



Second Revision No. 37-NFPA 1964-2017 [Detail]

6.10 Rough-Handling Test for — Master Stream Nozzles.

Submitter Information Verification

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Submittal Date: Tue Jul 18 12:08:43 EDT 2017

Committee Statement

Committee Statement: This change was editorial in nature.

Response Message:



Second Revision No. 1-NFPA 1964-2017 [Chapter 1]

Chapter 1 Administration

1.1* Scope.

This standard shall covers the requirements for new adjustable-pattern spray nozzles intended for general fire-fighting use, for marine and offshore platform fire-fighting use, ~~or for use with fire hoses affixed to standpipe systems, and for fire hose appliances up to and including 6 in. (150 mm) nominal dimension designed for connection to fire hose, fire apparatus, and fire hydrants intended for general fire service use in controlling or conveying water.~~

A.1.1

While nozzles meeting the requirements of this standard are designed to be used in fire suppression, including hose lines on standpipe systems, the nozzles cannot be expected to provide satisfactory performance if adequate water pressure and volume are not available. Pressures available in standpipe systems are often controlled by pressure-reducing devices. Fire departments planning to use spray nozzles with standpipe systems should ensure the standpipe system can supply the necessary pressure and volume.

The inspection and care of in-service nozzles is covered by NFPA 1962.

The purchasers should specify any desired conformance testing or required certification to this standard at the time they order the nozzle or appliance.

1.2 Purpose.

The purpose of this standard shall be to provide minimum performance and operational requirements for ~~fire-fighting spray nozzles and fire hose appliances and to assure purchasers or authorities having jurisdiction that~~ specify the design verification tests for spray nozzles that comply with this standard are suitable for and fire suppression use hose appliances.

1.3* Application.

These requirements shall apply to the following:

- (1) Manually operated basic spray, constant gallonage, and constant pressure spray nozzles whether designed as handline nozzles or master stream nozzles
- (2) Nozzles that have a rated discharge of 2000 gpm (7570 L/min) or less
- (3) Nozzles for use on Class A and Class B fires
- (4) Portable valves, including gate valves, ball valves, piston valves, butterfly valves, clappered valves, and pressure relief valves
- (5) Portable monitors, ladder pipes, and break-apart monitors
- (6) Miscellaneous hose appliances, including wyes, siamese, elbows, water curtains, water thieves, and manifolds

A.1.3

Adapters, reducers, caps, and plugs are covered by NFPA 1963 . Spray nozzles with built-in shutoff valves, spray nozzle tips, and spray nozzles with break-apart shutoff valves are covered by NFPA 1964 . Foam-making equipment, such as eductors, nozzles, and foam aspiration equipment, is covered by UL 162, *Standard for Foam Equipment and Liquid Concentrates* .

1.4 Equivalency.**1.4.1**

Nothing in this standard shall prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

1.4.2

Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.4.3

The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

1.5* Units of Measurement.

In this standard, U.S. values for measurement are followed by an equivalent in metric units. Either set of values can be used, but the same set of values (either U.S. or SI units) shall be used throughout.

Supplemental Information

<u>File Name</u>	<u>Description</u> <u>Approved</u>
1964_SR-1_Chapter_1_leg_changes.docx	For staff use

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Submittal Date: Tue Jun 20 09:40:50 EDT 2017

Committee Statement

Committee Statement: These changes were made as the committee has chosen to incorporate NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 2-NFPA 1964-2017 [Section No. 2.3.1]

2.3.1 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM B117, *Standard Practice for Operating Salt Spray (Fog) Apparatus*, 2016.

ASTM D395, *Standard Test Methods for Rubber Property — Compression Set*, 2014 2016 .

ASTM D412, *Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers — Tension*, 2015 2016 .

ASTM D573, *Standard Test Method for Rubber — Deterioration in an Air Oven*, 2015.

ASTM D2565, *Standard Practice for Xenon Arc Exposure of Plastics Intended for Outdoor Applications*, 2016.

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Submittal Date: Tue Jun 20 09:54:04 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes in order to update referenced documents as well as addressing the incorporation of NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 3-NFPA 1964-2017 [Section No. 3.3]

3.3 General Definitions.

3.3.1 Break-Apart Monitor.

See 3.3.10.1.

3.3.2 Control.

3.3.2.1 Lever-Type Control.

A control in which the handle operates along the axis of the nozzle.

3.3.2.2 Rotational-Type Control.

A control that rotates in a plane perpendicular to the axis of the nozzle.

3.3.2.3 Trigger-Type Lever Control.

A control that is actuated by a squeezing or pinching movement and features a spring-operated automatic return to the closed position.

3.3.3 Fire Hose Appliance.

A piece of hardware (excluding nozzles) generally intended for connection to fire hose to control or convey water.

3.3.4* Flush.

A nozzle feature that allows the orifice to be opened so that small debris that could otherwise be trapped in the nozzle, causing pattern disruptions and flow rate variation, can pass through.

3.3.5 Full-Time Swivel.

A connection that allows one side of the connection to swivel or rotate in relation to the other side after the connection has been tightened together.

3.3.6* Handline Nozzle.

A nozzle with a rated discharge of less than 350 gpm (1325 L/min).

3.3.7 Ladder Pipe.

A monitor that attaches to the rungs of a vehicle-mounted aerial ladder.

3.3.8* Master Stream Nozzle.

A nozzle with a rated discharge of 350 gpm (1325 L/min) or greater.

3.3.9 Maximum Operating Pressure.

The maximum pressure at which the device is designed to be operated.

3.3.10 Monitor.

A device designed to hold and direct a nozzle while being fed by one or more hose lines or by rigid piping.

3.3.10.1 Break-Apart Monitor.

A monitor that can be converted for use either in stationary mode on a fire apparatus or in portable mode on a separate ground base.

3.3.10.2 Portable Monitor.

A monitor that can be lifted from a vehicle-mounted bracket and moved to an operating position on the ground by not more than two people.

3.3.11* Nozzle.

A constricting appliance attached to the end of a fire hose or monitor to increase the water velocity and form a stream.

A.3.3.11 Nozzle.

A nozzle can be equipped with a shutoff and can be designed to produce a straight stream, a spray pattern, or both.

3.3.12 Portable Monitor.

See 3.3.10.2 .

3.3.13 Portable Valve.

See 3.3.20.1 .

3.3.14 Pressure.**3.3.14.1** High Pressure.

Pump discharge pressure from 500 psi (3500 kPa) to less than 1100 psi (7600 kPa). [1901, 2016]

3.3.14.2* Normal Pressure.

Pressure created by forces acting perpendicular to the pipe wall at the point where a pressure tap is made.

3.3.14.3* Nozzle Pressure.

The normal pressure measured at the inlet of the nozzle.

