerostatic pressure. A positive shutoff valve, and a pressure indicating device, as described in 5.10, shall be installed in the pressure supply piping. The pressure indicating device shall be installed between the shutoff valve and the test sample. In the case of breakaway fittings designed for handling LP-Gas, the test sample shall be treated with a leak detecting solution or immersed in water to assist in detecting leaks. The pressure shall be increased gradually from 0 and then maintained at 1.5 times the maximum design pressure. The test is then to be repeated at a pressure of 0.25 psi (1.7 kPa).

15 Operation Test

15.1 A swivel connector or emergency breakaway fitting which incorporates a swivel mechanism shall conform to the requirements of the Electrical-Continuity Test, Section 12, when applicable, and the External Leakage Test, Section 13, before and after having been subjected to 100,000 cycles of operation as described in 15.2 – 15.5.

15.2 One of the samples of swivel connectors or emergency breakaway fittings, when applicable, subjected to the Electrical-Continuity Test, Section 12, and to the External Leakage Test, Section 13, shall be subjected to this test. Preparatory to the test, the fluid confining portion of the sample connector or fitting shall be filled with the test liquid. For the duration of the test, the liquid shall be under a pressure of 50 psig (340 kPa) for connectors intended to handle petroleum products and 250 psig (1724 kPa) for connectors intended to handle LP-Gas. The test fluid shall be ASTM Reference Fuel C for connectors intended to handle petroleum products and n-hexane for connectors intended to handle LP-Gas.

15.3 The operating mechanism shall be arranged so that, during each cycle of operation, each joint of a swivel mechanism is rotated through an arc of 180 +10/-0 at a rate between 6 and 10 cycles/min. The manufacturer may request a faster rate but it shall not exceed 30 cycles/min. If the connector is constructed with more than one joint of a swivel mechanism, and it is not feasible to operate all joints simultaneously, then each joint may be operated separately. Rotation of the joint 180 +10/-0 and then back to the initial position is considered 1 cycle of operation.

15.4 For vapor recovery fittings intended to handle petroleum products, the vapor-confining portion of the fitting shall be filled with 5 mL (0.169 US fl. Oz) of the test fluid.

15.5 During the cycling, a force of 20 lbf (89 N) shall be applied to the swivel at an angle of 45 from the plane of rotation and in such a manner that the force is applied as a bending moment at that joint. The force shall be applied at the point on the swivel farthest from the joint. When necessitated by the swivel construction, the operation test shall be conducted on additional samples of the swivel with the load applied on the opposite side of the plane of rotation. See Figure 15.1 – Figure 15.4 for examples.

Exception: The load does not need to be applied to the opposite side of the plane of rotation when a product incorporates more than one swivel joint and the other swivel joint rotates preventing the load from being applied on the opposite side.

