

NFPA 1914

Standard for Testing Fire Department Aerial Devices

1997 Edition



National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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NFPA 1914
Standard for
Testing Fire Department Aerial Devices
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This edition of NFPA 1914, *Standard for Testing Fire Department Aerial Devices*, was prepared by the Technical Committee on Fire Department Apparatus and acted on by the National Fire Protection Association, Inc., at its Annual Meeting held May 19–22, 1997, in Los Angeles, CA. It was issued by the Standards Council on July 24, 1997, with an effective date of August 15, 1997, and supersedes all previous editions.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

This edition of NFPA 1914 was approved as an American National Standard on August 15, 1997.

Origin and Development of NFPA 1914

In 1954, the Fire Department Equipment Committee presented a report entitled *Standard Procedure for Aerial Ladder Testing* (NFPA 193-P) for tentative adoption. In 1955, it received final adoption. This document contained separate tests for wood and metal aerial ladders.

In 1958, new material covering the use, maintenance, and testing of ground ladders was added to the document, and a single procedure for testing both wood and metal aerial ladders was approved.

In 1959, a new section covering specifications for aluminum ground ladders for fire department use was adopted.

In May 1972, a complete revision of the 1959 edition of NFPA 193 was approved. This edition introduced tests for elevating platforms.

During 1974 and 1975, NFPA 193 was separated into two documents since the conditions of use for ground ladders and aerial ladders were so widely divergent. The new *Recommended Practice for the Maintenance, Care, Testing, and Use of Fire Department Aerial Ladders and Elevating Platforms* was designated as NFPA 1904 and approved in 1975.

In 1980, a complete revision of the document, which revised the document as a standard and renamed it as *Standard for Testing Fire Department Aerial Ladders and Elevating Platforms*, was approved.

The 1988 edition was again a complete revision to add more detail on required inspection, to require nondestructive testing of critical components on a periodic basis, and to include testing for water towers. The document was renumbered NFPA 1914 and renamed *Standard for Testing Fire Department Aerial Devices* to better describe its broader scope.

The 1991 edition added some clarification to the acceptance criteria for weld and other nondestructive testing inspections, revised the requirements for water system tests, and included for testing some additional components of the aerial devices. In addition, references and terminology were changed where necessary to correspond with the new editions of the fire apparatus standards.

The 1997 edition adds text to provide repair recommendations when the manufacturer is no longer in business, requires that free weights be used in testing, allows for acoustic emission testing, adds requirements for testing secondary operating controls, and adds a suggested form for recording the inspection and test results.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in membership may have occurred. A key to classifications is found at the back of this document.

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Contents

Chapter 1 Administration	1914- 4	3-7 Articulating Boom–Upper Boom Examination and Test	1914–14
1-1 Scope	1914- 4	3-8 Telescoping Boom Examination and Test	1914–15
1-2 Purpose	1914- 4	3-9 Operational Tests from Lower Controls	1914–16
1-3 Definitions	1914- 4	3-10 Operational Tests from Platform Controls	1914–16
1-4 General	1914- 7	3-11 Load Test	1914–16
1-5 Inspection Personnel	1914- 7	3-12 Water System Examination and Test	1914–17
1-6 Visual Inspection	1914- 7	3-13 Signs	1914–17
1-7 Weld Inspection	1914- 7	3-14 Records	1914–17
1-8 Bolt, Pin, and Washer Inspection	1914- 7		
1-9 Nondestructive Testing Procedures	1914- 7	Chapter 4 Testing Water Towers	1914–17
Chapter 2 Testing Metal Aerial Ladders	1914- 8	4-1 General	1914–17
2-1 General	1914- 8	4-2 Service Records	1914–17
2-2 Service Records	1914- 8	4-3 Turntable and Torque Box Inspection and Test	1914–17
2-3 Turntable and Torque Box Inspection and Test	1914- 8	4-4 Stabilizer Examination and Test	1914–17
2-4 Stabilizer Examination and Test	1914- 9	4-5 Aerial Ladder Examination and Test	1914–17
2-5 Aerial Ladder Inspection and Test	1914–10	4-6 Articulating Boom–Lower Boom Examination and Test	1914–17
2-6 Operating Test	1914–11	4-7 Articulating Boom–Upper Boom Examination and Test	1914–17
2-7 Load Testing	1914–11	4-8 Telescoping Boom Examination and Test	1914–17
2-8 Water System Test	1914–12	4-9 Operating Test	1914–17
2-9 Signs	1914–13	4-10 Water System Examination and Test	1914–18
2-10 Records	1914–13	4-11 Signs	1914–18
Chapter 3 Testing Elevating Platforms	1914–13	4-12 Records	1914–18
3-1 General	1914–13		
3-2 Service Records	1914–13	Chapter 5 Referenced Publications	1914–18
3-3 Turntable and Torque Box Inspection and Test	1914–13		
3-4 Stabilizer Examination and Test	1914–13	Appendix A Explanatory Material	1914–19
3-5 Elevating Platform and Boom Inspection and Test	1914–13		
3-6 Articulating Boom–Lower Boom Examination and Test	1914–14	Appendix B Inspection and Test Form	1914–21
		Index	1914–22

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Appendix A.