3.3.14.4 Rated Pressure.

The pressure at which a nozzle is designed to operate to produce a specified flow rate.

3.3.14.4.1 Maximum Rated Pressure.

The maximum pressure at which the manufacturer determines it is safe to operate the nozzle.

3.3.14.5 Ultra-High Pressure.

Pressure created by forces acting perpendicular to the pipe wall at the point where a pressure tap is made. ~~Ultra-high pressure is more~~ and which is greater than 1100 psi (7600 kPa).

3.3.15 Rated Discharge.

The rate(s) at which a nozzle is designed to flow water when operated at its rated pressure.

3.3.16 Shutoff Valve.

See 3.3.20.2 .

3.3.17 Slow-Operating Valve.

See 3.3.20.3 .

3.3.18 Spray Nozzle.

A nozzle intended for connection to a hose line or monitor to discharge water in either a spray pattern or a straight stream pattern as selected by the operator.

3.3.18.1* Basic Spray Nozzle.

An adjustable-pattern spray nozzle in which the rated discharge is delivered at a designated nozzle pressure and nozzle setting.

3.3.18.2* Constant Gallonage Spray Nozzle.

An adjustable-pattern spray nozzle that discharges a constant discharge rate throughout the range of patterns from a straight stream to a wide spray at a designed nozzle pressure.

3.3.18.3* Constant Pressure (Automatic) Spray Nozzle.

An adjustable-pattern spray nozzle in which the pressure remains relatively constant through a range of discharge rates.

3.3.18.4* Constant/Select Gallonage Spray Nozzle.

A constant discharge rate spray nozzle with a feature that allows manual adjustment of the orifice to effect a predetermined discharge rate while the nozzle is flowing.

3.3.19 Standpipe System.

An arrangement of piping, valves, hose connections, and allied equipment installed in a building or structure such that, when supplied with adequate water, allows attached hose lines to be used to extinguish a fire.

3.3.20 Valve.**3.3.20.1** Portable Valve.

A fire hose appliance that includes at least one valve and has fire hose connections on both inlet(s) and outlet(s).

3.3.20.2* Shutoff Valve.

A valve whose primary function is to operate in either a fully shutoff or a fully open condition.

A.3.3.20.2 Shutoff Valve.

Some shutoff valves have a secondary capability to operate and hold their position between the fully open and fully closed positions. The purchaser should specify that the valve be designed with that capability if it is required for operations.

3.3.20.3 Slow-Operating Valve.

A valve that has a mechanism to prevent movement of the flow-regulating element from the fully closed position to the fully opened position or vice versa in less than 3 seconds. [1901, 2016]

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Committee Statement

**Committee
Statement:**

The committee has made these changes as they are incorporating NFPA 1965 into NFPA 1964.

**Response
Message:**



Second Revision No. 4-NFPA 1964-2017 [New Section after 4.5.2]

4.6 Fire Hose Appliance Characteristics.

4.6.1* Maximum Operating Pressure.

The maximum operating pressure shall be a minimum of 200 psi (13.8 bar).

A.4.6.1

The appliance and the hose with which it is used should be carefully matched. All components of the system need to be rated at or above the maximum operating pressure. The use of appliances rated for use with a lower service test pressure hose could result in catastrophic failure. The friction loss through the appliance can vary, depending on the design of the appliance and the amount of water flowing through the appliance. It is suggested that the manufacturer or the authority having jurisdiction conduct tests to determine what the friction loss is through the appliance at various flows so the pump operator can account for that loss when determining the pump pressure required.

4.6.2 Appliance Connectors.

4.6.2.1

All fire hose couplings on the appliance shall meet the requirements of NFPA 1963 .

4.6.2.2*

All fire hose connectors on an appliance shall conform to NFPA 1963 . If the hose threads or connectors used by the fire department do not conform to NFPA 1963 , the authority having jurisdiction shall be permitted to designate the hose threads or connectors that shall be used.

A.4.6.2.2

The committee recognizes that different types of hose connections and hose threads might be used in different countries. It is extremely important for fireground operations involving multiple jurisdictions to use a common type of thread or hose connection. Each country should make an effort to standardize thread types. Since 1905, there has been an effort in the United States to standardize hose threads. NFPA 1963 provides criteria for the American National Fire Connection Screw Thread. The goal of NFPA 1963 is to develop uniformity of fire hose coupling threads and to achieve interconnectability of fire hose.

4.6.2.3

If the hose connector(s) on the appliance is equipped with a full-time swivel, the force required to rotate the swivel shall not exceed 30 lbf (133.4 N) when tested in accordance with Section 6.1 .

4.6.3 Manually Operated Shutoff Valves.

4.6.3.1

Shutoff valves or appliances equipped with a lever-operated handle shall indicate the closed position when the handle is perpendicular to the hose line it is controlling.

4.6.3.2

If an appliance has more than two valves with lever-operated handles, the two outside handles shall indicate their closed position as described in 4.6.3.1 .

4.6.3.2.1

If the design of the appliance does not permit the intervening handle(s) to indicate the closed position perpendicular to the hose, it shall be permitted to indicate the closed position when the handle(s) is at the 2 o'clock position when viewed from the single hose connection side.

4.6.3.2.2

Any valve arranged as permitted in 4.6.3.2.1 shall be permanently marked to indicate the open and closed positions.

4.6.3.3

Shutoff valves equipped with a U-shaped handle shall indicate the closed position when the handle is closer to the discharge end of the valve.

4.6.3.4

Operating a shutoff valve shall require a force of no more than 40 lbf (180 N) and no less than 3 lbf (13 N) to open or close the valve when tested in accordance with Section 6.2 .

4.6.3.5

Any 3 in. (76 mm) or larger shutoff valve on an appliance shall be a slow-operating valve.

4.6.4* Relief Valves.

If the appliance has a relief valve, the relief valve shall meet the requirements of 4.6.4.1 through 4.6.4.4 .

A.4.6.4

Users of hose-connected appliances should always be careful to avoid situations that create water hammer. Training should stress the need to open and close valves slowly. Relief valves will not operate in time to avoid damage to an appliance from a water hammer.

4.6.4.1

The relief valve shall be on the intake side of the shutoff valve.

4.6.4.2

The relief valve shall relieve to atmosphere.

4.6.4.3

The relief valve shall be field adjustable.

4.6.4.4

The manufacturer shall mark the range of pressure adjustment on the relief valve.

4.6.5 Portable Monitors.

4.6.5.1*

A portable monitor, except a portable ladder pipe, shall have an attachment for at least one tiedown.

A.4.6.5.1

It is important that portable monitors be tied down during use. The nozzle reaction on a portable monitor is directly opposite the direction of the stream. The nozzle reaction from a 2 in. (51 mm) smooth bore tip at a nozzle pressure of 100 psi (6.9 bar) is 600 lbf (2670 N).