Figure 15.1

Application of Test Force for Axial Swivel

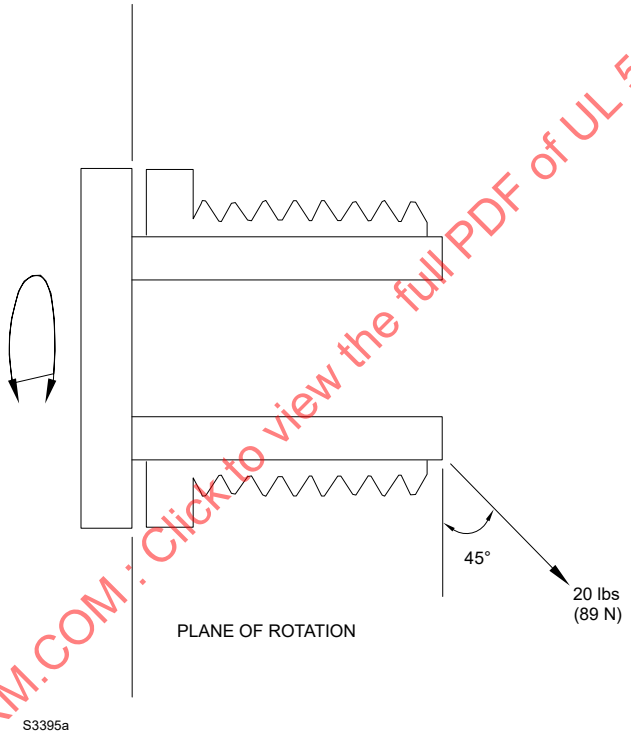


Figure 15.2

Alternate Application of Test Force for Axial Swivel

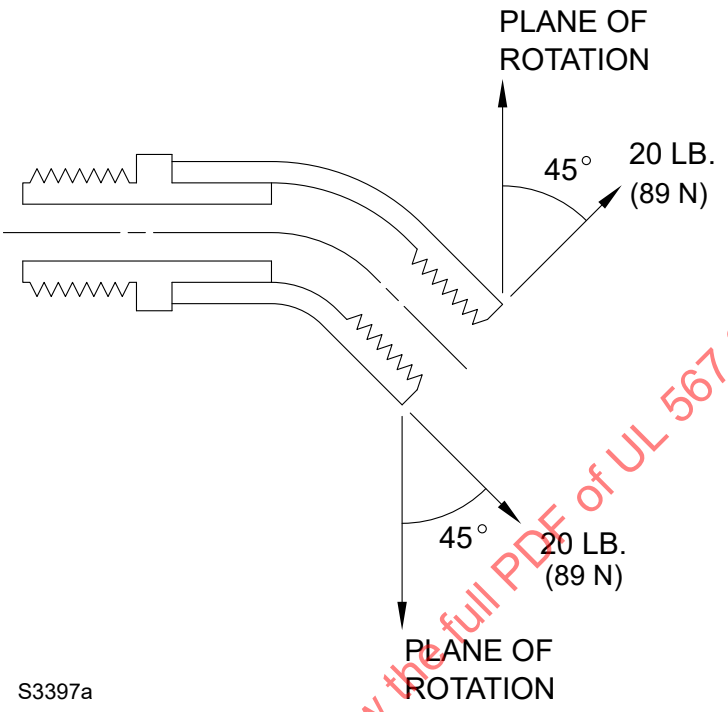


Figure 15.3

Application of Test Force for Compound Swivel

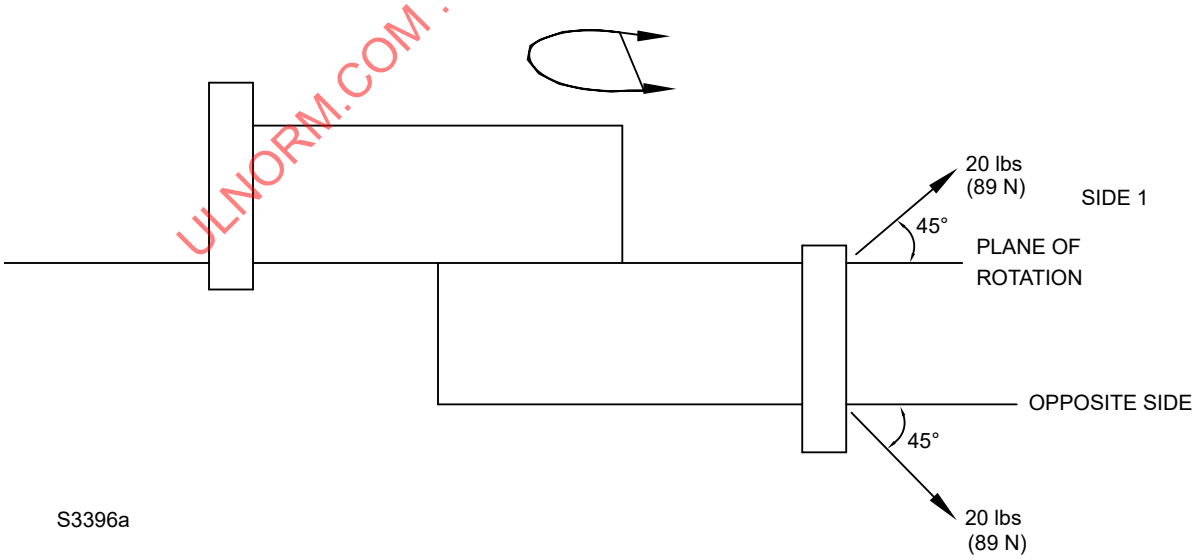
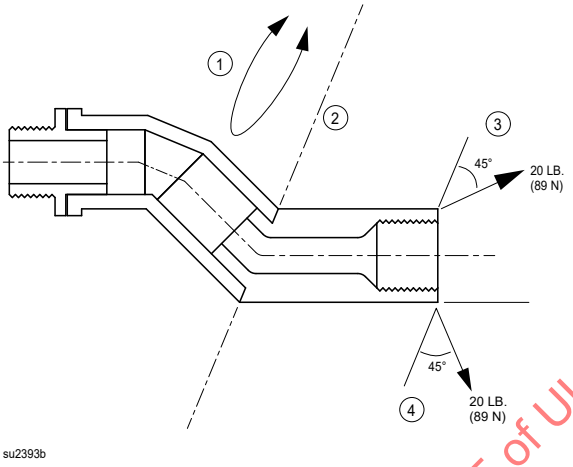