Information on referenced publications can be found in Chapter 5.

Chapter 1 Administration

1-1 Scope. This standard shall apply to the examination and testing of all fire apparatus, regardless of year of manufacture, that are equipped with an aerial ladder, an elevating platform, or a water tower as specified in NFPA 1901, *Standard for Automotive Fire Apparatus*.

1-2 Purpose. This standard specifies minimum inspection and testing requirements for aerial devices in an effort to ensure at least a minimum degree of safety under continued use. Because aerial devices can be misused and thereby overstressed, all aerial devices shall be periodically inspected and tested to determine continued serviceability.

1-3 Definitions.

Acoustic Emission Testing. A method of nondestructive testing (NDT) that utilizes acoustic or sound waves.

Aerial Device. An aerial ladder, elevating platform, aerial ladder platform, or water tower that is designed to position personnel, handle materials, provide continuous egress, or discharge water.

Aerial Ladder. A self-supporting, turntable-mounted, power-operated ladder of two or more sections permanently attached to a self-propelled automotive fire apparatus and designed to provide a continuous egress route from an elevated position to the ground.

Aerial Ladder Platform. A type of aerial device that combines an elevating platform with the continuous egress capabilities of an aerial ladder.

Aerial Ladder Sections. The structural members of the aerial ladder consisting of the base and fly sections.

Ambient Temperature. The temperature of the surrounding atmosphere.

American Society for Nondestructive Testing (ASNT). A professional organization that is devoted to promoting knowledge of nondestructive testing.

American Welding Society (AWS). An association that provides codes, guidelines, and standards utilized to evaluate welded structures and components in welded structures.

Ancillary Boom Ladder. A ladder or ladders affixed to a telescoping or articulating boom section.

Approved.* Acceptable to the authority having jurisdiction.

Articulating Boom. An aerial device consisting of two or more folding boom sections whose extension and retraction modes are accomplished by adjusting the angle of the knuckle joints.

Authority Having Jurisdiction.* The organization, office, or individual responsible for approving equipment, an installation, or a procedure.

Authorized Person. A person approved or assigned to perform specific types of duties or to be at a specific location at the job site.

Auxiliary Hydraulic Power. A small gasoline engine, diesel engine, or electric motor driven hydraulic pump used to operate an aerial device in an emergency or in lieu of the main hydraulic system.

Base Rail. The lower chord (i.e., rail) of an aerial ladder to which rungs and reinforcements are attached.

Base Section. The first or bottom section of an aerial device.

Bearing Raceway. The track in which the bearings are held between the upper and lower halves of a turntable rotation bearing.

Boom. An assembled section of an aerial device. The boom construction can be of the stressed skin box beam type, the truss-lattice-type, or the open "U" truss-type design.

Boom Boost Cylinders. The hydraulic cylinders located on the upper boom of an articulating boom aerial device that help lift the upper boom from the lower boom.

Boom Support. A structural component that is attached to the chassis frame and that is used to support the aerial device when it is in the cradled position.

Bow. The distance that the end of an aerial ladder or boom deviates from a straight line extension of the base section.

Cable. A wire rope used to transmit forces from one component to another for the purpose of extending or retracting an aerial device.

Cable Separation Guide. The mechanism that aligns and separates the cable when it is wound on the drum of an aerial ladder's extension winch.

Chassis. The basic operating motor vehicle including the engine, frame, and other essential structural and mechanical parts, but exclusive of the body and all appurtenances for the accommodation of driver, property, or passengers, appliances, or equipment related to other than control. Common usage may, but need not, include a cab (or cowl).

Collector Rings. A means of transmitting electrical power to the turntable from the main power supply. Usually, they are concentric rings made of brass that are contacted by brushes to make the transfer to the specific electrical functions.

Cylinder Links. The mechanisms that can be used in connecting an articulating boom to the end of the upper elevating cylinders or to the lower and upper booms.

Defect. A discontinuity in a part or a failure to function that interferes with the service or reliability for which the part was intended.

Deflection. The deviation from a straight course or fixed direction.