4.6.5.2

Portable ladder pipes shall have rung attachment mechanisms with multiple motion-locking devices.

4.6.5.3

The monitor shall be provided with stops to prevent it from being lowered to an angle of discharge or rotated to a point where the monitor becomes unstable.

4.6.5.4

A locking method shall be provided that will hold the elevation of the monitor in any position allowed by the manufacturer.

4.6.5.5

A locking method shall be provided that will hold the rotation of the monitor in any position allowed by the manufacturer.

4.6.5.6

Any shutoff valves incorporated in a monitor shall meet the requirements of 4.6.3 .

4.6.5.7

All swivel hose connections 3 1/2 in. (90 mm) or larger shall have a full-time swivel.

4.6.5.8 Force to Operate.**4.6.5.8.1**

The force to rotate a monitor shall be not less than 3 lbf (13 N) nor more than 40 lbf (180 N) when measured as defined in Section 6.7 .

4.6.5.8.2

The force to elevate the stream of a monitor shall be not more than 40 lbf (180 N) when measured as defined in Section 6.8 .

4.6.5.9

The monitor shall be capable of operation through all positions of elevation and rotation allowed by the manufacturer without any movement of the monitor's feet when tested in accordance with Section 6.9 .

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Submittal Date: Tue Jun 20 12:53:58 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 5-NFPA 1964-2017 [New Section after 4.6]

4.8 Leakage — Fire Hose Appliances.

4.8.1

If the appliance is equipped with a shutoff valve on the discharge side of the appliance, the appliance shall not develop in excess of 12 drops/min ($\frac{1}{2}$ mL/min) through the discharge orifice of the valve when tested in accordance with Section 6.3 .

4.8.2

There shall be no leakage through any part of the appliance other than the discharge orifice of a shutoff valve on the discharge side of the appliance when tested in accordance with Section 6.3 .

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Submittal Date: Tue Jun 20 14:40:07 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 6-NFPA 1964-2017 [New Section after 4.8]

4.11 Rough-Handling Tests for Fire Hose Appliances.

4.11.1

Section 4.6 shall not apply to portable monitors.

4.11.2

The appliance shall be capable of operation after being subjected to the rough usage tests in Section 6.6 .

4.11.3

Any operating force shall not increase more than 10 percent from that allowed before the test.

4.11.4

Following performance of the test to confirm compliance with 4.11.3 , the test sample shall again be subjected to the leakage test defined in Section 6.3 .

4.11.5

The leakage shall not increase by more than 10 percent from that allowed before the test.

4.12 Rough-Handling Tests for Portable Monitors.

4.12.1

The monitor shall remain operational and not leak or come apart after being subjected to the rough usage test described in Section 6.10 .

4.12.2

Any operating force shall not increase by more than 10 percent from that allowed before the test.

4.12.3

Following performance of the test to confirm compliance with 4.12.2 , the test sample shall again be subjected to the leakage test described in Section 6.3 .

4.12.4

The leakage shall not increase by more than 10 percent from that allowed before the test.

Submitter Information Verification

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Submittal Date: Tue Jun 20 14:44:04 EDT 2017

Committee Statement

**Committee
Statement:**

The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

**Response
Message:**



Second Revision No. 7-NFPA 1964-2017 [New Section after 4.9]

4.14 Connections for Large-Stream Devices.

4.14.1* Primary Inlet.

At least one inlet connection on each fire department large-stream device equipped with multiple primary inlets (other than devices piped permanently to a pump) shall be fitted with at least one female swivel connection, which shall have 2.5–7.5 NH standard thread as shown in Figure 4.14.1(a) and Figure 4.14.1(b). An adapter shall be permitted to be provided to meet this intent.

Figure 4.14.1(a) Large-Stream Device Rated from 400 gpm to 1250 gpm (1600 L/min to 5000 L/gpm).

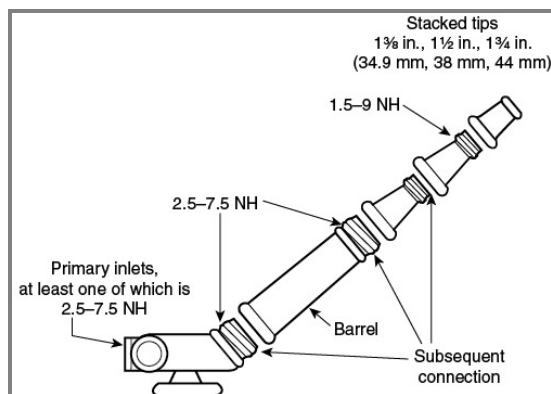
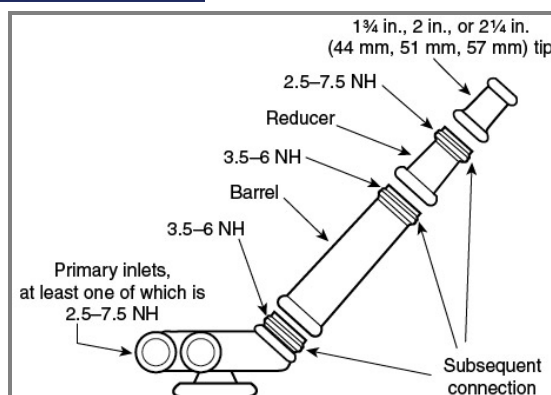


Figure 4.14.1(b) Large-Stream Device Rated More Than 1250 gpm (5000 L/min) but Less Than 3000 gpm (12,000 L/min).



A.4.14.1

Fire department large-stream devices with a single large-diameter input are designed to rely on the positioning of the hose for part of the device's stability. The manufacturer's instructions for use should be carefully followed for all large-stream devices. A device designed with a single hose-line inlet system is different from a device designed with a multiline inlet system, and trying to supply one device with adapters and fittings from different size hose can create a dangerous situation.

4.14.2* Subsequent Connections and Nozzles.

A.4.14.2

A flow of 400 gpm (1600 L/min) is the maximum normally obtained with a handline nozzle using a standard 1 1/4 in. (32 mm) straight-tip nozzle. A flow of 1250 gpm (5000 L/min) is the maximum normally obtained with a portable turret nozzle using a 2 in. (51 mm) straight-tip nozzle.

4.14.2.1

The discharge end of large-stream devices designed to flow from 400 gpm to 1250 gpm (1600 L/min to 5000 L/min) shall have the 2.5–7.5 NH thread for attaching straight-tip nozzle tips or spray nozzles.

4.14.2.1.1

If stacked straight-tip nozzles are used, one of the tips shall have the 1.5–9 NH thread as shown in Figure 4.14.1(a) .

4.14.2.1.2

Straight-tip nozzles and spray nozzles designed to flow from 400 gpm to 1250 gpm (1600 L/min and 5000 L/min) shall have 2.5–7.5 NH thread on their inlet.