Figure 15.4

Application of Test Force on Compound Swivel with 45° Outlet



1 – Direction of Rotation

2 – Plane of Rotation

3 – Side One – fixed line is parallel to plane of rotation.

4 – Opposite Side – fixed line is parallel to plane of rotation.

15.6 For coaxial vapor recovery products constructed with connections as shown in Figure 10.1, the inner liquid line "O" rings in the female connection end shall be subjected to 100,000 cycles of operation using the test method described in 15.2. A vapor recovery hose assembly shall be connected to the female connection end. During the cycling, the fitting is fixed and the inner liquid line of the hose assembly shall be rotated through an arc of 180 +10/0 and back to the initial position for each cycle of operation.

16 Endurance Test

16.1 An emergency breakaway fitting of the reconnectable fitting type shall be capable of conforming to the requirements of the Electrical-Continuity Test, Section 12, the External Leakage Test, Section 14, the Seat Leakage Test, Section 14, and the Pull Test, 20.2.1 – 20.2.5, before and after having been subjected to 100 cycles of operation as described below.

16.2 The breakaway fitting shall be connected to a source of liquid or aerostatic pressure (as specified by the manufacturer) and pressurized to 50 psig (340 kPa) for couplings intended to handle petroleum products and 350 psig (2414 kPa) for fittings intended to handle anhydrous ammonia or LP-Gas. For vapor recovery products, only the liquid path shall be pressurized. An air accumulator shall be used as a source of pressure or a pressure relief device shall be connected in line with the sample in order to keep the pressure constant through the entire cycle. One end of the sample shall be subjected to a pull force sufficient to separate the sample. The pressure shall be reduced to zero and the two halves are then reassembled and the sample pressurized. This is determined to be 1 cycle of operation.

17 Abuse Test

17.1 A hose swivel or emergency breakaway fitting shall not crack, rupture, or show other evidence of failure, and shall comply with the requirements of the Electrical-Continuity Test, Section 12, and the External Leakage Test, Section 13, before and after the Abuse Test specified in 17.2 and 17.3.

17.2 The remaining two samples of the hose swivel or two samples of the emergency breakaway fittings subjected to the Electrical-Continuity Test, Section 12 and to the External Leakage Test, Section 13, shall be tested. Each hose swivel or emergency breakaway fitting shall be attached to a 10-ft (3.0-m) length of 0.75 in (19.1 mm) hose. A service station-type hose nozzle valve or fuel transfer valve, as appropriate, shall be attached to each hose swivel or emergency breakaway fitting. A vapor recovery-type hose swivel or emergency breakaway fitting shall be attached to a 10-ft length of appropriate vapor recovery hose and to a representative vapor recovery hose nozzle valve. Connections shall be made using the torque values indicated in 9.2. The weight of the nozzle shall be as indicated in Table 17.1.

Table 17.1
Nozzle Weight

Hose nozzle valve type	Minimum weight, pounds	(kg)
Non-vapor recovery	4	(1.8)
Vapor recovery – twin hose	5	(2.3)
Vapor recovery – coaxial	5	(2.3)
Anhydrous ammonia or LP-Gas fuel transfer valve	7	(3.2)

17.3 The hose swivel or breakaway fitting shall be dropped from a height of 4 ft (1.2 m) onto a concrete floor in a manner that tends to cause the hose swivel or breakaway fitting to strike the floor first. The hose nozzle valve shall be oriented and secured to the hose so that the hose swivel or breakaway fitting will strike the floor first. The assembly shall be pressurized to the maximum design pressure for each drop. The hose swivel or breakaway fitting shall be dropped a total of ten times. For vapor recovery products, only the liquid path shall be pressurized. Separation is acceptable for a breakaway fitting of the reconnectable fitting type, provided that it can be reconnected such that the test can be completed, and the assembly also complies with the post-Abuse External Leakage test requirement of 17.1.