Discontinuity. A change in the normal, physical structure of a material that can affect its serviceability.

Diverter Valve. A valve that, when actuated, diverts hydraulic fluid from one function to another or from one hydraulic system to another; in aerial devices, it is one valve that diverts oil from the stabilizers when the aerial device is in use and vice versa.

Drift. A time-dependent movement away from an established position.

Drip. A flow of liquid that lacks sufficient quantity or pressure to form a continuous stream.

Elevating Platform. A self-supporting, turntable-mounted device consisting of a personnel-carrying platform attached to the uppermost boom of a series of power-operated booms that articulate, telescope, or both.

Elevating Platform Apparatus. A fire apparatus that is equipped with permanently mounted, power-operated booms of articulating or telescoping construction, or a combination thereof, and with a passenger-carrying platform that is attached to the uppermost boom.

Elevation Cylinder. The hydraulic components consisting of a cylinder barrel, cylinder rod, and related hardware that are used to vary the angle of the ladder or booms.

Elevation Indicator. An instrument on an aerial device that shows the angle of elevation of the aerial ladder or boom.

Elevation Lock. A manual- or positive-locking device (i.e., holding valve) that can be actuated to maintain indefinitely a desired angle or elevation without dependence upon engine power.

Emergency Hand-Crank Control. An auxiliary or supplemental control with which the operator can manually operate select functions of the aerial device.

Extension Cylinders. The hydraulic components consisting of a cylinder barrel, cylinder rod, and related hardware that are used to vary the length of extension of a telescoping aerial device.

Extension Indicator. A device on an aerial ladder or extendible boom aerial device that indicates the number of feet that the device has been extended.

Extension Sheave. A pulley through which an extension cable operates.

Fastener. A mechanical device, such as a rivet, bolt, screw, or pin, that is used to fasten two or more components together securely.

Ferromagnetic Materials. Materials that can be magnetized and strongly attracted to a magnetic field such as iron, steel, cobalt, and nickel.

Fly Locks. See Ladder Locks.

Fly Section. Any section of an aerial telescoping device beyond the base section.

Fracture. A type of defect found in welds that has a large length-to-width ratio and travels through or adjacent to the metal grain boundaries. Usually, this type of defect is referred to as a crack.

Hinge Pins. Pins that are used at either the swivel or point of articulation of an aerial device.

Holding Valve. A one-way valve that maintains hydraulic pressure in a cylinder until it is activated to release.

Instability. A condition of a mobile unit in which the sum of the moments tending to overturn the unit exceeds the sum of the moments tending to resist overturning.

Interlock. A device or arrangement by means of which the functioning of one part is controlled by the functioning of another.

Ironing. A term used for the damage caused to the bottom of a base rail by misalignment or malfunction of the rollers, which causes wear or indentation of the base rail material.

Knuckle. A point of connection between the upper and lower booms of an articulating device—the point at which lower and upper booms are hinged together.

Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Ladder Cradle. A structural component that supports an aerial ladder when it is bedded.

Ladder Locks. The mechanical locks or pawls that prevent movement of the sections of an aerial device when the power is shut off or in the event of loss of pressure in hydraulic circuits.

Leak. A continuous stream of liquid escaping from a hose, pipe, coupling, connection, or other confining structure at any point where the escape should not occur.

Level. An indicating device that is affixed to a turntable or truck body and is used to verify the levelness of a turntable prior to operating an aerial device.

Level II (ASNT). A tested and experienced level of proficiency for a nondestructive testing technician.

Leveling Linkages. The components and controls for achieving a level position of the elevating platform basket.

Liquid Penetrant Inspection. A nondestructive inspection method used to locate and determine the severity of surface discontinuities in materials based on the ability of a liquid to penetrate into small openings, such as cracks.

Listed.* Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets identified standards or has been tested and found suitable for a specified purpose.

Live Load. Forces acting on the aerial device from personnel, portable equipment, water, and nozzle reaction.

Load Limit Indicator. A load indicator or an instruction plate visible at the operator's position that shows the recommended safe load at any condition of aerial device elevation and extension.

Magnetic Particle Inspection. A nondestructive inspection method used to locate discontinuities in ferromagnetic materials by magnetizing the material and then applying an iron powder to mark and interpret the patterns that form.

Mobile Unit. A combination of an aerial device, its vehicle, and related equipment.

Monitor Nozzle. A water stream nozzle that is mounted on an aerial device and permanently connected to the waterway.

NDT (Nondestructive Testing). One of several methods used to inspect a structural component without physically altering or damaging the materials.

Neutral Position. The position of operating controls when the controls are not engaged.

Operator. A person qualified to operate an aerial device.