4.14.2.2

The discharge end of large-stream devices designed to flow more than 1250 gpm (5000 L/min) but less than 3000 gpm (12,000 L/min) shall have the 3.5–6 NH thread for attaching straight-tip nozzles or spray nozzles.

4.14.2.2.1

A 3.5–6 NH female × 2.5–7.5 NH male reducer fitting or a stacked tip having the male 2.5–7.5 NH thread as an integral component as shown in Figure 4.14.1(b) shall be provided.

4.14.2.2.2

Straight-tip nozzles and spray nozzles designed to flow more than 1250 gpm (5000 L/min) but less than 3000 gpm (12,000 L/min) shall have 3.5–6 NH thread on their inlet.

4.14.2.3

Subsequent connections, straight-tip nozzles, and spray nozzles on large-stream devices designed to flow 3000 gpm (12,000 L/min) or more shall have an NH standard thread consistent with the nominal inlet or outlet size.

Supplemental Information

<u>File Name</u>	<u>Description</u> <u>Approved</u>
Fig_4.13.1_a_.jpg	For staff use
Fig_4.13.1_b_.jpg	For staff use

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Submittal Date: Tue Jun 20 15:47:36 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 8-NFPA 1964-2017 [New Section after 4.10.6]

4.16 Markings — Fire Hose Appliances.

4.16.1

Each fire hose appliance shall be permanently identified with the following information using numerals and letters not less than $\frac{3}{16}$ in. (4.8 mm) in height:

- (1) Name of manufacturer
- (2) Unique product or model designation
- (3) Maximum operating pressure
- (4) For monitors, maximum rated flow

4.16.2

The information on the maximum operating pressure shall be visible to the operator when the appliance is in its normal operating position.

4.16.3

The rated flow of the portable monitor shall be near the marking of the maximum operating pressure.

Submitter Information Verification

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Submittal Date: Tue Jun 20 16:05:09 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 9-NFPA 1964-2017 [Sections 5.2, 5.3]

5.2 High- and Low -Temperature Exposure.

The dry nozzle and appliance shall be capable of operation and there shall be no cracks or broken sections after it has been tested to a high temperature of 135°F (57°C) and then to a low temperature of -25°F (-32°C) in accordance with Section 6.15 .

5.2.1

The nozzle shall be capable of operation after storage in temperatures of 135°F (57°C).

5.2.2

Test samples that develop cracks or broken sections, or that fail to meet the operational control requirements in Section 4.3 after being tested in accordance with Section 6.5 , shall be considered as having failed to meet this requirement.

5.3 Low-Temperature Exposure.

5.3.1

The dry nozzle shall be capable of operation in temperatures as low as -25°F (-32°C).

5.3.2

Test samples that develop cracks or broken sections, or that fail to meet the operational control requirements in Section 4.3 after being tested in accordance with Section 6.6 , shall be considered as having failed to meet this requirement.

Supplemental Information

<u>File Name</u>	<u>Description Approved</u>
1964-Chapter_4--renumbered_for_reference.docx	For staff use

Submitter Information Verification

Submitter Full Name: Ken Holland
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Submittal Date: Wed Jun 21 10:07:24 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.
Response Message:



Second Revision No. 10-NFPA 1964-2017 [Section No. 5.4]

5.3* Corrosion Exposure.

5.3.1

After the corrosion exposure, the nozzle shall then be tested for any leakage in accordance with Section 4.7 .

5.3.2

All functions such as pattern selection, flush, flow rate adjustments, and shutoff shall continue to meet the requirements of Section 4.3 after the nozzle has nozzles and appliances shall be capable of operation after they have been subjected to a salt spray test in accordance with Section 6.166.9 .

5.3.3

The nozzle shall then be tested for any leakage in accordance with Section 4.6 . If the appliance has a valve(s), operating forces and leakage shall not increase by more than 10 percent from that allowed before the test .

Supplemental Information

<u>File Name</u>	<u>Description</u> <u>Approved</u>
1964_SR-10_5.4_leg_changes.docx	For staff use

Submitter Information Verification

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Submittal Date: Wed Jun 21 11:03:22 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 11-NFPA 1964-2017 [Section No. 5.6.3]

5.5.3

~~At the conclusion of this testing, the nozzle shall be inspected for cracking or crazing, the presence of which indicates failure of the test. The appliance shall then be subjected to a rough usage test in accordance with Section 6.6 if the appliance is not a portable monitor or in accordance with Section 6.10 if the appliance is a portable monitor.~~

Submitter Information Verification

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Submittal Date: Wed Jun 21 11:10:44 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 12-NFPA 1964-2017 [Section No. 5.7]

5.6 Moist Ammonia–Air Stress Cracking.

Nozzles or components made from copper alloys containing more than 15 percent zinc shall withstand exposure to a moist ammonia–air mixture without developing stress cracks when tested in accordance with Section 6.18.

Supplemental Information

<u>File Name</u>	<u>Description</u> <u>Approved</u>
1964_SR-12_5.7_leg_changes.docx	For staff use

Submitter Information Verification

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Submittal Date: Wed Jun 21 11:12:43 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 13-NFPA 1964-2017 [Section No. 5.8.1.4]

5.7.1.4 Compression Sets.

5.7.1.4.1

~~The~~ For nozzles, the rubber material or synthetic elastomer shall have a compression set of not more than 15 percent, determined in accordance with Section 6.20.

5.7.1.4.2

For appliances, a compression set of the material shall not be more than 25 percent, determined in accordance with Section 6.20 .

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Submittal Date: Wed Jun 21 11:17:23 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 14-NFPA 1964-2017 [Section No. 6.1]

6.1 Flow Rate Test.

6.1.1 Test Equipment — Nozzles .

6.1.1.1

Pressure gauges connected to a piezometer ring shall be used to measure the water pressure at the nozzle inlet.

6.1.1.2

When testing nozzles equipped with a 1 ½ in. (38 mm) connection at a discharge rate of 250 gpm (946 L/min) and higher, the pressure gauge shall be mounted on a 2 ½ in. (65 mm) waterway.

6.1.1.2.1

A tapered adaptor shall be used between the 2 ½ in. (65 mm) waterway and the 1 ½ in. (38 mm) inlet to the nozzle.

6.1.1.2.2

The maximum included angle of the adaptor shall be 30 degrees.

6.1.2 Test Procedure — Nozzles .

6.1.2.1

The nozzle shall be mounted such that the discharge rate through the nozzle and pressure at the inlet to the nozzle can be measured.

6.1.2.2

With the shutoff fully open, the inlet pressure shall be adjusted to the rated pressure, ± 2 percent.