17.4 For a breakaway fitting that is not of the reconnectable fitting type, if it separates during testing, the test shall be stopped and the Seat Leakage Test, Section 14, conducted on each half. The post-Abuse External Leakage test is not conducted.

18 Drop Test

18.1 An emergency breakaway fitting of the reconnectable type shall conform to the requirements of the Electrical-Continuity Test, Section 12, the External Leakage Test, Section 13, the Seat Leakage Test, Section 14, and the Pull Test, Section 20, before and after having been subjected to the conditioning specified in 18.2 and 18.3.

18.2 The remaining two samples of the breakaway fittings subjected to the Electrical-Continuity Test, Section 12, and the External Leakage Test, Section 13, shall be tested. The fittings shall be separated and the outlet ends shall be attached to a 10 ft (3.1 m) length of 0.75 in (19.1 mm) hose. A vapor recovery fitting shall be attached to a 10 ft (3.1 m) length of vapor recovery hose. Connections shall be made using the torque values indicated in Table 9.2.

18.3 The assembly shall be pressurized to the maximum design pressure for each drop. For vapor recovery products, only the liquid path shall be pressurized. The fitting shall be dropped a total of ten times from a height of 8 ft (2.4 m) onto a concrete floor in a manner that tends to cause the fitting ends to strike the floor first.

Exception No. 1: An emergency breakaway fitting for use between the hose nozzle valve and hose assembly only, shall have both ends dropped from 4 ft (1.22 m) onto a concrete floor in a manner that tends to cause the fitting ends to strike the floor first. The emergency breakaway fitting shall also be marked in accordance with 27.5.

Exception No. 2: An emergency breakaway fitting for connection to the dispenser outlet only or for connection to a whip hose installed to the dispenser outlet only, shall have the outlet end only dropped from 8 ft (2.4 m) onto a concrete floor in a manner that tends to cause the fitting ends to strike the floor first. The emergency breakaway fitting shall also be marked with the flow direction and in accordance with 27.5.

Exception No. 3: An emergency breakaway fitting for LP-Gas with any installation restrictions are dropped from the height they are intended to be installed at onto a concrete floor in a manner that tends to cause the fitting ends to strike the floor first. The height shall be as recommended by the manufacturer and shall also be marked in accordance with 27.5 unless the product construction inherently limits the maximum drop height, such as with a cable.

19 Hydrostatic-Strength Test

19.1 A product shall withstand, without rupture or permanent distortion, a hydrostatic pressure of five times its maximum design pressure. Vapor confining components are subjected to a liquid or aerostatic pressure of 2.5 psig (17.24 kPa). If external leakage is observed during this test the connector fitting shall subsequently comply with the requirements for leakage specified in the External Leakage Test, Section 13.

19.2 Three samples of swivel connectors, emergency breakaway fittings and pipe-connecting fittings shall be tested. Emergency breakaway fittings shall be tested as follows:

a) For emergency breakaway fittings of the reconnectable fitting type, both halves of the fitting shall be tested separately and then tested as a completely assembled unit; or

b) For emergency breakaway fittings of the single-break fitting type, both halves of the fitting shall be tested separately.

19.3 Each test sample shall be connected to a source of hydrostatic pressure. A positive shutoff valve and a pressure indicating device, as described in 5.10, shall be installed in the pressure supply piping. The pressure gauge shall be installed between the shutoff valve and the sample under test.

19.4 The test pressure shall be slowly raised to the required test pressure and held for at least 1 min.

20 Pull Test

20.1 Pipe-connecting fittings

20.1.1 A pipe-connecting fitting, as defined in 5.7 (a), shall withstand the applicable longitudinal pull force specified in Table 20.1 without a pipe or tube pulling out of the fitting.