Override. The takeover of all aerial device movement control functions by an operator at a second control station.

Payload. The weight specified by the manufacturer that can be supported safely and moved via the aerial device.

Platform. The structure that is attached to the tip of a boom or aerial ladder for carrying personnel and equipment. The platform is comprised of a support structure, floor, railings, and an operator control station for controlling the aerial device from the platform position.

Platform Load Capacity. The amount of weight that the platform can support safely. Load capacity is dependent upon added equipment weight on the platform, personnel, and the nozzle reaction force when the water system is discharging water.

Pneumatic Lines. The lines that supply air, which is normally for a breathing system or for pneumatic power tools, to an elevating platform or the tip of an aerial ladder.

Properly. As recommended by the manufacturer.

PTO. Power takeoff.

Qualified Person. A person who, by possession of a recognized degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, has demonstrated the ability to deal with problems relating to a particular subject matter, work, or project.

Radiography. A nondestructive inspection method that uses X-rays, nuclear radiation, or both to detect discontinuities in material and to present their images on a recording medium.

Rated Capacity. The total amount of weight of all personnel and equipment that can be safely supported at the outermost rung of an aerial ladder or on the platform of an elevating platform with the waterway uncharged.

Rated Vertical Height. The vertical distance measured by a plumb line from the rated working height to the ground. For an aerial ladder, it is measured from the top rung of the fly section; for an aerial with an elevating platform, it is measured from the top of the platform handrails to the ground; and for a water tower, it is measured from the discharge end of the water monitor nozzle. All measurements are taken at the maximum elevation allowed by the original equipment manufacturer (OEM) and published in the operator's manual.

Relief Valve. A pressure-controlling device that allows the bypass of hydraulic fluids to limit the pressures in a hydraulic system.

Rotation Gear. The main gear of an aerial device that is used for the rotation of the turntable.

Rotation Gear Reduction Box. The mechanism of an aerial device that transfers hydraulic or electric power to the rotation gear, creating the torque necessary to rotate the turntable.

Rotation Lock. A strong friction or other positive-locking device (e.g., holding valve) that retains the turntable in any desired position.

Rung Cap Casting. A casting that can be riveted to the outside of the base rail over the ends of each rung on an aerial ladder.

Safety Stop Mechanism. A device that is located on the aerial device and prevents raising the elevating platform booms or sections beyond safe, operating, horizontal or vertical angles.

Shall. Indicates a mandatory requirement.

Should. Indicates a recommendation or that which is advised but not required.

Slide Blocks. Blocks made of a variety of materials (i.e., brass, nylon) that act as spacing devices, wear strips, or wear pads.

Stability. The truck is considered to be in a state of stability when no sign of overturning is evident with the aerial ladder or elevating platform in operation. The lifting of a tire or stabilizer on the opposite side of the vehicle from the load does not necessarily indicate a condition of instability. Instability occurs when an aerial device can no longer support a given load and overturning is imminent.

Stabilizer. A device integral with or separately attached to the chassis of an aerial fire apparatus which is used to increase the moments tending to resist overturning the apparatus.

Stabilizer Pad. A plate inserted beneath a stabilizer shoe to give greater surface bearing area.

Stabilizer Shoe. A permanently mounted shoe on a stabilizer to provide a ground surface area.

Stressed-Skin-Type Boom Section. A boom framework that is fabricated by the welding of metal into full box sections with internal torsional members.

Telescopic. Extended or retracted by sliding of the overlapping sections.

Top Rail. The top chord (i.e., rail) of an aerial ladder to which reinforcements are attached.

Torque Box (also known as Torsion Box or Mainframe). A structural component placed between the turntable and the chassis of an aerial device to absorb the stresses of operation. It can be integrated into the chassis frame design.

Torque Value. A measure of tightness or the amount of stress that is put on a fastening device (i.e., bolt) to secure it properly.

Trussed-Lattice-Type Boom Section. An open truss boom framework with vertical and diagonal braces that are fastened to horizontal beams of the frame.

Turntable. A rotating structural component that allows rotation of an aerial device through a rotating bearing and that connects the aerial device to the chassis and stabilization system. It is normally designed to permit continuous 360-degree rotation and may or may not contain an operator's control station.

Turntable Alignment Indicator. An indicator that facilitates alignment of the aerial device with the boom support for bedding purposes.

Twist. The degree of rotational movement from a given position.

Ultrasonic Inspection. A nondestructive method of inspection in which high frequency vibrations are injected through the surface of the test material and bounced back to their source from the opposite surface; if a flaw exists, signals return in a different pattern, revealing the location and extent of the flaw.