6.1.2.3

Basic spray nozzles shall be tested and flow rate measurement taken in both straight stream and wide angle spray pattern settings after the nozzle pressure has been adjusted as specified in 6.1.2.2 for each of the pattern settings.

6.1.2.4

Constant gallonage spray nozzles shall be tested and the flow rate shall be monitored through the full range of pattern selection.

6.1.2.5

Constant/select gallonage spray nozzles shall be tested at each discrete flow rate selection.

6.1.2.5.1

The nozzle pressure shall be adjusted as specified in 6.1.2.2 for each discrete flow rate selection.

6.1.2.5.2

The flow rate shall be monitored through the entire range of pattern selection.

6.1.2.6

Constant pressure (automatic) spray nozzles shall be tested on the same equipment specified in 6.1.1.

6.1.2.6.1

The flow rate shall be increased to the minimum rated discharge and the pressure at this flow rate shall be recorded.

6.1.2.6.2

The flow rate and nozzle pressure shall be monitored through the entire range of pattern selection from straight stream to wide angle spray, and any deviation greater than 2 percent in flow rate or pressure shall be recorded.

6.1.2.6.3

The discharge rate shall continue to be slowly increased to the maximum rated discharge and the minimum and maximum pressures throughout the discharge range shall be recorded.

6.1.2.6.4

At the maximum discharge rate, the flow rate and the pressure shall be monitored through the entire range of pattern selection from straight stream to wide angle spray and any deviation greater than 2 percent in flow rate or pressure shall be recorded.

Submitter Information Verification

Submitter Full Name: Ken Holland

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Submittal Date: Wed Jun 21 12:19:17 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 15-NFPA 1964-2017 [Section No. 6.2]

6.2 Flush Test — Nozzles .

6.2.1

Nozzles shall be held in the vertical position, discharge end down, with the nozzle in either the fully open or flush position.

6.2.2

The appropriate size steel ball shall pass through the nozzle without changes in the control position.

6.2.2.1

For nozzles with discharge rates up to 60 gpm (230 L/min), a $\frac{1}{8}$ in. (3.18 mm) steel ball shall be used.

6.2.2.2

For nozzles with discharge rates of 60 gpm to 150 gpm (230 L/min to 570 L/min), a $\frac{3}{16}$ in. (4.76 mm) steel ball shall be used.

6.2.2.3

For nozzles with discharge rates greater than 150 gpm (570 L/min), a $\frac{1}{4}$ in. (6.35 mm) steel ball shall be used.

Submitter Information Verification

Submitter Full Name: Ken Holland

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Submittal Date: Wed Jun 21 12:21:13 EDT 2017

Committee Statement

Committee Statement: The committee has made this change as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 16-NFPA 1964-2017 [Sections 6.3.1, 6.3.2, 6.3.3]

6.3.1 Lever-Type Controls — Nozzles .

6.3.1.1

The nozzle shall be mounted in the closed position with an inlet pressure of 100 psi (6.9 bar).

6.3.1.1.1

A dynamometer, which records the maximum force reading, shall be attached to the lever or handle where it is designed to be held during operation.

6.3.1.1.2

The shutoff or pattern selection lever or handle shall be moved from the fully closed to fully open position for the full range of pattern adjustment and the maximum force recorded.

6.3.1.1.3

The inlet pressure shall be adjusted to 100 psi (6.9 bar) while in the full discharge position.

6.3.1.1.4

The dynamometer shall be used to measure the maximum force to move the lever through the full range of positions.

6.3.1.1.5

The maximum force required in both directions shall be recorded.

6.3.1.2

The nozzle shall be mounted without any pressure applied to it and the controlling lever shall be placed in the closed or full forward position.

6.3.1.2.1

The dynamometer shall be used to measure the force required to move the lever from the full forward position.

6.3.1.2.2

The force required to move the lever shall be recorded.

6.3.2 Rotational Pattern Control — Nozzles .

6.3.2.1

Nozzles equipped with rotational pattern control shall be mounted on a rigid device, and the force required to rotate the pattern sleeve shall be measured while water is discharging at 100 psi (6.9 bar).

6.3.2.2

A length of twine or string, not to exceed $\frac{3}{32}$ in. (2.9 mm) in diameter, shall be wrapped around the nozzle at the point where the nozzle normally would be held while rotating the pattern sleeve.

6.3.2.2.1

The string shall be of sufficient length to wrap around the nozzle at least six times.

6.3.2.2.2

The first two turns shall overlap the starting end of the string, and the balance of the turns shall not overlap any other turn.

6.3.2.3

A force gauge, which records the maximum force reading, shall be attached to a loop in the free end of the string.

6.3.2.4

The pattern sleeve shall be rotated by pulling the force gauge perpendicular to the center axis of the nozzle such that, as the pattern sleeve rotates, the string will unwind so that the force always remains tangential to the pattern sleeve.

6.3.2.5

The pattern sleeve shall be rotated from the straight stream position to the wide spray position, and vice versa. If the nozzle is equipped with detents for the pattern settings, this test shall commence with the pattern sleeve in the straight stream and wide spray detent.

6.3.3 Full-Time Swivel — Nozzle .**6.3.3.1**

Nozzles equipped with a full-time swivel shall be tested while water is discharging at the rated pressure of the nozzle.

6.3.3.2

A length of twine or string, not to exceed $\frac{3}{32}$ in. (2.9 mm) in diameter, shall be wrapped around the nozzle at the point where the nozzle normally would be held while rotating the pattern sleeve.

6.3.3.3

The pattern sleeve of the nozzle shall be rotated to the end of its travel in the wide spray direction.

6.3.3.4

The force shall be applied tangentially with a dynamometer to determine the force required to rotate the nozzle, and this force shall be recorded.

Submitter Information Verification

Submitter Full Name: Ken Holland

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Street Address:

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Submittal Date: Wed Jun 21 12:24:32 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

**Response
Message:**



Second Revision No. 18-NFPA 1964-2017 [Section No. 6.3.4]

6.3.4 Twist Shutoff — Nozzles .

6.3.4.1

A nozzle with a twist shutoff shall be mounted on a device equipped with a relief valve, or other means, to maintain 100 psi (6.9 bar) in both the closed position and the fully open position while flowing the rated discharge.

6.3.4.2

The test shall start with the nozzle in the closed position.

6.3.4.3

The force gauge shall be used to twist the shutoff to the fully open position, following the method outlined in 6.3.2.2 through 6.3.2.4.

6.3.4.4

The windings on the pattern sleeve shall be reversed, and the force gauge used as described in 6.3.2.4 to rotate the shutoff from the fully open to the fully closed position.

6.3.4.5

In the fully closed position, any leakage shall be measured and shall not exceed that allowed by 4.7.2.

Submitter Information Verification

Submitter Full Name: Ken Holland

Organization: National Fire Protection Assoc

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Submittal Date: Wed Jun 21 12:43:12 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 17-NFPA 1964-2017 [New Section after 6.3.4.5]

6.3.5 Test of Handles on Manually Operated Shutoff Valves/Appliances.

6.3.5.1

The appliance or the valve used with the appliance shall be mounted in a device capable of holding the appliance or valve stationary.

6.3.5.2

A dynamometer, which records the maximum force reading, shall be attached to the outermost point of the handle.

6.3.5.3

With the valve in the closed position, an inlet gauge pressure of 100 psi (6.9 bar) shall be applied to the valve.

6.3.5.4

The dynamometer shall be used to measure the force to move the handle from the fully closed position to the fully open position, and the maximum force shall be recorded.

6.3.5.5

The inlet pressure shall be adjusted to a gauge pressure of 100 psi (6.9 bar) while the valve is in the fully open position.

6.3.5.5.1

If the outlet of the valve is 1 in. (25.4 mm) or less, the flow shall be whatever flow rate is achieved with the inlet pressure at 100 psi (6.9 bar).

6.3.5.5.2

If the outlet of the valve is greater than 1 in. (25.4 mm), the flow shall be at least 250 gpm (946 L/min) with the inlet pressure at 100 psi (6.9 bar). A nozzle or restricting orifice shall be permitted to be used downstream of the valve to regulate the flow.

6.3.5.6

The dynamometer shall be used to measure the force to move the handle from the fully open position to the fully closed position, then back to the fully open position.

6.3.5.7

The maximum force measured in both directions shall be recorded.

6.3.5.8

The valve shall be fully closed without any inlet pressure on the valve.

6.3.5.9

The dynamometer shall be used to measure the force to move the handle from the fully closed position to the fully open position.

6.3.5.10

The maximum force measured in both directions shall be recorded.

Submitter Information Verification

Submitter Full Name: Ken Holland

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Submittal Date: Wed Jun 21 12:37:11 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 19-NFPA 1964-2017 [Section No. 6.4]

6.6 Hydrostatic Test.

6.6.1 Hydrostatic Pressure.

6.6.1.1

The nozzle or appliance shall be mounted in a closed position on a device capable of exerting a hydrostatic pressure of 900 psi (62 bar) or three times the maximum rated pressure, whichever is higher.

6.6.1.2

Test caps capable of withstanding the required hydrostatic pressure shall be attached to the appliance openings, and all valves shall be placed in the fully open position.

6.6.2

All air shall be bled out of the system.

6.6.3

The pressure guage shall be increased by 50 psi (3.5 bar) increments and held for 30 seconds at each pressure up to the maximum pressure for which the nozzle is being tested.

6.6.4

This maximum pressure shall be held for 1 minute without rupture ~~of the nozzle~~.

6.6.5

Leakage shall not be permitted through any part of the nozzle other than the discharge orifice.

6.6.6

Increase in leakage through the discharge orifice of nozzles shall be permitted beyond that allowed in Section 4.7.

6.6.7

Operating forces and leakage shall not increase by more than 10 percent from that allowed before the test.

Submitter Information Verification

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Submittal Date: Wed Jun 21 12:46:05 EDT 2017

Committee Statement

**Committee
Statement:
Response
Message:**

The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.



Second Revision No. 21-NFPA 1964-2017 [Section No. 6.5]

6.7 High-Temperature Tests.

6.7.1

The nozzle or appliance shall be conditioned to 135°F (57°C) for 24 hours prior to the test.

6.7.2

Immediately after being removed from the heating chamber, the nozzle or appliance shall be tested for proper function of all adjustments and controls.

6.7.3

Binding of any function, such as pattern selection, flush, flow rate adjustment, or shutoff, shall not be permitted.

Submitter Information Verification

Submitter Full Name: Ken Holland

Organization: National Fire Protection Assoc

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Submittal Date: Wed Jun 21 12:53:10 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 20-NFPA 1964-2017 [Section No. 6.6]

6.8 Low-Temperature Tests.

6.8.1

A dry nozzle or appliance shall be conditioned to –25°F (–32°C) for 24 hours prior to the test.

6.8.2

Immediately after being removed from the cooling chamber, the nozzle or appliance shall be tested for proper function of all adjustments and controls.

6.8.3

Binding of any function, such as pattern selection, flush, flow rate adjustment, or shutoff, shall not be permitted.

6.8.4

Within 3 minutes after being removed from the cooling chamber, the nozzle or appliance other than portable monitors, shall be subjected to the rough-handling tests identified in Section ~~6.7~~ 6.9 for handline nozzles or Section ~~6.8~~ 6.10 for master stream nozzles.

6.8.5

Portable monitors shall be tested in accordance with Section 6.9 .

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Submittal Date: Wed Jun 21 12:50:55 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 22-NFPA 1964-2017 [Section No. 6.7]

6.9 Rough-Handling Tests for — Handline Nozzles.

Each nozzle shall be subject to the three tests in ~~6.7.4~~ 6.9.1 through ~~6.7.3~~ 6.9.3.

6.9.1 Test One.

6.9.1.1

The nozzle shall be attached to a length of hose at least 10 ft (3 m) long.

6.9.1.2

With the hose uncharged, the nozzle shall be dropped from a height of 6 ft (2 m) onto a concrete surface so that it impacts directly or squarely on the discharge end.

6.9.2 Test Two.

6.9.2.1

The nozzle shall be attached to a length of hose at least 10 ft (3 m) long.

6.9.2.2

With the hose uncharged, the nozzle shall be dropped twice from a height of 6 ft (2 m) onto a concrete surface so that the points of impact are on two different sides of the nozzle.

6.9.2.2.1

For nozzles equipped with a shutoff handle or lever, one of the points of impact shall be directly on that handle or lever while in the closed position.

6.9.2.2.2

For nozzles equipped with a handhold, handgrip, or ladder hook, one of the points of impact shall be on the handhold, handgrip, or ladder hook.

6.9.3 Test Three.

6.9.3.1

The nozzle shall be attached to a length of hose at least 10 ft (3 m) long.

6.9.3.2

With the nozzle shut off and the hose line charged with water to a pressure of 100 psi (6.9 bar), the nozzle shall be dropped twice from a height of 6 ft (2 m) onto a concrete surface so that the points of impact are on two different sides of the nozzle.

6.9.3.2.1

For nozzles equipped with a shutoff handle or lever, one of the points of impact shall be directly on that handle or lever while in the closed position.

6.9.3.2.2

For nozzles equipped with a handhold, handgrip, or ladder hook, one of the points of impact shall be on the handhold, handgrip, or ladder hook.

Submitter Information Verification

Submitter Full Name: Ken Holland

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Submittal Date: Wed Jun 21 13:08:10 EDT 2017

Committee Statement

Committee Statement: This change was editorial in nature.

Response Message:



Second Revision No. 38-NFPA 1964-2017 [New Section after 6.8]

6.11 Force-to-Rotate Test — Monitors.

6.11.1

The monitor shall be mounted in a device capable of holding its base stationary. A dynamometer, which records the maximum force reading, shall be attached to the monitor where a person would normally grab the monitor to rotate it.

6.11.2

The monitor shall be flowing water at its maximum rate of flow at a nozzle discharge pressure of 100 psi (6.9 bar) through a smooth bore tip.

6.11.3

The dynamometer shall be used to measure the force when the monitor is rotated first in one direction and then in the other direction. The maximum force in both directions shall be recorded.

6.12 Force-to-Elevate Test — Monitors.

6.12.1

The monitor shall be mounted in a device capable of holding its base stationary. A dynamometer shall be attached to the monitor where a person would normally grab the monitor to elevate it.

6.12.2

The monitor shall be flowing water at its maximum flow rate at a nozzle discharge pressure of 100 psi (690 kPa) through a smooth bore tip.

6.12.3

The dynamometer shall be used to measure the force when the monitor is elevated from its lowest position to its maximum elevation. The maximum force shall be recorded.

6.13 Stability Test for Portable Monitors.

6.13.1 Test Setup.

6.13.1.1

The monitor shall be set up in accordance with the manufacturer's instructions on a concrete surface with a broom finish.

6.13.1.2

The position of the feet shall be marked on the surface so that any movement can be detected.

6.13.1.3

The monitor shall be attached to a secure tiedown point with an attachment that has approximately 6 in. (150 mm) of slack.

6.13.1.4

The attachment shall have a rated strength of at least twice the maximum test reaction force.

6.13.1.5

The hose supplying the monitor shall be charged and any slack removed from the hose.

6.13.1.6

The monitor shall be equipped with a smooth bore nozzle that is capable of flowing the rated flow of the monitor at 100 psi (6.9 bar) discharge pressure.

6.13.1.7

The monitor shall be positioned to discharge the stream at the maximum elevation position.

6.13.2 Test Procedure.**6.13.2.1**

A water flow shall be established at a nozzle discharge pressure of 150 psi (10.4 bar).

6.13.2.2

The monitor shall then be operated through all positions of elevation and rotation allowed by the manufacturer.

6.13.2.3

The monitor shall be operated for a minimum of 3 minutes.

6.13.2.4*

Any movement of the monitor feet relative to the concrete surface of more than 1 1/2 in. (38 mm) shall constitute failure of this test, and the water supply shall be immediately shut down and the test discontinued.

A.6.13.2.4

It is extremely important that, as the monitor is operated through all its positions, any change in stream direction be done slowly so that there are not sudden changes in force on the monitor.

Submitter Information Verification

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Submittal Date: Tue Jul 18 14:12:50 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 39-NFPA 1964-2017 [New Section after 6.8]

6.4 Leakage Test — Appliances.

6.4.1

The appliance shall be connected to a source of water.

6.4.2

If the appliance is equipped with a shutoff valve on the discharge side of the appliance, the valve shall be closed and all the air bled out.

6.4.3

If the appliance is not equipped with a shutoff valve on the discharge side of the appliance, the discharge side of the appliance shall be capped and all the air bled out.

6.4.4

The appliance shall be pressurized to a gauge pressure of 800 psi (55.2 bar) or 1 1/2 times the maximum operating pressure, whichever is higher, and held for a period of 1 minute.

6.4.5

The leakage, if any, shall be measured.

6.5 Full-Time Swivel — Appliances.

6.5.1

An appliance equipped with a full-time swivel on the hose connection shall be tested while it is dry.

6.5.2

The appliance shall be mounted in a device capable of holding the appliance stationary.

6.5.3

The coupling shall have a hook or other device added in a manner that will allow an attached dynamometer to apply force tangentially.

6.5.4

The force required to rotate the coupling shall be applied tangentially with a dynamometer, which records the maximum force reading.

6.5.5

The force shall be recorded.

Submitter Information Verification

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Submittal Date: Tue Jul 18 15:50:10 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 23-NFPA 1964-2017 [New Section after 6.8.3]

6.10.4 Rough-Handling Test — Appliances.

6.10.4.1

A cap shall be attached to each male threaded connection on the appliance to protect the exposed threads.

6.10.4.2

If the appliance weighs less than 10 lb (4.54 kg), the appliance shall be dropped from a height of 6 ft (2 m) onto a concrete surface so that it impacts directly or squarely on each side and on the top and the bottom (a minimum of six drops).

6.10.4.3

If the appliance weighs 10 lb (4.54 kg) or more, the appliance shall be dropped from a height of 3 ft (1 m) onto a concrete surface so that it impacts directly or squarely on each side and on the top and the bottom (a minimum of six drops).

6.10.5 Rough Usage Test for Portable Monitors.

6.10.5.1

The assembled monitor shall have caps and plugs installed to protect any threaded connection.

6.10.5.2

The legs shall be extended and the monitor shall be dropped from a height of 3 ft (1 m) onto a concrete surface so that it impacts directly on a support leg.

6.10.5.3

The monitor shall continue to be dropped from a height of 3 ft (1 m) onto a concrete surface until it has been dropped on each supporting leg.

6.10.5.4

The monitor shall then be dropped from the same height onto the discharge end and the intake end of the appliance.

6.10.5.5

If the monitor is of a break-apart design, it shall be disassembled and each piece dropped on the break-apart point.

6.10.5.6

Following these drops, the monitor shall be inspected to be sure that it will still rotate and elevate and that all components are still attached and operational as designed by the manufacturer.

6.10.5.7

The monitor shall be flow tested and shall remain operational and not leak or come apart.

Submitter Information Verification

Submitter Full Name: Ken Holland

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Submittal Date: Wed Jun 21 13:12:35 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.
Response Message:



Second Revision No. 25-NFPA 1964-2017 [Section No. 6.10.1 [Excluding any Sub-Sections]]

Sample nozzles and appliances shall be exposed to ultraviolet light and water for 720 hours.

Submitter Information Verification

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Submittal Date: Wed Jun 21 13:37:40 EDT 2017

Committee Statement

Committee Statement: The committee has made this change as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 27-NFPA 1964-2017 [Sections 6.10.2, 6.10.3, 6.10.4, 6.10.5, 6.10.6]

6.15.2 Carbon-Arc Lamp Source.

6.15.2.1

Ultraviolet light shall be obtained from two stationary enclosed carbon-arc lamps.

6.15.2.2

The arc of each lamp shall be formed between two vertical carbon electrodes, $\frac{1}{2}$ in. (12.7 mm) in diameter, located at the center of a ~~revolvable~~ revolving vertical metal cylinder 31 in. (787 mm) in diameter and 17 $\frac{3}{4}$ in. (451 mm) in height.

6.15.2.3

Each arc shall be enclosed with a number 9200 PX clear Pyrex™ glass globe.

6.15.2.4

The ~~samples test components~~ shall be mounted vertically on the inside of the ~~revolvable metal~~ cylinder, ~~arc~~ing the lamps, and the cylinder shall ~~revolve~~ revolved continuously around the stationary arcing lamps at 1 rpm.

6.15.2.5

A system of nozzles shall be provided so that ~~each sample in turn is sprayed with water as the cylinder revolves.~~ During during each operating cycle, ~~each sample~~ the samples shall be exposed to ~~both~~ the light and to water spray for 3 minutes and to only the light for an ~~additional~~ 17 minutes (~~for a~~ total 20 minutes).

6.15.2.6

The air temperature within the revolving cylinder of the apparatus during ~~operations~~ the test shall be 145°F $\pm$ 9°F (63°C $\pm$ 5°C).

6.15.3 Xenon-Arc Lamp Source.

6.15.3.1

The ultraviolet light exposure shall be obtained in accordance with ASTM D2565, Standard Practice for Xenon Arc Exposure of Plastics Intended for Outdoor Applications .

6.15.3.2

The source of radiation shall be a 6500 W, water-cooled xenon-arc lamp with borosilicate inner and outer optical filters.

6.15.3.3

The wattage to the lamp shall be controlled automatically to provide spectral irradiance of 0.0325 W/ft^2 $\underline{\underline{2}}$ (0.35 W/m^2 $\underline{\underline{2}}$) at 0.000014 in. (340 nm).

6.15.3.4

The samples shall be mounted vertically on the inside of a 38 in. (97 cm) diameter cylinder, facing the arc, and the cylinder shall be rotated about the arc at 1 rpm.

6.15.3.5

During each operating cycle of 120 minutes, each sample shall be exposed to light for 102 minutes and to light and water spray for 18 minutes.

6.15.3.6

The black-panel temperature during the dry portion of the light-on cycle shall be regulated to 145°F ± 9°F (63°C ± 5°C).

6.15.3.7

At the conclusion of the test, the components shall be inspected for cracking or crazing.

Supplemental Information

<u>File Name</u>	<u>Description</u> <u>Approved</u>
1964_SR-27_6.10.2.docx	For staff use.

Submitter Information Verification

Submitter Full Name: Ken Holland

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Submittal Date: Wed Jun 21 13:43:08 EDT 2017

Committee Statement

Committee Statement: These sections of text have been moved/included due to the committee incorporating NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 28-NFPA 1964-2017 [New Section after 6.11]

6.16.2

A sample appliance(s) shall be subjected to air-oven aging for 180 days at 212°F (100°C) and then allowed to cool at least 24 hours in air at 74°F (23°C) at 50 percent relative humidity.

Submitter Information Verification

Submitter Full Name: Ken Holland

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Submittal Date: Wed Jun 21 13:46:54 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 29-NFPA 1964-2017 [Section No. 6.12]

6.17 Handholds, Handgrips, and Ladder Hooks — Nozzles .

The sample nozzle shall be mounted in a fixture to simulate intended use and a force of 300 lbf (1335 N) shall be applied to the nozzle for 5 minutes to simulate the nozzle reaction force.

Submitter Information Verification

Submitter Full Name: Ken Holland

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Submittal Date: Wed Jun 21 13:48:31 EDT 2017

Committee Statement

Committee Statement: The committee has made this change as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 30-NFPA 1964-2017 [Section No. 6.13.1.2]

6.18.1.2

Each sample shall be connected to an appropriate male coupling, or mating coupling for appliances, and tightened to the minimum torque necessary to produce a leaktight assembly.

Submitter Information Verification

Submitter Full Name: Ken Holland

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Submittal Date: Wed Jun 21 13:49:57 EDT 2017

Committee Statement

Committee Statement: The committee has made this change as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 31-NFPA 1964-2017 [Section No. 7.1]

7.1* Certification.

Performance of the nozzle and appliance to the requirements of this standard shall be certified by a testing laboratory or by the manufacturer.

Submitter Information Verification

Submitter Full Name: Ken Holland

Organization: National Fire Protection Assoc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jun 21 14:25:52 EDT 2017

Committee Statement

Committee Statement: The committee has made this change as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 32-NFPA 1964-2017 [Sections 7.2.1, 7.2.2, 7.2.3]

7.2.1

A minimum of one nozzle or one completely assembled appliance shall pass each required test.

7.2.2*

Multiple nozzles or appliances shall be permitted to be used during the testing process.

7.2.2.1

The same nozzle or appliance equipped with a shutoff valve(s) that is initially used to evaluate the requirements of Section 4.3 shall be used for the rough-handling evaluation (*see Section 4.9 and Section 4.10*).

7.2.2.2

The same nozzle or appliance that is used to test the high-temperature exposure (~~see Section 5.2~~) shall be used to test the low-temperature exposure (*see Section 5.2 5.3*) with the high-temperature exposure evaluation done first.

7.2.3

Any nozzle or nozzle components and appliance or appliance components that have been subjected to the destructive tests to prove compliance with the requirements of this standard shall be considered unsuitable for in-service use.

Submitter Information Verification

Submitter Full Name: Ken Holland

Organization: National Fire Protection Assoc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jun 21 14:28:54 EDT 2017

Committee Statement

Committee Statement: The committee has made these changes as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 33-NFPA 1964-2017 [Section No. 7.4]

7.4 Design Changes.

Any changes to the design of the nozzle or appliance or in the materials of construction shall be cause for retesting.

Submitter Information Verification

Submitter Full Name: Ken Holland

Organization: National Fire Protection Assoc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jun 21 14:31:30 EDT 2017

Committee Statement

Committee Statement: The committee has made this change as they have incorporated NFPA 1965 into NFPA 1964.

Response Message:



Second Revision No. 36-NFPA 1964-2017 [Section No. A.4.4]

A.4.4

~~The Committee recognizes that not all countries use the same type of hose threads. It is believed to be extremely important for fireground operations involving multiple jurisdictions to use a common type of thread. Each country should make an effort to standardize thread types. Since 1905, an effort has been made in the United States to standardize hose threads. NFPA 1963 provides criteria for the American National Fire Connection Screw Thread. The goal of NFPA 1963 is uniformity and interchangeability of fire hose coupling threads.~~

Submitter Information Verification

Submitter Full Name: Ken Holland

Organization: National Fire Protection Assoc

Street Address:

City:

State:

Zip:

Submittal Date: Thu Jun 22 10:58:29 EDT 2017

Committee Statement

Committee Statement: The committee has deleted this annex item as it is covered in another section of the annex as part of the incorporation of NFPA 1965 into NFPA 1964.

Response Message: