NFPA 1912

Standard for Fire Apparatus Refurbishing

2001 Edition

NFPA, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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Standard for

Fire Apparatus Refurbishing

2001 Edition

This edition of NFPA 1912, *Standard for Fire Apparatus Refurbishing*, was prepared by the Technical Committee on Fire Department Apparatus and acted on by the National Fire Protection Association, Inc., at its November Meeting held November 12–15, 2000, in Orlando, FL. It was issued by the Standards Council on January 13, 2001, with an effective date of February 9, 2001.

This edition of NFPA 1912 was approved as an American National Standard on February 9, 2001.

Origin and Development of NFPA 1912

With a considerable number of fire apparatus refurbished each year, a need was identified for a document to help both fire service administrators and refurbishing contractors in all phases of the refurbishing process. This first edition of NFPA 1912, *Standard for Fire Apparatus Refurbishing*, specifies the minimum requirements for the refurbishing of automotive fire/rescue apparatus, whether the refurbishing work is done at the fire departments or municipal maintenance facilities, or at the facilities of private contractors or apparatus manufacturers.

This document defines the requirements for two levels of refurbishing. Level I results in the assembly of a new fire apparatus by the use of a new chassis frame, driving and crew compartments, front axle, steering and suspension components, and the use of either new components or components from an existing apparatus for the remainder of the apparatus. Level II results in the upgrade of major components or systems of a fire apparatus with components or systems that comply with or exceed the applicable standards in effect at the time the original apparatus was manufactured. In addition, this document contains extensive appendix material designed to assist a user with the preparation of specifications for the refurbishment of a fire apparatus.

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Committee Scope: This Committee shall have primary responsibility for documents on the design and performance of fire apparatus for use by the fire service.

Contents

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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 and Appendix C.

Chapter 1 Administration

1.1* Scope. This standard specifies the minimum requirements for the refurbishing of automotive fire apparatus utilized for fire fighting and rescue operations, whether the refurbishing work is done at the fire department or municipal maintenance facilities or at the facilities of private contractors or apparatus manufacturers.

This standard shall not apply to the repair of fire apparatus.

1.2 Purpose. This standard specifies the minimum requirements for the refurbishing of automotive fire/rescue apparatus, to ensure that any apparatus refurbished in accordance with this standard meets applicable motor vehicle regulations and applicable portions of the appropriate edition of the NFPA automotive fire apparatus standard.

1.3 Application. This standard is applicable to fire apparatus contracted for refurbishment on or after July 1, 2001; however, nothing shall prevent the use of the standard prior to July 1, 2001, if the purchaser and contractor agree. The standard is not intended to be applied retroactively.

1.4 Equivalency. Nothing in this standard is intended to 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. Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency. The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

1.5* Responsibility of Purchaser. It shall be the responsibility of the purchaser to specify the details of the fire apparatus refurbishing; its required performance, including where operations at elevations above 2000 ft (610 m) or on grades greater than 6 percent are required; the maximum number of fire fighters to ride within the apparatus; specific added continuous electrical loads that exceed the minimum of this standard; and any hose, ground ladders, or equipment to be carried by the apparatus that exceed the minimum requirements of this standard.

1.6 Responsibility of the Contractor.

1.6.1* The contractor shall provide a detailed description of the refurbished fire apparatus, a list of equipment to be furnished, and other construction and performance details to which the apparatus shall conform.

1.6.2* Responsibility for the fire apparatus and equipment shall remain with the contractor until such responsibilities are accepted by the purchaser.

1.7 Definitions.

1.7.1 Acceptance. An agreement between the purchasing authority and the contractor that the terms and conditions of the contract have been met.

1.7.2 Acceptance Tests. Tests performed on behalf of or by the purchaser at the time of delivery to determine compliance with the fire department's specifications.

1.7.3 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.

1.7.3.1 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.

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

1.7.3.3 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.

1.7.3.4 Water Tower. An aerial device consisting of permanently mounted power-operated articulating or telescoping booms and a waterway designed to supply a large-capacity, mobile, elevated water stream.

1.7.4 Angle of Approach. The smallest angle made between the road surface and a line drawn from the front point of ground contact of the front tire to any projection of the apparatus in front of the front axle.

1.7.5 Angle of Departure. The smallest angle made between the road surface and a line drawn from the rear point of ground contact of the rear tire to any projection of the apparatus behind the rear axle.

1.7.6* Approved. Acceptable to the authority having jurisdiction.

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

1.7.8 Center of Gravity. The point at which the entire weight of the fire apparatus is considered to be concentrated so that, if supported at this point, the apparatus would remain in equilibrium in any position.

1.7.9 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 might, but need not, include a cab (or cowl).

1.7.10 Component. A constituent part of a fire apparatus or system.

1.7.11 Continuous Egress. A continuous exit or rescue path down an aerial device from an elevated position to the ground.

1.7.12* Contractor. The person or company responsible for fulfilling an agreed upon contract.

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

1.7.14 Fire Apparatus. A vehicle of 10,000 lb (4540 kg) or greater gross vehicle weight rating (GVWR) used for fire suppression or support by a fire department, fire brigade, or other agency responsible for fire protection.

1.7.14.1 Aerial Fire Apparatus. A vehicle equipped with an aerial ladder, elevating platform, aerial ladder platform, or water tower that is designed and equipped to support fire fighting and rescue operations by positioning personnel, handling materials, providing continuous egress, or discharging water at positions elevated from the ground.

1.7.14.2 Initial Attack Apparatus. Fire apparatus with a permanently mounted fire pump, water tank, and hose body, the primary purpose of which is to initiate a fire suppression attack on structural, vehicular, or vegetation fires and to support associated fire department operations.

1.7.14.3 Mobile Foam Fire Apparatus. Fire apparatus with a permanently mounted fire pump, foam proportioning system, and foam concentrate tank(s) whose primary purpose is for use in the control and extinguishment of flammable and combustible liquid fires in storage tanks and other flammable liquid spills.

1.7.14.4 Mobile Water Supply Apparatus (Tanker, or Tender). A vehicle designed primarily for transporting (pickup, transporting, and delivering) water to fire emergency scenes to be applied by other vehicles or pumping equipment.

1.7.14.5 Pumper. Fire apparatus with a permanently mounted fire pump, water tank, and hose body, the primary purpose of which is to combat structural and associated fires.

1.7.14.6* Quint. Fire apparatus with a permanently mounted fire pump, a water tank, a hose storage area, an aerial ladder or elevating platform with a permanently mounted waterway, and a complement of ground ladders.

1.7.14.7* Special Services Fire Apparatus. A multipurpose vehicle that primarily provides support services at emergency scenes.

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

1.7.16 Gallon. United States gallon.

1.7.17 Gage. A round, analog pressure-indicating device that uses mechanical means to measure pressure.

1.7.18 GAWR (Gross Axle Weight Rating). See 1.7.48.1.

1.7.19 GCWR (Gross Combination Weight Rating). See 1.7.48.2.

1.7.20 Gpm. Gallons per minute.

1.7.21* Grade. A measurement of the angle used in road design and expressed as a percentage of elevation change over distance.

1.7.22 GVWR (Gross Vehicle Weight Rating). See 1.7.48.3.

1.7.23 Line Voltage Circuit, Equipment, or System. An ac or dc electrical circuit, equipment, or system where the voltage to ground or from line to line is 30 volts (V) rms (ac) or 42.4 V peak (dc) or greater, but does not exceed 250 V rms (ac) or peak (dc).

1.7.24 Low-Voltage Circuit, Equipment, or System. An electrical circuit, equipment, or system where the voltage does not exceed 30 volts (V) rms (ac) or 42.4 V peak (dc), usually 12 V dc in fire apparatus.

1.7.25 Manufacturer. The person or persons, company, firm, corporation, partnership, or other organization responsible for turning raw materials or components into a finished product.

1.7.26* Net Pump Pressure. The sum of the discharge pressure and the suction lift converted to psi or kPa when pumping at draft, or the difference between the discharge pressure and the intake pressure when pumping from a hydrant or other source of water under positive pressure.

1.7.27 Operator. A person qualified to operate a fire apparatus.

1.7.28 Psi. Pounds per square inch.

1.7.29 PTO. Power takeoff.

1.7.30 Pump.

1.7.30.1 Auxiliary Pump. A water pump mounted on the fire apparatus in addition to a fire pump and used for fire fighting either in conjunction with or independent of the fire pump.

1.7.30.2 Fire Pump. A water pump mounted on an apparatus with a rated capacity of 250 gpm (950 L/min) or greater at 150 psi (1035 kPa) net pump pressure, and used for fire fighting.

1.7.30.3 Transfer Pump. A separate engine or PTO-driven water pump mounted on the apparatus with a minimum rated capacity of 250 gpm (945 L/min) at 50 psi (345 kPa) net pump pressure and used primarily for water transfer.

1.7.31 Pump Operator's Panel. The area on a fire apparatus that contains the gages, controls, and other instruments used for operating the pump.

1.7.32 Pump Operator's Position. The location from which the pump operator operates the pump.

1.7.33* Purchaser. The authority having responsibility for the specification and acceptance of the apparatus.

1.7.34 Purchasing Authority. The agency that has the sole responsibility and authority for negotiating, placing, and, where necessary, modifying each and every solicitation, purchase order, or other award issued by a governing body.

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

1.7.36 Rated Water Pump Capacity. The flow rate at which the pump manufacturer certifies compliance of the pump with the requirements set forth in this standard.

1.7.37 Refurbishing.

1.7.37.1* Level I Refurbishing. The assembly of a new fire apparatus by the use of a new chassis frame, driving and crew compartment, front axle, steering and suspension components, and the use of either new components or components from an existing apparatus for the remainder of the apparatus.

1.7.37.2* Level II Refurbishing. The upgrade of major components or systems of a fire apparatus with components or systems that comply with the applicable standards in effect at the time the original apparatus was manufactured.

1.7.38 Repair. To restore to sound condition after failure or damage.

1.7.39 Replacement. The removal of an existing component or system and the installation of a similar component or system generally of the same model or the same capability (i.e., "like for like" replacement).

1.7.40 Shall. Indicates a mandatory requirement.

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

1.7.42 Suspension System. The components utilized to attach the axle(s) to the frame assembly.

1.7.43 Tanker. See 1.7.14.4, Mobile Water Supply Apparatus.

1.7.44 Tender. See 1.7.14.4, Mobile Water Supply Apparatus.

1.7.45 Turntable. A structural component that allows 360-degree continuous rotation of an aerial device through a rotating bearing and that connects the aerial device to the chassis and stabilization system and could contain an operator's control station.

1.7.46 Unequipped Apparatus. The completed vehicle excluding personnel, agent(s), and any equipment removable without the use of tools.

1.7.47* Upgrade. The replacement or addition of components or systems with new components or systems with improved performance or capability.

1.7.48 Weight Rating.

1.7.48.1* GAWR (Gross Axle Weight Rating). The chassis manufacturer's specified maximum load-carrying capacity of an axle system.

1.7.48.2* GCWR (Gross Combination Weight Rating). The chassis manufacturer's specified maximum load carrying capacity for tractor trailer–type vehicles having three or more axle systems (a multiaxle axle installation is one system).

1.7.48.3* GVWR (Gross Vehicle Weight Rating). The chassis manufacturer's specified maximum load-carrying capacity of a vehicle having two axle systems (a multiaxle axle installation is one system).

1.8* Conversion Factors. In this standard, values for measurement are followed by an equivalent in SI units, but only the value that first appears shall be considered as the requirement since the value in SI units could be approximate. Table 1.8 provides the conversion factors that shall be used where SI units are not provided in the text or where more precision is desired.

Table 1.8 Conversion Factors

U.S. Customary Units		SI Units
1 gallon per minute (gpm)	=	3.785 liters per minute (L/min)
1 pound per square inch (psi)	=	6.895 kilopascals (kPa)
1 pound per square inch (psi)	=	0.0690 bar
1 inch of mercury (in. Hg)	=	3.386 kilopascals (kPa)
1 inch (in.)	=	25.40 millimeters (mm)
1 foot (ft)	=	0.305 meter (m)
1 cubic foot (ft^3)	=	0.0283 cubic meter (m^3)
1 square inch ($in.^2$)	=	645.2 square millimeters (mm^2)
1 mile per hour (mph)	=	1.609 kilometers per hour (kph)
1 pound (lb)	=	0.454 kilogram (kg)
1 horsepower (hp)	=	0.746 kilowatt (kW)

Chapter 2 General Requirements

2.1* General. Fire apparatus receiving Level I refurbishing shall meet the requirements of applicable chapters of the current edition of NFPA 1901, *Standard for Automotive Fire Apparatus,* except as noted in Chapter 3. Fire apparatus receiving Level II refurbishing shall meet the requirements of applicable chapters of the edition of the NFPA automotive fire apparatus standard that was in effect at the time of its original manufacture, except as noted in Chapter 4.

2.2 Fire Apparatus Components. All components shall be installed in accordance with that component manufacturer's installation instructions.

2.2.1 Fire Pump. If the fire apparatus is equipped with a new fire pump, the pump and its associated equipment shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, for fire pumps.

2.2.2 Auxiliary Pump. If the fire apparatus is equipped with an new auxiliary pump, the pump and its associated equipment shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, for auxiliary pumps.

2.2.3 Water Transfer Pump. If the fire apparatus is equipped with a new water transfer pump, the pump and its associated equipment shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, for transfer pumps.

2.2.4 Water Tank. If the fire apparatus is equipped with a new water tank, the water tank shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, for water tanks.

2.2.5 Aerial Device. If the fire apparatus is equipped with a new aerial device (i.e., aerial ladder, elevating platform, or water tower), the aerial device shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, for aerial devices.

2.2.6 Foam Proportioning System. If the fire apparatus is equipped with a new foam proportioning system, the apparatus shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, for foam proportioning systems.

2.2.7 Compressed Air Foam System. If the fire apparatus is equipped with a new compressed air foam system, the system shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, for compressed air foam systems.

2.2.8 Line Voltage Electrical System. If the fire apparatus is equipped with a new line voltage electrical system (120/240 volts), the system shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, for line voltage electrical systems.

2.2.9 Command and Communications. If the fire apparatus is equipped with a new command and communications area, the area shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, for command and communications.

2.2.10 Air System. If the fire apparatus is equipped with a new air system, the system shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, for air systems.

2.2.11 Winch System. If the fire apparatus is equipped with a new winch system, the system shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, for winches.

2.3 Governmental Requirements. The fire apparatus shall comply with all applicable federal and state motor vehicle laws and regulations.

2.4 Personnel Protection.

2.4.1* Guards, shields, or other protection shall be added to refurbished fire apparatus where necessary to prevent injury to personnel by hot, moving, or rotating parts during normal nonmaintenance operations. Electrical insulation or isolation shall be provided where necessary to prevent electrical shock from onboard electrical systems.

2.4.2 Vehicular workmanship shall ensure a safe operating environment free of accessible sharp projections and edges.

2.4.3 Safety-related (e.g., caution, warning, danger) tags and labels shall meet the requirements of ANSI Z535.4, *Product Safety Signs and Labels.*

2.5* Carrying Capacity.

2.5.1 The GAWR and GCWR or GVWR of the chassis shall be adequate to carry the fully equipped fire apparatus including full water and other tanks (if so equipped), the specified hose load (if so equipped), unequipped personnel weight, ground ladders (if so equipped), and a miscellaneous equipment allowance as outlined in Table 2.5.1.

2.5.2* The unequipped personnel weight shall be calculated at 200 lb (91 kg) per person times the maximum number of persons to ride the fire apparatus as specified in Section 1.5.

Chapter 3 Level I Refurbishing

3.1* General. All new or upgraded components utilized in Level I refurbishing shall meet the requirements of the current edition of NFPA 1901, *Standard for Automotive Fire Apparatus,* for those components unless otherwise specified in this chapter.

3.2* Carrying Capacity. If fire apparatus components or systems are to be upgraded, the contractor shall ensure that the completed apparatus does not exceed the GAWR and GCWR or GVWR of the chassis when carrying the weight of the unequipped apparatus, the fully loaded water and other tanks, the specified hose load, unequipped personnel weight, ground ladders, and the miscellaneous equipment allowance as defined in Table 2.5.1.

3.3 Vehicle Stability.

3.3.1 The height of the fully loaded vehicle's center of gravity shall not exceed the chassis manufacturer's maximum limit.

3.3.2 The front-to-rear weight distribution of the fully loaded vehicle shall be within the limits set by the chassis manufacturer. Front axle loads shall not be less than the minimum axle loads specified by the chassis manufacturer, under full load and all other loading conditions.

Table 2.5.1 Miscellaneous Equipment Allowance

Apparatus Type	Chassis GVWR		Equipment Allowance	
	lb	kg	lb	kg
Pumper fire apparatus	All		2,000	908
Initial attack fire apparatus	10,000 to 15,000	4,540 to 6,810	900	410
	15,001 to 20,000	6,810 to 9,080	1,500	680
	20,001 and up	9,080 and up	2,000	908
Mobile water supply fire apparatus	All		1,000	454
Aerial fire apparatus	All		2,500	1,134
Quint fire apparatus	All		2,500	1,134
Special service fire apparatus	10,000 to 15,000	4,540 to 6,810	2,000	908
	15,001 to 20,000	6,810 to 9,080	2,500	1,134
	20,001 and up	9,080 and up	3,000	1,360
Mobile foam fire apparatus	All		2,000	908

3.3.3 The difference in weight on the end of each axle, from side to side, when the vehicle is fully loaded and equipped shall not exceed 7 percent.

3.4 Frame. The fire apparatus frame shall be replaced with a new chassis frame meeting NFPA 1901, *Standard for Automotive Fire Apparatus*, requirements.

3.5 Drivetrain.

3.5.1 If the original drivetrain or associated components are used, the contractor shall perform a thorough inspection of the drivetrain components not scheduled for replacement (such as drive shaft, end yokes or flanges, universal joints and associated mountings) for wear, balance, stress cracks, or other damage. The contractor shall notify the purchaser in writing of any damage discovered during the inspection.

3.5.2 If a new drivetrain or associated components are installed, the contractor shall certify that the installation meets the component manufacturer's recommendations.

3.6 Engine and Engine System Design.

3.6.1 If the original engine and accessories are used, the contractor shall perform a thorough inspection of the engine and related accessories including, but not limited to, mountings, fan belts, and filters. The inspection shall check for wear, fluid leaks, loss of power, and other potential problems. The contractor shall notify the purchaser in writing of all necessary repairs and services needed to bring the engine and related accessories within the engine manufacturer's original specifications. All belts and filters shall be replaced.

3.6.2* If the existing engine and/or engine system is to be replaced, it shall be replaced with one that meets the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*. The contractor shall furnish certification that the engine meets Environmental Protection Agency (EPA) standards in effect at the time of contract signing as well as certification that the installation meets the engine manufacturer's specifications.

3.7 Cooling System.

3.7.1 If the original cooling system is to be reused, the contractor shall perform a thorough inspection of the cooling system for leaks, blockages, wear, or other problems that could affect vehicle engine cooling. The contractor shall notify the purchaser in writing of any problems discovered during the inspection. The cooling system shall be flushed, and new coolant meeting the engine manufacturer's specifications shall be added.

3.7.2 If the cooling system is to be replaced, it shall be replaced with one that meets the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, as well as the engine manufacturer's specifications.

3.8 Lubrication System.

3.8.1 If the original lubrication system is to be revised, the contractor shall perform a thorough inspection of the lubrication system for leaks, blockages, or other problems that could affect vehicle lubrication. The contractor shall notify the purchaser in writing of any problems discovered during the inspection.

3.8.2 If the lubrication system is to be replaced, it shall be replaced with one that meets the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, and the engine manufacturer's standards.

3.9 Fuel and Air Systems. The fire apparatus fuel and air intake systems shall be replaced with new fuel and air intake systems that meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, and the engine manufacturer's standards.

3.10 Exhaust System. The original fire apparatus exhaust system shall be replaced with a new exhaust system that meets the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, and the engine manufacturer's standards.

3.11 Vehicle Components.

3.11.1 Braking System.

3.11.1.1 The contractor shall certify that the braking system meets the performance requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*.

3.11.1.2 When a new braking system or brake components are installed, the contractor shall certify that the installation meets the component manufacturer's requirements.

3.11.1.3 Parking brakes shall control the rear wheels, or all wheels, and shall be of the positive, mechanically actuated type. The parking brake system shall hold the fully loaded fire apparatus on at least a 20 percent grade. A lockup device to retain applied pressure on hydraulically actuated service brake systems, or the use of the "park" position on an automatic transmission shall not be substituted for a separate parking brake system. Parking brakes on steerable axles of tiller vehicles shall be provided where necessary to meet the requirements of this standard. Air-applied brakes or mechanically actuated brakes shall be acceptable on these axles.

3.11.1.4 All fire apparatus with a GVWR of 36,000 lb (16,330 kg) or greater shall be equipped with an auxiliary braking system.

3.11.2 Suspension, Wheels, and Tires.

3.11.2.1 The suspension system shall be replaced with a new suspension system that meets the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*.

3.11.2.2* If the existing axle(s), wheels, or tires are utilized, the contractor shall inspect the axles, wheels, and tires for wear, stress cracks, proper bolt torque, or other problems. Damaged components shall be repaired or replaced.

3.11.2.3 The contractor shall certify that the axles, wheels, and tires of the completed fire apparatus meet all current federal and state GVWR, GCWR, and GAWR requirements.

3.11.2.4 An angle of approach and an angle of departure of at least 8 degrees shall be maintained at the front and rear of the vehicle when it is normally loaded as indicated in Section 2.5.

3.11.3 Steering. The fire apparatus steering system shall be replaced with a new steering system meeting the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*.

3.11.4 Transmission/Transfer Case.

3.11.4.1 If either the original transmission or the transfer case is reused, the contractor shall inspect the transmission or transfer case, its mountings, and any associated accessories for wear, damage, and fluid leaks. The contractor shall notify the purchaser in writing of any problems discovered during the inspection. All fluids and filters shall be changed.

3.11.4.2 In the event a new or refurbished transmission or transfer case is installed in the fire apparatus, the contractor shall certify that the installation meets the transmission or transfer case manufacturer's specifications for installation on that specific type of apparatus.

3.11.5 Fuel Tank. The fire apparatus fuel tank shall be replaced with a new tank that meets the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus.*

3.11.6 Tow Hooks. Front or rear tow hooks or tow eyes shall be attached to the frame structure to allow towing (not lifting) of the fire apparatus without damage.

3.12 Low-Voltage Electrical Systems and Warning Devices. The fire apparatus electrical wiring system and warning devices shall be replaced with a complete new system that meets the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus.*

3.13* Driving and Crew Compartments. The fire apparatus driving and crew compartments shall be replaced with new driving and crew compartments that meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus,* and the chassis manufacturer's standards.

3.14 Body, Compartmentation, and Hose Storage.

3.14.1 If the original fire apparatus body is to be reused, it shall be inspected for serviceability and upgraded to meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus.*

3.14.2 If the fire apparatus body, compartmentation, and hose storage areas are to be replaced, they shall be replaced with components that meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus.*

3.14.3 If new compartments are to be added to an existing fire apparatus body, they shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus.*

3.14.4* Metal Finish. The fire apparatus shall comply with the requirements for metal finish in NFPA 1901, *Standard for Automotive Fire Apparatus,* including the application of reflective striping.

3.15 Fire Pump and Associated Equipment. If the original fire pump is reused, the contractor shall inspect the fire pump, its mountings, and its associated accessories for wear, damage, and leaks. The contractor shall notify the purchaser in writing of any problems discovered during the inspection. All new or upgraded parts or components shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus.* The pump packing shall be adjusted according to the pump manufacturer's recommendations.

3.16 Water Tanks.

3.16.1 If the existing water tank is to be reused, the contractor shall inspect the water tank for serviceability and report any defects to the purchaser in writing.

3.16.2* If a new water tank is installed, it shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus.* Installation of a new water tank shall not result in the completed fire apparatus exceeding the GAWR and GCWR or GVWR of the chassis under the conditions specified in Section 3.2.

3.17 Aerial Devices.

3.17.1 If the original aerial device is to be used, a full inspection and test as defined in NFPA 1914, *Standard for Testing Fire Department Aerial Devices,* shall be performed. A test shall be performed prior to refurbishing to determine the condition of the aerial device.

3.17.2 If the original aerial device is reused, it shall meet the requirements of the NFPA automotive fire apparatus standard in effect at the time of the contract signing for the original manufacture of the apparatus.

3.18 Equipment Carried on Fire Apparatus.

3.18.1 If new ground ladders are furnished, they shall meet the requirements of NFPA 1931, *Standard on Design of and Design Verification Tests for Fire Department Ground Ladders.*

3.18.2 If new hose is furnished, it shall meet the requirements of NFPA 1961, *Standard on Fire Hose.*

3.18.3 If new nozzles are furnished, they shall meet the requirements of NFPA 1964, *Standard for Spray Nozzles (Shutoff and Tip).*

3.19 Tests and Delivery Data Requirements.

3.19.1 Fire Apparatus Certification Tests.

3.19.1.1 If the refurbished fire apparatus is equipped with a fire pump that has a rated capacity of 750 gpm (2850 L/min) or greater, the pump system shall be tested after the pump and all its associated piping and equipment have been installed on the apparatus. The tests shall be conducted at the contractor's approved facility and certified by an independent testing organization approved by the purchaser. The certification shall include at least the tests defined in 3.19.2 through 3.19.6. If the apparatus is equipped with a water tank, the water tank to pump flow test defined in 3.19.7 shall be included.

3.19.1.2 If the refurbished fire apparatus is equipped with a fire pump that has a rated capacity of less than 750 gpm (2850 L/min), the pump shall be tested after the pump and all its associated piping and equipment have been installed on the apparatus. The tests shall be conducted at the manufacturer's approved facility and certified by the contractor. The certification shall include at least the tests defined in 3.19.2 and 3.19.4 through 3.19.6. If the apparatus is equipped with a water tank, the water tank to pump flow test defined in 3.19.7 shall be included.

3.19.2 Pumping Tests. A pumping certification test shall be conducted in accordance with the test requirements defined in NFPA 1901, *Standard for Automotive Fire Apparatus.*

3.19.3 Pumping Engine Overload Test. If a new fire pump is installed, a pumping engine overload test shall be conducted in accordance with the test requirements defined in NFPA 1901, *Standard for Automotive Fire Apparatus.* If the original fire pump is retained or reused, a pumping engine overload test shall be conducted in accordance with the test requirements of the edition of the NFPA automotive fire apparatus standard in effect at the time of the contract signing for the original manufacture of the apparatus.

3.19.4 Pressure Control System Test. If the refurbished fire apparatus is equipped with a new pressure control system on the fire pump, it shall be tested in accordance with the test requirements defined in NFPA 1901, *Standard for Automotive*

Fire Apparatus. If the original pressure control system is retained or reused, it shall be tested in accordance with the pressure control device testing requirements of NFPA 1911, *Standard for Service Tests of Fire Pump Systems on Fire Apparatus*.

3.19.5 Priming Device Test. If the refurbished fire apparatus is equipped with a new priming device on the fire pump, it shall be tested in accordance with the test requirements defined in NFPA 1901, *Standard for Automotive Fire Apparatus*. If the original priming device is retained or reused, it shall be tested in accordance with the priming device test requirements of NFPA 1911, *Standard for Service Tests of Fire Pump Systems on Fire Apparatus*.

3.19.6 Vacuum Test. If the refurbished fire apparatus is equipped with a new fire pump, a vacuum test shall be conducted in accordance with the test requirements defined in NFPA 1901, *Standard for Automotive Fire Apparatus*. If the original fire pump is retained or reused, a vacuum test shall be conducted in accordance with the test requirements of NFPA 1911, *Standard for Service Tests of Fire Pump Systems on Fire Apparatus*.

3.19.7 Water Tank to Pump Flow Test. If the refurbished fire apparatus has a new water tank(s), fire pump(s), or pump piping, a water tank to pump flow test shall be conducted in accordance with the test requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*. If the original water tank(s), pump(s), or pump piping is retained or reused, a water tank to pump flow test shall be conducted to ensure the installation meets the requirements of the edition of the NFPA automotive fire apparatus standard in effect at the time of the contract signing for the original manufacture of the apparatus.

3.19.8 Aerial Device Certification Tests. If a new or reutilized aerial device is installed on the refurbished fire apparatus, the completed apparatus shall be tested at the manufacturer's approved facility and certified by an independent testing organization approved by the purchaser. New aerial devices shall be tested to the current edition of NFPA 1901, *Standard for Automotive Fire Apparatus*. Reutilized aerial devices shall be tested to the edition of the NFPA automotive fire apparatus standard in effect at the time of the original aerial device manufacture.

3.19.9 Refurbisher's Pre-Delivery Tests.

3.19.9.1 Water Tank Capacity Test. If the refurbished fire apparatus has a new water tank, the water tank manufacturer shall certify the capacity of the water tank. This certification shall be provided to the purchaser when the apparatus is delivered. If the refurbished fire apparatus retains or reuses the original water tank, the tank shall be tested to ensure it meets the requirements of the edition of the NFPA automotive fire apparatus standard in effect at the time of the contract signing for the original manufacture of the apparatus.

3.19.9.2 Piping Hydrostatic Test. If the refurbished fire apparatus has a new fire pump or pump piping system, a piping hydrostatic test shall be conducted in accordance with the test requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*. If the refurbished fire apparatus retains or reuses the original pump(s) and pump piping, a piping hydrostatic test shall be conducted to ensure the integrity of the piping installation meets the requirements of the edition of the NFPA automotive fire apparatus standard in effect at the time of the contract signing for the original manufacture of the apparatus.

3.19.9.3 Electrical System Tests. Electrical system tests shall be conducted in accordance with the test requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, on all refurbished fire apparatus.

3.19.9.4* Foam System Tests. If the refurbished fire apparatus has a newly installed foam system or system components, the system shall be tested in accordance with the test requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*. If the refurbished fire apparatus reuses the original foam systems and system components, the system shall be tested to ensure it meets the requirements of the edition of the NFPA automotive fire apparatus standard in effect at the time of the contract signing for the original manufacture of the apparatus.

3.19.10* Road Tests.

3.19.10.1 If the refurbished fire apparatus has upgraded powertrain components (engine, transmission, driveline, and axles), it shall be road tested in accordance with 3.19.10.2 through 3.19.10.5. If the refurbished fire apparatus reuses the original powertrain components (engine, transmission, driveline, and axles), it shall be tested to ensure it meets the requirements of the edition of the NFPA automotive fire apparatus standard in effect at the time of the contract signing for the original manufacture of the apparatus. The tests shall be conducted at a location and in a manner that does not violate local, state, or federal traffic laws.

3.19.10.2 The fire apparatus shall be fully equipped and loaded as required in Section 2.5. The tests shall be conducted on dry, level, paved roads that are in good condition. The engine shall not be operated in excess of the maximum governed speed.

3.19.10.3 Acceleration tests shall consist of two runs in opposite directions over the same route.

3.19.10.3.1 The vehicle shall attain a true speed of 35 mph (56 kph) from a standing start within 25 seconds.

3.19.10.3.2 The vehicle shall attain a minimum top speed of not less than 50 mph (80 kph).

3.19.10.4 If the fire apparatus is equipped with an auxiliary braking system, the manufacturer shall road test the system to confirm that the system is functioning as intended by the auxiliary braking system manufacturer.

3.19.10.5 The service brakes shall bring the fully laden fire apparatus to a complete stop from an initial speed of 20 mph (32 kph), in a distance not exceeding 35 ft (10.7 m) by actual measurement, on a dry, level, paved surface that is free of loose material, oil, or grease.

3.19.11 Tests on Delivery. If acceptance tests are desired at the point of delivery, they shall be run in accordance with the provisions of Section 3.19 and shall duplicate the portions of the tests that the purchaser specifies. Aerial device stability tests shall not be run at other than the refurbisher's or the aerial device manufacturer's facility.

3.20 Data Required of the Contractor.

3.20.1 The contractor shall supply, at the time of delivery, at least two copies of a complete operation, service, and parts manuals covering the completed fire apparatus as delivered and accepted. This requirement may be adjusted to cover only partial manuals for those new components or systems that are changed from the original configuration. The requirement

for either complete or partial manuals shall be supplied by the purchasing authority.

3.20.2 The contractor shall supply, at the time of delivery, at least one copy of the following:

(1) Engine manufacturer's certified brake horsepower curve for a new engine installation showing the maximum governed speed
(2) Contractor's record of fire apparatus refurbishment, including, if applicable, all technical information required for inspection to comply with NFPA 1914, *Standard for Testing Fire Department Aerial Devices*
(3) Pump manufacturer's certification of suction capabilities for new pump installations
(4) Pump manufacturer's certification of hydrostatic test for new pump installations
(5) Certification of inspection and test
(6) If the apparatus is equipped with a pump, a copy of the chassis manufacturer's approval for stationary pumping applications
(7) Weight documents from a certified scale showing actual loading on the front axle, rear axle(s), and overall vehicle (with the water tank full but without personnel, equipment, and hose) to determine compliance with Section 2.5

3.20.3 A label shall be affixed to the vehicle certifying that the vehicle is in compliance with all applicable Federal Motor Vehicle Safety Standards (FMVSS) in effect at the time of completion.

3.20.4 If the original fire pump is replaced with a new fire pump, a new test plate shall be provided on the pump operator's panel that gives the rated discharges and pressures, together with the speed of the engine as determined by the certification test for each unit; the position of the parallel–series pump as used; and the governed speed of the engines as stated by the engine manufacturer on a certified brake horsepower curve. The plate shall be completely stamped with all information at the contractor's facility and attached to the vehicle prior to delivery.

Chapter 4 Level II Refurbishing

4.1* General. Level II refurbishing shall constitute the upgrade of major system(s) or component(s) to the current applicable standards (unless otherwise noted herein). Any upgraded system shall be compatible with its associated components. Systems or components that are not compatible shall not be installed on the refurbished fire apparatus.

4.2* Carrying Capacity. If a fire apparatus system or component is to be upgraded, the contractor shall ensure that the completed apparatus does not exceed the GAWR and GCWR or GVWR of the chassis when carrying the weight of the unequipped apparatus, the fully loaded water and other tanks, the specified hose load, unequipped personnel weight, ground ladders, and the miscellaneous equipment allowance as defined in Table 2.5.1.

4.3* Vehicle Stability.

4.3.1 The height of the fully loaded vehicle's center of gravity shall not exceed the chassis manufacturer's maximum limit.

4.3.2 The front-to-rear weight distribution of the fully loaded vehicle shall be within the limits set by the chassis manufacturer. Front axle loads shall not be less than the minimum axle loads specified by the chassis manufacturer, under full load and all other loading conditions.

4.3.3 The difference in weight on the end of each axle, from side to side, when the vehicle is fully loaded and equipped shall not exceed 7 percent.

4.4 Frame. If the vehicle's frame is to be upgraded, all parts of the frame not scheduled to be replaced shall be inspected for wear, broken or loose bolts or other fittings, bent or damaged members, or other problems. The contractor shall notify the purchaser in writing of any problems or abnormal conditions discovered during the inspection.

4.5 Drivetrain.

4.5.1 If the vehicle drivetrain is to be upgraded, the contractor shall inspect all components of the drivetrain not scheduled to be replaced for wear, balance, stress cracks, or other damage. The inspection shall include the drive shaft, end yokes or flanges, universal joints, and associated mountings. The contractor shall notify the purchaser in writing of any damaged components or other problems discovered during the inspection.

4.5.2 If a new drivetrain or associated components are installed or existing components are modified, the contractor shall ensure that the installation meets the component manufacturer's recommendations.

4.6 Engine and Engine System Design.

4.6.1* If the engine or an engine system component(s) is upgraded, the contractor shall inspect the engine and all related accessories not scheduled to be replaced for wear, fluid leaks, loss of power, excessive smoke, or other potential problems. The contractor shall notify the purchaser in writing of all necessary repairs and services needed to bring the engine and related accessories within applicable manufacturers' specifications. All belts and filters shall be replaced.

4.6.2* If the existing engine or engine system is to be replaced, it shall be replaced with one that meets or exceeds the requirements of the edition of NFPA automotive fire apparatus standard in effect at the time the apparatus was manufactured. The contractor shall furnish certification that the engine meets or exceeds the EPA standards in effect at the time of original apparatus construction as well as certification that the installation meets the engine manufacturer's requirements.

4.7 Cooling System.

4.7.1 If the cooling system or any related component(s) are to be upgraded, the contractor shall inspect all portions of the cooling system not scheduled to be replaced for leaks, blockages, wear, and other conditions that could affect the cooling of the vehicle's engine. The contractor shall notify the purchaser in writing of any problems or abnormal conditions discovered during the inspection. The cooling system shall be flushed, and new coolant that meets the engine manufacturer's requirements shall be added.

4.7.2 If the cooling system or cooling system components are upgraded, the contractor shall certify that the upgraded cooling system meets the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus,* and the engine manufacturer.

4.7.3 The upgraded engine cooling system shall maintain a temperature in the engine at or below the engine manufacturer's maximum temperature rating under all conditions of operation for which the fire apparatus is designed.

4.8 Lubrication System. If the lubrication system or any related component(s) is to be upgraded, the contractor shall inspect all portions of the lubrication system not scheduled to be replaced for leaks, wear, and other problems that could affect the performance of the system. The contractor shall notify the purchaser in writing of any problems or abnormal conditions discovered during the inspection. The upgraded lubrication system shall meet the engine manufacturer's requirements.

4.9 Fuel and Air Systems. If the fuel system or air intake system is to be upgraded, the contractor shall inspect all portions of the system not scheduled to be replaced for leaks, wear, and other problems that could affect the performance of the system. The contractor shall notify the purchaser in writing of any problems or abnormal conditions discovered during the inspection. The contractor shall certify that the upgraded fuel system or air intake system meets the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, and the engine manufacturer.

4.10 Exhaust System. If the exhaust system components are to be upgraded, the contractor shall inspect all portions of the system not scheduled to be replaced for leaks, loose hangers, rusted tubing, wear, and other problems that could affect the performance of the exhaust system. The contractor shall notify the purchaser in writing of any problems or abnormal conditions discovered during the inspection. The contractor shall certify that the upgraded exhaust system meets the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus,* and the engine manufacturer.

4.11 Vehicle Components.

4.11.1 Braking System.

4.11.1.1* If the braking system is to be upgraded, the contractor shall inspect all portions of the braking system and associated accessories not scheduled to be replaced for wear, leakage, loss of performance, and other problems that could affect the performance of the braking system. The contractor shall notify the purchaser in writing of any problems or abnormal conditions found during the inspection.

4.11.1.2* If a new braking system or new brake components are installed, the installation shall meet the manufacturers' recommendations.

4.11.1.3 The contractor shall certify that the braking system meets or exceeds the performance requirements of the edition of the NFPA automotive fire apparatus standard in effect at the time of contract signing for the original manufacture of the apparatus.

4.11.2 Suspension, Wheels, and Tires.

4.11.2.1* If the suspension, wheels, or tires are to be upgraded, the contractor shall inspect the axles, wheels, tires, springs, hangers, mountings, and suspension system accessories not scheduled to be replaced for wear, stress cracks, sagging, improper bolt torque, and other problems. The contractor shall notify the purchaser in writing of any damaged components or other problems that are discovered during the inspection.

4.11.2.2 The manufacturer shall certify that the upgraded suspension, wheels, and tires of the fire apparatus meet all applicable component manufacturers' standards as well as all GVWR, GCWR, and GAWR ratings. The completed apparatus shall meet all applicable federal and state weight ratings.

4.11.2.3 An angle of approach and an angle of departure of at least 8 degrees shall be maintained at the front and rear of the vehicle when it is normally loaded as indicated in Section 2.5.

4.11.3 Steering.

4.11.3.1 If the steering system is to be upgraded, the contractor shall inspect the entire system, including the steering box, steering gear, drag links, power steering pump, hose, and accessories not scheduled to be replaced for wear, leakage, loss of performance, and other problems. The contractor shall notify the purchaser in writing of any damaged components or other problems that are discovered during the inspection.

4.11.3.2 The contractor shall certify that the upgraded steering system meets the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, and the component manufacturer.

4.11.3.3 The upgraded steering system shall be capable of turning the front wheels to an angle of at least 30 degrees to either the right or left for nondriving front axles, and at least 28 degrees for driving front axles. Power steering or power-assisted steering shall be provided.

4.11.4 Transmission/Transfer Case.

4.11.4.1 If either the transmission or the transfer case is to be upgraded, the contractor shall inspect all components of the transmission or transfer case, their mountings, and the associated accessories not scheduled to be replaced for wear, damage, and fluid leaks. All fluid levels and filters shall be checked. The contractor shall notify the purchaser in writing of any damaged components or other problems that are discovered during the inspection.

4.11.4.2 If an upgraded transmission is installed in the fire apparatus, the contractor shall certify that the installation meets the transmission manufacturer's specifications for installation in that specific type of apparatus, as well as the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus.*

4.11.5 Fuel Tank.

4.11.5.1 If the fuel tank is to be upgraded, the contractor shall inspect all components of the fuel tank, its mountings, and associated accessories not scheduled to be replaced for wear, damage, and fluid leaks. The contractor shall notify the purchaser in writing of any damaged components or other problems that are discovered during the inspection.

4.11.5.2 Fuel tanks that are replaced shall be replaced with new tanks that meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus.*

4.11.6* Tow Hooks. If upgraded front or rear tow hooks or tow eyes are installed, they shall be attached to the frame structure to allow towing (not lifting) of the fire apparatus without damage.

4.12 Low-Voltage Electrical Systems and Warning Devices.

4.12.1* General. Any upgraded 12-V or 24-V electrical systems or warning devices installed on the fire apparatus shall be appropriate for the service intended and shall meet the specific requirements of Chapter 4.

4.12.2* If the low-voltage electrical system is upgraded, the contractor shall inspect the components of the electrical system not scheduled to be replaced for problems that could affect vehicle electrical performance. The inspection shall include the condition of wires, connectors, relays, fuses, and/or circuit breakers and related components. The contractor shall notify the purchaser in writing of any damaged components or problems that are discovered during the inspection.

4.12.3 Power Supply. If the alternator is to be upgraded, it shall be replaced by a 12-V or 24-V alternator. It shall have a minimum output at idle to meet the minimum continuous electrical load of the fire apparatus as defined in 4.12.3.1 at 200°F (93°C) ambient temperature within the engine compartment, and it shall be provided with full automatic regulation.

4.12.3.1 The minimum continuous electrical load shall consist of the total amperage required to simultaneously operate the following in a stationary mode at the scene:

(1) The propulsion engine and transmission.
(2) All clearance and marker lights and other electrical devices mandated by the Federal Motor Vehicle Safety Standard (FMVSS) No. 108, *Lamps, reflective devices, and associated equipment*, and other laws or regulations.
(3) The radio(s) at a duty cycle of 10 percent transmit and 90 percent receive. For calculation and testing purposes, a default value of 5.0 A continuous shall be used.
(4) The minimum optical warning system required where the apparatus is blocking right-of-way.
(5) The continuous electrical current required to simultaneously operate any fire pumps, aerial devices, and hydraulic pumps.
(6)* Other warning devices and electrical loads defined by the purchaser as critical to the mission of the apparatus.

4.12.3.2 Load Management.

4.12.3.2.1* If the total connected electrical load of the upgraded low-voltage electrical system exceeds the minimum continuous electrical output rating of the installed alternator(s) operating under the conditions specified in 4.12.3, an automatic electrical load management system shall be required.

4.12.3.2.2 The minimum continuous electrical load defined in 4.12.3.1 shall not be subject to automatic load management.

4.12.4* Optical Warning Devices. If the optical warning devices are to be upgraded, the contractor shall inspect the components of the optical warning system that are not scheduled to be replaced for problems that could affect the vehicle's warning devices. The inspection shall include the condition of wires, connectors, relays, fuses and/or circuit breakers, motors, lenses, and related components. The contractor shall notify the purchaser in writing of any problems or discrepancies that are discovered during the inspection.

4.12.5 Audible Warning Devices.

4.12.5.1 Audible warning equipment in the form of at least one automotive traffic horn and one electric or electronic siren shall be provided. A means shall be provided to allow the activation of the siren within convenient reach of the driver.

4.12.5.2 If upgraded or additional air horns, electric siren(s), or electronic siren speaker(s) are installed, they shall be mounted as low and as far forward on the fire apparatus as practical. Upgraded or additional audible warning equipment shall not be mounted on the roof of the apparatus.

4.13* Driving and Crew Compartments.

4.13.1 If the driving and/or crew compartment is to be upgraded, the contractor shall inspect the driving and crew compartments, their mountings, and associated accessories for wear, damage, and corrosion. The contractor shall notify the purchaser in writing of any damaged components that are discovered during the inspection.

4.13.2* If a new driving and/or crew compartment is installed, it shall be a fully enclosed design that meets the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*. The driving compartment shall have a seating capacity for a minimum of two fire fighters except at a tiller driving position, which shall have seating for at least one person. The driving and crew compartments shall have a combined capacity at least equal to the maximum number of persons expected to ride within the fire apparatus as defined by Section 1.5.

4.13.3 If the new driving and/or crew compartment is of a tilt-up design, it shall be arranged so that all the manufacturer's recommended routine maintenance checks of lubricant and fluid levels can be performed easily by the operator without raising the driving/crew compartment and without the need for hand tools.

4.13.4 If the new driving and/or crew compartment is of a tilt-up design, a redundant holding device shall be provided in addition to the primary system for holding the driving/crew compartment in the fully raised position. The activation and release of both systems shall be accomplished clear of the travel path for the driving/crew compartment as it is raised and lowered, while still having the travel path in clear view.

4.13.5 After installation of a new driving or crew compartment, airflow through the radiator shall be sufficient to comply with the cooling system requirements as defined in 4.7.3.

4.13.6 Fully Enclosed Crew Compartment Conversions. If an existing two-door open canopy style crew compartment is converted into a fully enclosed crew compartment, the added-on portion of the crew compartment shall comply with all applicable requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*.

4.14 Body, Compartmentation, and Hose Storage.

4.14.1 If the body, compartmentation, or hose storage areas are to be upgraded, the contractor shall inspect all portions of the body, compartmentation, or hose storage areas not scheduled to be replaced for wear, damage, and corrosion. The contractor shall notify the purchaser in writing of any damaged components that are discovered during the inspection.

4.14.2* In the event a new body, compartmentation, or hose storage area is installed, it shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*.

4.14.3 If additional compartments are added to an existing body, they shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*.

4.14.4 Metal Finish.

4.14.4.1 The fire apparatus when refinished shall comply with Section 13.9 of NFPA 1901, *Standard for Automotive Fire Apparatus*, including the application of reflective striping.

4.14.4.2 If the metal finish is to be upgraded, all exposed ferrous metal surfaces not plated or stainless steel shall be cleaned and prepared and shall be painted or coated. The

paint or coating, including any primer, shall be applied in accordance with the paint or coating manufacturer's recommendations. The purchaser shall specify if nonferrous body components are to be painted and any lettering, numbering, or decorative striping shall be furnished.

4.15 Fire Pump and Associated Equipment. If the fire pump or associated equipment is to be upgraded, the contractor shall inspect all portions of the fire pump, its mountings, and any associated accessories not scheduled to be replaced for wear, damage, and leaks. The contractor shall notify the purchaser in writing of any damaged components or other problems that are discovered during the inspection. All upgraded parts or components shall be compatible with the original pump. The pump packing shall be adjusted to the pump manufacturer's recommended tolerances.

4.16 Water Tank.

4.16.1 If the existing water tank is to be reused, the contractor shall inspect the water tank for serviceability and shall report any defects to the purchaser in writing.

4.16.2* If a new water tank is installed, it shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*. Installation of a new water tank shall not result in the completed apparatus exceeding the GAWR and GCWR or GVWR of the chassis under the conditions specified in Section 4.2.

4.17 Aerial Devices.

4.17.1 If the aerial device is to be upgraded, the contractor shall inspect all components of the aerial device, its mountings, controls, and associated accessories not scheduled to be replaced for wear, damage, corrosion, and other deficiencies. The contractor shall notify the purchaser in writing of any damaged components or other problems that are discovered during the inspection. All new or replacement parts or components shall be compatible with the design of the original aerial device and shall meet the requirements of the NFPA automotive fire apparatus standard in effect at the time of the contract signing for the original manufacture of the apparatus.

4.17.2 If a replacement aerial device is installed, the new device shall meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, and shall be so certified by the contractor.

4.18 Equipment Carried on Fire Apparatus.

4.18.1 If new ground ladders are furnished, they shall meet the requirements of NFPA 1931, *Standard on Design of and Design Verification Tests for Fire Department Ground Ladders*.

4.18.2 If new hose is furnished, it shall meet the requirements of NFPA 1961, *Standard on Fire Hose*.

4.18.3 If new nozzles are furnished, they shall meet the requirements of NFPA 1964, *Standard for Spray Nozzles (Shutoff and Tip)*.

4.19 Tests and Delivery Data Requirements.

4.19.1 Pump Certification Tests.

4.19.1.1 If the refurbished fire apparatus is equipped with a new or upgraded fire pump that has a rated capacity of 750 gpm (2850 L/min) or greater, the pump system shall be tested after the pump and all its associated piping and equipment have been installed on the apparatus. The tests shall be conducted at the contractor's approved facility and certified by an independent testing organization approved by the purchaser. The certification shall include at least the tests defined in 4.19.2 through 4.19.6. If the apparatus is equipped with a water tank, the water tank to pump flow test as defined in 4.19.7 shall be included.

4.19.1.2 If the refurbished fire apparatus is equipped with a new or upgraded fire pump that has a rated capacity of less than 750 gpm (2850 L/min), the pump shall be tested after the pump and all its associated piping and equipment have been installed on the apparatus. The tests shall be conducted at the manufacturer's approved facility and certified by the contractor. The certification shall include at least the tests defined in 4.19.2 and 4.19.4 through 4.19.6. If the apparatus is equipped with a water tank, the water tank to pump flow test as defined in 4.19.7 shall be included.

4.19.1.3 If the refurbished fire apparatus is equipped with an existing fire pump that is neither upgraded nor replaced, the pump shall be tested after the refurbishment is complete. The tests shall be conducted at the manufacturer's approved facility and certified by the contractor. The certification shall include at least the tests defined in 4.19.2 and 4.19.4 through 4.19.6. If the apparatus is equipped with a water tank, the water tank to pump flow test as defined in 4.19.7 shall be included.

4.19.2 Pumping Tests. If the refurbished fire apparatus is equipped with a new or upgraded fire pump, the pumping test shall be conducted in accordance with the test requirements defined in NFPA 1901, *Standard for Automotive Fire Apparatus*. If the original fire pump is retained, the pumping test shall be conducted in accordance with the test requirements in the edition of the NFPA automotive fire apparatus standard in effect at time of the contract signing for the original manufacture of the apparatus.

4.19.3 Pumping Engine Overload Test. If the refurbished fire apparatus is equipped with a new or upgraded fire pump, a pumping engine overload test meeting the test requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, shall be conducted. If the refurbished fire apparatus retains its original pump(s), a pumping engine overload test shall be conducted in accordance with the test requirements of the edition of the NFPA automotive fire apparatus standard in effect at time of the contract signing for the original manufacture of the apparatus.

4.19.4 Pressure Control Device Test. If the refurbished fire apparatus is equipped with a new or upgraded pressure control device on the fire pump, it shall be tested in accordance with the test requirements defined in NFPA 1901, *Standard for Automotive Fire Apparatus*. If the original pressure control device is retained, it shall be tested in accordance with the pressure control system test requirements of NFPA 1911, *Standard for Service Tests of Fire Pump Systems on Fire Apparatus*, if it has not been tested within the previous twelve months or if any work has been done to the pressure control device.

4.19.5 Priming Device Test. If the refurbished fire apparatus is equipped with a new or upgraded priming device on the fire pump, it shall be tested in accordance with the test requirements defined in NFPA 1901, *Standard for Automotive Fire Apparatus*. If the original priming device is retained, it shall be tested in accordance with the priming device test requirements of NFPA 1911, *Standard for Service Tests of Fire*

Pump Systems on Fire Apparatus, if the priming device has not been tested within the previous twelve months or if any work has been done to the priming device.

4.19.6 Vacuum Test. If the refurbished fire apparatus has a new or upgraded pump or pump piping, a vacuum test shall be conducted in accordance with the test requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*. If the original pumps and pump piping are retained, a vacuum test shall be conducted in accordance with the vacuum test requirements of NFPA 1911, *Standard for Service Tests of Fire Pump Systems on Fire Apparatus*, if that test has not been conducted within the previous twelve months or if any work has been done to the pump.

4.19.7 Water Tank to Pump Flow Test. If the refurbished apparatus has a new or upgraded water tank(s), pump(s), or pump piping, a water tank to pump flow test shall be conducted in accordance with the test requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*. If the original water tank(s), pump(s), and pump piping are reused, a water tank to pump flow test shall be conducted in accordance with the water tank to pump flow test requirements of NFPA 1911, *Standard for Service Tests of Fire Pump Systems on Fire Apparatus*, if that test has not been conducted within the previous twelve months or if any work has been done to the pump.

4.19.8 Aerial Device Certification Tests. If a new or upgraded aerial device is installed on the refurbished fire apparatus, the completed apparatus shall be tested in accordance with the test requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, at the manufacturer's approved facility and certified by an independent testing organization approved by the purchaser. If the original aerial device is reused, the completed apparatus shall be inspected and tested in accordance with the complete requirements of NFPA 1914, *Standard for Testing Fire Department Aerial Devices*, if the aerial device has not been tested to the complete requirements of NFPA 1914 within the previous twelve months or if any work has been done to the aerial device or related systems.

4.19.9 Refurbisher's Pre-Delivery Tests.

4.19.9.1 Water Tank Capacity Test. A water tank capacity test meeting the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, shall be conducted on all refurbished fire apparatus having newly installed water tanks. Fire apparatus retaining their original water tanks shall be tested to the requirements in the edition of the applicable standard in effect at the time of original contract signing if any work has been done to the tank or its related systems.

4.19.9.2 Electrical System Tests. If any work is conducted that substantially changes the original electrical system of the fire apparatus or adds new loads (such as adding a load management system, new lights, new relay boards, and so forth), the apparatus shall be tested to the requirements of the current edition of NFPA 1901, *Standard for Automotive Fire Apparatus*. If any work is conducted on the electrical system that leaves the original electrical system configuration intact (such as tightening connections, replacing individual wires, and so forth), the apparatus shall be tested to the requirements of the edition of the NFPA automotive fire apparatus standard in effect at the time of the contract signing for the original manufacture of the apparatus.

4.19.9.3* Foam System Tests. If the refurbished fire apparatus has a new foam system, the system shall be tested in accordance with the test requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*. If the refurbished fire apparatus retains its original foam system and system components, and if any work has been done to the foam system or the foam system has been upgraded, the system shall be tested to ensure it meets the requirements of the edition of the NFPA automotive fire apparatus standard in effect at the time of the contract signing for the original manufacture of the apparatus.

4.19.10 Road Tests.

4.19.10.1* If the refurbished fire apparatus has upgraded powertrain components (engine, transmission, driveline, and axles), it shall be road tested in accordance with 4.19.10.2 through 4.19.10.5. If the refurbished fire apparatus reuses the original powertrain (engine, transmission, driveline, and axles), the powertrain shall be tested to ensure it meets the requirements of the edition of the NFPA automotive fire apparatus standard in effect at the time of the contract signing for the original manufacture of the apparatus. The tests shall be conducted at a location and in a manner that does not violate local, state, or federal traffic laws.

4.19.10.2 The fire apparatus shall be fully equipped and loaded as required in Section 2.5. The tests shall be conducted on dry, level, paved roads that are in good condition. The engine shall not be operated in excess of the maximum governed speed.

4.19.10.3 Acceleration tests shall consist of two runs in opposite directions over the same route.

4.19.10.3.1 The vehicle shall attain a true speed of 35 mph (56 kph) from a standing start within 25 seconds.

4.19.10.3.2 The vehicle shall attain a minimum top speed of not less than 50 mph (80 kph).

4.19.10.4 If the fire apparatus is equipped with an auxiliary braking system, the manufacturer shall road test the system to confirm that the system is functioning as intended by the auxiliary braking system manufacturer.

4.19.10.5 The service brakes shall bring the fully laden apparatus to a complete stop from an initial speed of 20 mph (32 kph), in a distance not exceeding 35 ft (10.7 m) by actual measurement, on a dry, level, paved surface that is free of loose material, oil, or grease.

4.19.11 Tests on Delivery. If acceptance tests are specified at the point of delivery, they shall be run in accordance with the provisions of Section 4.19 as applicable and duplicate the portions of the tests that the purchaser specifies. Aerial device stability tests shall not be run at other than the refurbisher's or the aerial device manufacturer's facility.

4.20 Data Required of the Contractor.

4.20.1 If applicable, the contractor shall supply, at the time of delivery, at least one copy of the following:

(1) Engine manufacturer's certified brake horsepower curve for a new engine installation showing the maximum governed speed
(2) Contractor's record of fire apparatus refurbishment including, if applicable, all technical information required for inspection to comply with NFPA 1914, *Standard for Testing Fire Department Aerial Devices*
(3) Pump manufacturer's certification of suction capabilities for new pump installations

(4) Pump manufacturer's certification of hydrostatic test for new pump installations
(5) Certification of inspection and test
(6) If equipped with a pump, a copy of the chassis manufacturer's approval for stationary pumping applications
(7) Weight documents from a certified scale showing actual loading on the front axle, rear axle(s), and overall vehicle (with the water tank full but without personnel, equipment, and hose) supplied with the completed vehicle to determine compliance with Section 2.5

4.20.2 A label shall be affixed to the vehicle certifying that the vehicle is in compliance with all applicable Federal Motor Vehicle Safety Standards (FMVSS) in effect at the time of completion.

4.20.3 If the original fire pump is replaced with a new fire pump, a new test plate shall be provided on the pump operator's panel that gives the rated discharges and pressures together with the speed of the engine as determined by the certification test for each unit, the position of the parallel-series pump as used, and the governed speed of the engines as stated by the engine manufacturer on a certified brake horsepower curve. The plate shall be completely stamped with all information at the contractor's facility and attached to the vehicle prior to delivery.

Chapter 5 Referenced Publications

5.1 The following documents or portions thereof are referenced within this standard as mandatory requirements and shall be considered part of the requirements of this standard. The edition indicated for each referenced mandatory document is the current edition as of the date of the NFPA issuance of this standard. Some of these mandatory documents might also be referenced in this standard for specific informational purposes and, therefore, are also listed in Appendix C.

5.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 1901, *Standard for Automotive Fire Apparatus*, 1999 edition.

NFPA 1911, *Standard for Service Tests of Fire Pump Systems on Fire Apparatus*, 1997 edition.

NFPA 1914, *Standard for Testing Fire Department Aerial Devices*, 1997 edition.

NFPA 1931, *Standard on Design of and Design Verification Tests for Fire Department Ground Ladders*, 1999 edition.

NFPA 1961, *Standard on Fire Hose*, 1997 edition.

NFPA 1964, *Standard for Spray Nozzles (Shutoff and Tip)*, 1998 edition.

5.1.2 Other Publications.

5.1.2.1 ANSI Publication. American National Standards Institute, Inc., 11 West 42nd Street, 13th floor, New York, NY 10036.

ANSI Z535.4, *Product Safety Signs and Labels*, 1991.

5.1.2.2 U.S. Government Publication. U.S. Government Printing Office, Washington, DC 20402.

Title 49, *Code of Federal Regulations*, Part 571, Federal Motor Vehicle Safety Standards (FMVSS), No. 108, *Lamps, reflective devices, and associated equipment.*

Appendix A Explanatory Material

Appendix A is not a part of the requirements of this NFPA document but is included for informational purposes only. This appendix contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.1 This document is designed to be used to aid in developing specifications for the refurbishing of fire apparatus. It is the intent of NFPA 1912 to ensure that refurbished fire apparatus meet all applicable federal motor vehicle regulations as well as the applicable portions of NFPA 1901, *Standard for Automotive Fire Apparatus.*

This standard will do the following:

(1) Identify minimum levels of refurbishing
(2) Establish minimum requirements for inspection and/or replacement of all vehicle components
(3) Create informational checklists that will identify areas on the vehicle that should be addressed when considering refurbishing
(4) Create a guideline for any personnel engaged in preparing specifications for fire department or municipal agency emergency vehicle refurbishing

A.1.5 The refurbishing of a fire apparatus generally involves a major investment and should be treated as such. Fire apparatus are complex mechanical equipment that should not be refurbished in a haphazard manner. A decision to refurbish should be made only after a detailed study of the fire department's apparatus needs, taking into consideration other equipment the department owns or plans to buy.

A.1.6.1 Depending on the scope of the refurbishing, the detailed description could include estimated weight, wheelbase, principal dimensions, transmission ratios, axle ratios, and, if applicable, the rated capacity of the aerial device. The purpose of these contractor specifications is to define what the contractor intends to furnish and deliver to the purchaser.

A.1.6.2 Depending on the scope of the refurbishing, a qualified and responsible representative of the contractor should instruct personnel, specified by the purchaser, in the operation, care, and maintenance of the refurbished fire apparatus and equipment delivered. If the refurbishing does not change any of the operating procedures of the apparatus, instruction on the operation, care, and maintenance of the refurbished fire apparatus and equipment might not be required.

A.1.7.6 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.1.7.7 Authority Having Jurisdiction. The phrase "authority having jurisdiction" is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or

other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.1.7.12 Contractor. The contractor might not necessarily refurbish the vehicle or any portion of the vehicle but is responsible for the completion, delivery, acceptance, and warranty of the entire unit. Since fire apparatus are frequently refurbished in-house by the local fire department or city garage, the term *contractor* would include that department and its personnel if the project were to be done by the local fire department, fire brigade, or other municipal agency.

A.1.7.14.6 Quint. The primary purpose of this type of fire apparatus is to combat structural and associated fires, and to support fire-fighting and rescue operations by positioning personnel, handling materials, providing continuous egress, or discharging water at positions elevated from the ground.

A.1.7.14.7 Special Services Fire Apparatus. These services could be rescue, command, hazardous material containment, air supply, electrical generation and floodlighting, or transportation of support equipment and personnel.

A.1.7.21 Grade. A 45-degree slope is equal to a 100 percent grade.

A.1.7.26 Net Pump Pressure. When operating from a hydrant, the net pump pressure is typically less than the discharge pressure. For example, if the discharge pressure gage reads 150 psi (1034 kPa) and the intake (suction) gage reads 20 psi (138 kPa), the net pump pressure equals 130 psi (896 kPa). When operating from draft, the net pump pressure will be above the discharge pressure. For example, if the discharge pressure gage reads 145 psi (1000 kPa) and the intake (suction) gage reads 10 in. Hg (34 kPa) vacuum, the net pump pressure will be 150 psi (1034 kPa) (1 in. Hg = 0.5 psi = 3.38 kPa).

A.1.7.33 Purchaser. In the case of refurbished apparatus, the purchaser can be the original owner of the vehicle scheduled for refurbishing, or it may be a person, organization, or jurisdiction considering the purchase of a refurbished fire apparatus.

A.1.7.37.1 Level I Refurbishing. A vehicle that has undergone Level I refurbishing receives a new make and model designation and a new Certificate of Origin for the current calendar year.

A.1.7.37.2 Level II Refurbishing. A vehicle that has undergone Level II refurbishing retains its original make and model identification as well as its original title and year of manufacture designation.

A.1.7.47 Upgrade. It is recommended that consideration be given to using upgraded components or systems that meet current standards to the maximum extent possible, to ensure that the refurbished apparatus will approach the performance and safety requirements of newly manufactured apparatus.

A.1.7.48.1 GAWR (Gross Axle Weight Rating). It is a requirement of the Federal Motor Vehicle Safety Standards that GAWR be shown on a label on the vehicle. The system includes, but is not limited to, the axle, tires, suspension, wheels, frame, brakes, and applied engine torque.

A.1.7.48.2 GCWR (Gross Combination Weight Rating). It is a requirement of the Federal Motor Vehicle Safety Standards that GCWR be shown on a label on the vehicle. Where the trailer is detachable, the GCWR limits the axle system(s) maximum load for any replacement trailer.

A.1.7.48.3 GVWR (Gross Vehicle Weight Rating). It is a requirement of the National Highway Traffic Safety Administration that the GVWR of a vehicle be posted in the vehicle on a permanently fixed label. The GVWR can be equal to or less than the sum of the front GAWR and the rear GAWR. The in-service weight or gross vehicle weight should always be equal to or less than the GVWR.

A.1.8 Metric units of measurement in this standard are in accordance with the modernized metric system known as the International System of Units (SI).

The liter unit is outside of, but recognized by, SI and commonly is used in international fire protection. The conversion factors given in Table A.1.8 are not SI conversions but could be useful to the user of this document.

Table A.1.8 Non-metric Conversion Factors

U. S. Customary Units	Other Units
1 pound per square inch (psi)	2.31 feet of water (ft H_2O)
1 pound per square inch (psi)	2.036 inches of mercury
1 inch of mercury (in. Hg)	1.135 feet of water
1 inch of mercury (in. Hg)	0.491 psi
1 gallon of water	8.34 pounds
1 gallon of water	231 cubic inches
1 gallon per minute (gpm)	0.833 imperial gallons per minute

A.2.1 It is recommended that upgraded components or systems meeting current NFPA standards be installed whenever possible for enhanced safety and serviceability. Replacement parts, components, or systems should meet the requirements of NFPA 1901, *Standard for Automotive Fire Apparatus*, to the maximum extent possible. Meeting the requirements will help to make the fire apparatus as safe as possible, in addition to making for easier availability of parts for maintenance and repair.

Where local operating conditions necessitate apparatus of unusual design, the purchaser should carefully define the special requirements in the specifications. Height, width, under-vehicle clearance, wheelbase, turning radius, length, and so forth, can occasionally need special attention. For example, a community having low overpasses needs to have a refurbished apparatus capable of traveling underneath these overpasses. The specifications for the refurbished apparatus should state the maximum travel height that is allowable.

A.2.4.1 The engine compartment and the underside of the vehicle are not considered areas of normal non-maintenance operation.

A.2.5 The carrying capacity of a fire apparatus is one of the least understood features of design, and one of the most important. All apparatus are designed for a *rated GVWR* or maximum total weight, which should not be exceeded by the apparatus refurbisher or by the user after the vehicle has been placed in service. For tractor-drawn vehicles, the design should be adequate for rated GCWR weight. There are many factors that make up the rated GVWR, including the design of the springs and suspension system, the rated axle capacity, the rated tire loading, and the distribution of the weight between the front and rear wheels.

One of the most critical factors is the size of the water tank. Water weighs approximately $8^1/_3$ lb/gal (1 kg/L). A value of 10 lb/gal (1.2 kg/L) may be used when estimating the weight of the tank and its water, making a 500-gal (1900-L) tank and its water about $2^1/_2$ tons (2268 kg).

If the finished apparatus is not to be overloaded, the purchaser should provide the contractor with the weight of equipment to be carried if it is in excess of the allowance shown in Table 2.5.1. *(See Section 2.5.)*

Overloading the apparatus by the refurbisher through design, or by the user through specifying a larger water tank on a small chassis, or by the user adding a great deal of equipment after the apparatus has been returned to service will materially reduce the life of the vehicle and will undoubtedly result in increased maintenance costs, particularly with respect to transmissions, clutches, and brakes. Overloading can also seriously affect handling characteristics, making steering and braking particularly difficult.

The distribution of the weight between the front and rear wheels is also a factor for major consideration, as improper design will seriously affect the handling characteristics. Too little weight on the front wheels can cause a front-end skid and, over bumpy roads, can cause the front of the vehicle to veer from side to side; at the very least it will be difficult to keep the vehicle under control. Too much weight on the front wheels will reduce the traction of the rear wheels and can result in a rear-end skid or difficulty in traveling over unpaved roads or in mud and snow. Further, overloading of either the front or rear wheels might require that the tires be of different sizes.

Fire apparatus should be able to perform its intended service under adverse conditions that could require operation off paved streets or roads. Chassis components should be selected with the rigors of service in mind.

A.2.5.2 A weight of 250 lb (114 kg) for a fully equipped fire fighter is used elsewhere in NFPA standards. The 200 lb (91 kg) per person used here does not include the weight of SCBA and tools carried by a fire fighter, as the weight of this equipment is accounted for elsewhere.

A.3.1 The National Highway Traffic Safety Administration (NHTSA) in the United States has a regulation (49 *CFR* 571.7e) for determining when the modifications to a used vehicle are so extensive that the resulting vehicle will be considered new for the purposes of the Federal Motor Vehicle Safety Standards (FMVSS). Section 571.7(e) states: "Combining new and used components. When a new cab is used in the assembly of a truck, the truck will be considered newly manufactured . . . unless the engine, transmission, and drive axle(s) (as a minimum) of the assembled vehicle are not new, and at least two of these components were taken from the same vehicle."

A.3.2 Vehicles are designed with specific GAWR and GCWR or GVWR ratings based on the safe carrying capacity of components and/or the entire vehicle. Increasing the weight over these limits can result in loss of stability, lack of adequate braking or other handling problems, all of which have the potential for injury or death to fire fighters and civilians. Requesting a contractor to exceed these limits, or to compound an overweight problem, creates a potential liability issue for both the purchaser and the contractor. Vehicles at or above their GAWR and GCWR or GVWR ratings should not be considered for refurbishing unless upgraded components are installed to increase the weight ratings, or the refurbishing will result in a net decrease in vehicle weight.

A.3.6.2 It should be noted that older engines may not meet current EPA standards and may not be able to be economically upgraded to current standards.

A.3.11.2.2 Due to the hazards associated with split rims and the injuries resulting from them, they should be considered for replacement with solid rims whenever possible.

A.3.13 Cab replacements with increased seating capacity can have an impact on the vehicle weight, and this should be taken into consideration. A fully enclosed cab for more than the original number of personnel can require upgrades to suspension, axles, tires, and other components. Canopy cab extensions with patio door–type closures or separate telephone booth–type personnel enclosures are also acceptable means to accomplish this safety design feature. The use of 3-point seat belts, where available, is encouraged.

The purchaser should consider specifying remote controls on the mirrors to facilitate correct mirror adjustment. When necessary, heated mirrors should also be considered.

A.3.14.4 All exposed ferrous metal surfaces not chrome-plated or stainless steel should be cleaned and prepared and should be painted to the color(s) specified by the purchaser. If nonferrous body components are furnished, the purchaser should specify which surfaces are to be painted. The paint, including the primer, should be applied in accordance with the paint manufacturer's recommendations.

A.3.16.2 When dealing with a new tank installation, the specified changes must take into consideration the overall weight of the tank cradle, additional plumbing required, and water or agent weight, as well as the tank itself. Apparatus stability and braking ability can be adversely affected by exceeding the maximum allowable configurations. Contractors as well as purchasers can be held accountable and liable if maximum limits are exceeded. Therefore, exceeding the maximum should not be considered and if additional tank size is still preferred or required, weight reductions in other areas such as hose load, miscellaneous equipment, or newer lightweight components should be utilized to maintain, yet not exceed, the maximum allowable limits.

A.3.19.9.4 NFPA 1901, *Standard for Automotive Fire Apparatus*, did not have any requirements for foam prior to the 1991 edition. It is recommended that the foam system manufacturer's test requirements be utilized for apparatus that retain their original foam systems that were originally purchased prior to the effective date of NFPA 1901, *Standard for Automotive Fire Apparatus*, 1991 edition.

A.3.19.10 Any time the engine or drivetrain is altered or replaced with different components, the purchaser should require road testing to ensure the reconditioned apparatus meets minimum acceptable standards.

A.4.1 The National Highway Traffic Safety Administration (NHTSA) in the United States has a regulation (49 *CFR* 571.7e) for determining when the modifications to a used vehicle are so extensive that the resulting vehicle will be considered new for the purposes of the Federal Motor Vehicle Safety Standards (FMVSS). Section 571.7(e) states: "Combining new and used components. When a new cab is used in the assembly of a truck, the truck will be considered newly manufactured . . . unless the engine, transmission, and drive axle(s) (as a minimum) of the assembled vehicle are not new, and at least two of these components were taken from the same vehicle."

A.4.2 Vehicles are designed with specific GAWR and GCWR or GVWR ratings based on the safe carrying capacity of components and/or the entire vehicle. Increasing the weight over these limits can result in loss of stability, lack of adequate braking, or other handling problems, all of which have the potential for injury or death to fire fighters and civilians. Requesting a contractor to exceed these limits, or to compound an overweight problem, creates a potential liability issue for both the purchaser and the contractor. Vehicles at or above their GAWR and GCWR or GVWR ratings should not be considered for refurbishing unless upgraded components are installed to increase the weight ratings, or the refurbishing will result in a net decrease in vehicle weight.

A.4.3 Vehicle stability is one of the most critical factors in apparatus safety. When apparatus manufacturer's data on center of gravity and weight distribution are known, these should be complied with to ensure a stable apparatus. The height of the fully loaded vehicle's center of gravity should not exceed the chassis manufacturer's maximum limit. All other factors being equal, a lower apparatus will be more stable and less prone to overturning. The front-to-rear weight distribution of the fully loaded vehicle should be within the limits set by the chassis manufacturer. Front axle loads should not be less than the minimum axle loads specified by the chassis manufacturer, under full load and all other loading conditions. Apparatus with extreme weight bias at front or rear can be difficult to control on curves or on road surfaces with poor adhesion. The difference in weight on the end of each axle, from side to side, when the vehicle is fully loaded and equipped should not exceed 7 percent.

A.4.6.1 The purchaser should consider the following tests when the engine or engine system is to be refurbished:

(1) Compression test
(2) Blowby test
(3) Fuel pressure test
(4) Oil analysis

A.4.6.2 It should be noted that older engines may not meet current EPA standards and may not be able to be economically upgraded to current standards.

A.4.11.1.1 Problems with the vehicle braking system have the potential for causing serious accidents, resulting in injury or death to both fire fighters and civilians. In addition, there is a corresponding liability issue in the operation of a vehicle with an inadequate braking system. It is recommended that all required braking system repairs be made before the apparatus is returned to service.

A.4.11.1.2 Consideration should be given to installing an antilock braking system (ABS) when the braking system is to be upgraded.

A.4.11.2.1 Due to the hazards associated with split rims and the injuries resulting from them, they should be considered for replacement with solid rims whenever possible.

A.4.11.6 If the purchaser wants the hooks or rings to be accessible without having to open compartment doors, the specifications should state that fact.

A.4.12.1 This section defines the requirements for upgraded alternators, batteries, load management, and instrumentation to detect incipient electrical system failure. The intent is to require that an upgraded electrical system will operate the apparatus using power supplied by the alternator, shed nonessential electrical loads where necessary, and provide early warning of electrical failure in time to permit corrective action.

A.4.12.2 All components that are upgraded should be replaced with components meeting the current NFPA automotive fire apparatus standard to the maximum extent possible. The current standard provides additional lighting for safety and makes provision for two modes of operation: responding and blocking the right-of-way. Consideration should also be given to having the contractor furnish a wiring schematic of the rewired areas of the apparatus to enable vehicle repair technicians to more easily troubleshoot the electrical system or make additions to the system.

A.4.12.3.1(6) The purchaser needs to analyze the electrical loads that have to be maintained to fulfill the mission of the refurbished apparatus and to define those loads for the refurbisher of the apparatus. The purchaser needs to understand, however, that there is a limit to the output capacity of an alternator system on the apparatus' engine, and this standard requires that the apparatus be capable of maintaining the minimum continuous electrical load under the conditions defined in 4.12.3.1. When that load is exceeded and larger alternators are not available, the purchaser and the refurbisher need to work together to determine how to reduce the minimum continuous electrical load so that it can be sustained under the conditions defined in 4.12.3.1.

A.4.12.3.2.1 Reduced crew sizes have forced the apparatus operator to assume many new fireground tasks besides that of operating apparatus. Even if the operator is at the apparatus, he is too busy with higher priority tasks to pay much attention to monitoring the condition of the electrical system.

Electrical loads on modern fire apparatus frequently exceed the alternator capacity and can be supplied only by the deep discharge of the apparatus batteries. The high-cycle batteries that are designed to provide the large amount of amperage to crank modern diesel engines are severely damaged when deeply discharged. The automatic load management is intended to protect the electrical system from needless damage while maintaining the operation of essential devices.

It is important that the priority of all managed loads be specified by the purchaser so that, as electrical loads are disconnected from the apparatus' electrical system, they are shed in an order least likely to affect emergency operations. Optical warning devices in excess of the minimum required in NFPA 1901, *Standard for Automotive Fire Apparatus*, can and should be load managed.

A.4.12.4 Consideration should be given to upgrading the optical warning devices to the current NFPA 1901, *Standard for Automotive Fire Apparatus* standard, both for improved safety during emergency responses, as well as to minimize current draw when operating at the scene. The upgraded lighting

should provide an increased measure of safety, as well as minimize loads to the low voltage electrical system.

A.4.13 The purchaser should consider specifying remote controls on the mirrors to facilitate correct mirror adjustment. When necessary, heated mirrors should also be considered.

A.4.13.2 Cab replacements with increased seating capacity can have an impact on the vehicle weight, and this should be taken into consideration. A fully enclosed cab for more than the original number of personnel can require upgrades to suspension, axles, tires, and other components. Canopy cab extensions with patio door–type closures or separate telephone booth–type personnel enclosures are also acceptable means to accomplish this safety design feature. The use of 3-point seat belts, where available, is encouraged.

A.4.14.2 It is recommended that any upgrades to the existing body, compartmentation, or hose storage area be made according to current NFPA standards to the maximum extent possible.

A.4.16.2 When dealing with a new tank installation, the specified changes must take into consideration the overall weight of the tank cradle, additional plumbing required, and water or agent weight, as well as the tank itself. Apparatus stability and braking ability can be adversely affected by exceeding the maximum allowable configurations. Contractors as well as purchasers can be held accountable and liable if maximum limits are exceeded. Therefore, exceeding the maximum should not be considered, and if additional tank size is still preferred or required, weight reductions in other areas such as hose load, miscellaneous equipment, or newer lightweight components should be utilized to maintain, yet not exceed, the maximum allowable limits.

A.4.19.9.3 There were no foam system requirements for apparatus built prior to the adoption of the 1991 edition of NFPA 1901, *Standard for Automotive Fire Apparatus.*

A.4.19.10.1 Any time the engine or drivetrain is altered or replaced with different components, the purchaser should require road testing to ensure the refurbished apparatus meets minimum acceptable standards.

Appendix B Fire Apparatus Refurbishing Specifications

This appendix is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 General. Fire apparatus refurbishment can range from simple cosmetic–type restorations to complete Level I refurbishing. Therefore, the amount of information that the contractor and purchaser require can vary greatly. Depending on the scope of the proposed work, consideration should be given to the details discussed in some or all of the following paragraphs. It is recommended that the form in Figure B.1 be used to identify the information needed to properly develop specifications for those portions of the fire apparatus that are to be modified or upgraded during the refurbishment.

The local fire chief and fire department staff know the conditions under which the apparatus will be used. However, competent advice should also be obtained from knowledgeable and informed sources such as other experienced fire service personnel, trade journals, training instructors, maintenance personnel, and fire equipment and component manufacturers. The fire insurance rating authority should also be consulted.

The study should look not only at current operations and risks protected but also at how these might change over the life of the fire apparatus.

B.1.1 Writing the Specifications.

B.1.1.1 This standard provides the minimum technical requirements that refurbished fire apparatus are expected to meet. It is recognized that many purchasers will desire additional features beyond these minimum requirements. The requirements in this standard, together with the appendix material, should be carefully studied. Details of where the apparatus has to exceed the minimum requirements or where a specific arrangement is required should be carefully defined in the specifications for the refurbished apparatus. These details might include special performance requirements, the number of seats and seating arrangement for fire fighters riding on the apparatus, or the provision of space for extra hose or equipment the apparatus will be required to carry.

B.1.1.2 Where local operating conditions necessitate apparatus of an unusual design, the purchaser needs to define carefully the special requirements in the specifications. Height, width, under-vehicle clearance, wheelbase, turning radius, length, and so forth, might need special attention. For example, a community with many narrow, winding streets should have apparatus capable of readily negotiating switchbacks without delay.

B.1.1.3 Fixed Components.

B.1.1.3.1 A major consideration in the design of a refurbished fire apparatus is the fixed components. These include the following:

(1) Electrical generators
(2) Water tanks, fire pumps, and other fire-fighting equipment
(3) Air cascade or compressors
(4) Reels of all types

B.1.1.3.2 These fixed components could represent the most concentrated and heaviest loads on the vehicle. They could be located in exterior compartments or within the interior of the vehicle. They should be organized in the layout to be functional and user friendly in emergency applications. It is vital that these components be situated on the vehicle to provide for the following:

(1) Good load distribution
(2) Balance (both front-to-rear and right-to-left)
(3) Low center of gravity

B.1.1.4 Portable Equipment.

B.1.1.4.1 A major function of any fire apparatus, no matter what the type, is to carry portable equipment to the emergency scene. Portable equipment can add significant weight to the vehicle. For this reason, the document places emphasis on the final GVWR and carrying capacity of the completed vehicle, which includes both fixed and portable equipment.

B.1.1.4.2 Because the listings of portable and fixed equipment carried on the vehicle varies depending upon the mission of the vehicle, the fire department should measure and weigh their specific equipment to ensure the refurbished apparatus has adequate carrying capacity to accommodate both the volume and weight of the equipment.

B.1.1.4.3 The fire department should classify the equipment as follows:

(1) Existing equipment to be carried
(2) Proposed new equipment to be carried
(3) Possible equipment to be carried in the future

In this way, a chassis with an adequate GVWR can be provided to ensure that the vehicle will not be overloaded in the future.

B.1.1.4.4 After determining the weight and volume of present, proposed, and future portable equipment, the fire department should analyze the actual volume and arrangement of space necessary for the portable equipment. The following factors could increase the volume required:

(1) Compartment door and box pan interference
(2) Mounting implications
(3) Compartment shelving
(4) Slide trays
(5) Components of the body such as component flanges, notches, and other interferences that affect removal of equipment from a compartment
(6) Ventilation requirements of a generator, air compressor, or other equipment

B.1.1.5 This standard is designed to promote sound equipment that is capable of good performance, with inclusion of restrictive features only where needed to specify minimum requirements. The tests and inspections are an important feature of the refurbishing process, and the results should be carefully analyzed to ensure that the completed apparatus meets the specified performance requirements.

B.1.1.6 Since the passage of Public Law 89-563, the National Traffic and Motor Vehicle Safety Act of 1966, the federal government has adopted certain motor vehicle safety standards applicable to all manufacturers of trucks, including fire apparatus. It is unlawful for a manufacturer to deliver a truck not in compliance with these federal standards. These federal safety standards are frequently changed, and their provisions make the incorporation of certain features and devices mandatory. Apparatus refurbishers face substantial penalties for infraction of these rules and, therefore, cannot build to specifications that would require them to perform unlawfully or to delete required items or to include any items that are illegal.

B.1.1.7 Additional requirements are placed on both apparatus and engine manufacturers by the Clean Air Act, which is enforced by the Environmental Protection Agency (EPA). These EPA standards have resulted in major changes in the performance of many engines. Neither the engine manufacturer nor the apparatus manufacturer are permitted to modify engines once they are certified to EPA standards. Because of the EPA standards, it is often necessary to install larger engines than might have been previously used in order to obtain the same apparatus performance. New engines installed in refurbished apparatus are required to meet the current EPA standards. Rebuilt engines will only have to meet the requirements in effect at the time of original manufacture.

B.1.1.8 Depending on the scope of the refurbishing, it may be desirable to provide for an interim inspection at the contractor's refurbishing facility. The advantages of such a provision include the opportunity to evaluate construction prior to final assembly and painting. The specifications should detail the particulars of such an inspection.

B.1.1.9 The chief of the fire department (or a designated representative) normally exercises the acceptance authority following satisfactory completion of tests and inspections for compliance with purchase specifications. The specifications should provide details of delivery expectations, including the desired training, the required acceptance tests, and who is responsible for the various costs associated with the delivery and acceptance.

B.1.1.10 If training of designated fire department personnel is required due to the scope of the refurbishing, it is essential to ensure that the purchaser and user are aware of, and instructed in, the proper operation, care, and maintenance of the apparatus acquired. This training should provide the initial instruction on the refurbished apparatus. The training is typically delivered by a qualified representative of the contractor in the user's community. The specifications should clearly identify the arrangement for providing the training, including its location, its duration, and necessary training aids such as video tapes or training manuals.

B.1.1.11 The purchaser should also define in the specifications the warranty desired for the refurbished apparatus. The warranty is a written guarantee of the integrity of the refurbishing or its components that defines the manufacturer's responsibility within a given time period. The warranty is sometimes extended for a second warranty period beyond the terms of the basic warranty for specific components, such as the engine, pump, frame, water tank, and so forth. If a secondary manufacturer is involved in modifying components that are warranted by the original manufacturer, the responsibility for warranty work should be clearly understood by the original manufacturer, the secondary manufacturer, the contractor, and the purchaser.

B.1.1.12 The purchaser might consider a warranty bond to ensure that any warranty work will be performed, even if the apparatus refurbisher should go out of business. A warranty bond is a third-party secured bond established by the refurbisher before delivery of a vehicle to guarantee workmanship, quality of material, or other stated performance of the vehicle components.

B.1.1.13 Finally, it is recommended that the fire chief, fire department staff, or committee assigned to develop the specifications consult with the purchaser's attorney, engineer, and other appropriate officials for assistance in developing the detailed specifications.

B.1.2 Obtaining and Studying Proposals.

B.1.2.1 When the specifications are complete, they should be distributed to apparatus refurbishers and contractors with a request for bids or proposals to furnish the specified refurbished apparatus. The request should specify a date, time, and place for the formal opening of the bids. This date should allow at least one month for the apparatus refurbishers to study the specifications and estimate the cost of the apparatus refurbishing. More time could be required if engineering drawings of the refurbished apparatus are required.

B.1.2.2 Time should also be allocated to allow the prospective apparatus refurbishers to examine the apparatus prior to submitting a bid. Someone familiar with the work to be performed should accompany the prospective bidder so as to answer any questions that could arise. However, it is imperative that all bidders are provided with the same information.

B.1.2.3 The request also should state the time period during which the purchaser expects the bidder to honor the bid price and whether a bid bond is required. A bid bond guarantees that if a contract is offered to the bidder within the defined time period, the bidder will enter into the contract under the terms of the bid.

B.1.2.4 A pre-bid meeting should be considered between the purchaser of a refurbished fire apparatus and the prospective apparatus refurbishers or their agents prior to the submittal of the bids. Such a meeting is designed to allow for a detailed review of the draft specifications by all present at the meeting. Problems with the specifications, ideas on how to provide the purchaser with the desired apparatus in other ways, clarification of the purchaser's intent, and other questions can be resolved prior to the formal bid process. The meeting can often solve misunderstandings or problems prior to their occurrence. It also gives the prospective bidders an opportunity to inspect the apparatus scheduled for refurbishing prior to bidding.

B.1.2.5 With a performance specification, it is usually possible to obtain more favorable bids, because there is genuine competition and the specifications are not overly restrictive. The bid should be accompanied by a detailed description of the refurbished apparatus, a list of equipment to be furnished, and other construction and performance details, including, but not limited to, estimated weight, wheel base, principal dimensions, transmission, and axle ratios. The purpose of the contractor's specifications is to define what the contractor intends to furnish and deliver to the purchaser.

B.1.2.6 Refurbishers' proposals might include amendments and exceptions. Frequently, these changes are offered to meet price requirements or because individual refurbishers prefer to refurbish apparatus in a manner more convenient to them. If the intent of the original specification is not changed and the bid is favorable, the purchaser should consider accepting these amendments with the approval of the purchasing authority. On the other hand, extreme care should be taken to avoid allowing exceptions that merely devalue the apparatus and give one bidder an advantage.

B.1.2.7 The purchaser should study the proposals, look for deviations from the specifications, and obtain clarification where necessary. If the purchaser has specifically provided for alternatives when calling for bids, extra care should be exercised when evaluating the proposals as combinations of complicated bid information will need careful analysis. The financial arrangements, a delivery date, and the method of delivery should be stipulated and agreed to by the purchasing authority.

B.1.3 Awarding the Contract.

B.1.3.1 With the award of a contract, it is important for the purchasing authority to understand exactly who the contract is with and the nature of the relationship with the apparatus refurbisher.

B.1.3.2 Some purchasing authorities require a performance bond as part of the contract. A performance bond is a bond executed in connection with a contract that guarantees that the contractor will fulfill all of the undertakings, covenants, terms, conditions, and agreements contained in the contract. Should the contractor fail to meet the terms of the contract, the bonding company will be responsible for the difference in cost between the original contract price and the new price of the apparatus when it has to be supplied by another contractor.

B.1.3.3 Before signing a contract, the purchaser should make certain that the successful bidder has a complete and thorough understanding of the specifications. If there are any disagreements, these should be resolved in writing and made part of the contract. If any changes are agreed upon, they should be stated in writing and be signed by both parties. The contract should not be signed until the fire chief (or a designee) and the purchasing authority are satisfied.

B.1.4 Acceptance. When the refurbished apparatus is ready for delivery and acceptance, the purchaser has a responsibility to check the completed apparatus carefully against the specifications and contract to ensure all that is required is being delivered. Depending on the scope of the work, this can include witnessing any required acceptance tests and verifying that the gross vehicle weight and the axle weight distribution are within the chassis and axle ratings.

B.1.4.1 The purchaser also should arrange for any training specified as part of the delivery and ensure that it is properly provided.

B.1.4.2 Only when the purchaser is totally satisfied that the contract has been fulfilled should payment be authorized.

Appendix C Referenced Publications

C.1 The following documents or portions thereof are referenced within this standard for informational purposes only and are thus not considered part of the requirements of this standard unless also listed in Chapter 5. The edition indicated here for each reference is the current edition as of the date of the NFPA issuance of this standard.

C.1.1 NFPA Publication. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 1901, *Standard for Automotive Fire Apparatus*, 1999 edition.

C.1.2 Other Publication.

C.1.2.1 U.S. Government Publication. U.S. Government Printing Office, Washington, DC 20402.

Title 49, *Code of Federal Regulations*, Part 571, Federal Motor Vehicle Safety Standards (FMVSS), Sec. 571.7(e), "Combining New and Used Components."

FIGURE B.1 Apparatus Refurbishing Specification Form.

APPARATUS REFURBISHING SPECIFICATION FORM

PROCUREMENT ISSUES

Date of bid opening: _____

Purchaser's name and address: _____

_____

Contact name and telephone number: _____

Sealed bid envelope information, address, and identification marking: _____

_____

_____

The bidder is to honor the bid price for _____ days.

If interim inspection trip(s) to the contractor's facility are to be provided, indicate the number of trips _____ and number of participants _____ .

How many parts, service and operation manuals are to be provided? _____

Are complete or partial manuals required? ❑ Complete ❑ Partial

What type of manuals are to be provided? _____

_____

Where is the delivery of the apparatus to occur? _____

_____

_____

Where and when is the acceptance to occur? _____

_____

_____

Is operation and service training to be provided? ❑ Yes ❑ No

If so, it is to be conducted at _____

_____

for _____ persons for _____ days.

Specify details of any special payment plan or schedule required. _____

_____

_____

Is an approval drawing required? ❑ Yes ❑ No

Is a bid bond required? ❑ Yes ❑ No

What percent of the bid price? _____

Is a performance bond required? ❑ Yes ❑ No

What percent of the bid price? _____

If an extended warranty on specific components is required, indicate which components and the length of the warranty. _____

_____

_____

Is a warranty bond required? ❑ Yes ❑ No

In what amount? _____

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GENERAL REQUIREMENTS

Special design features required on this apparatus: _____

_____

_____

_____

Will apparatus operate "off paved roads" ? ❑ Yes ❑ No

Maximum elevation at which the apparatus will operate (if over 2000 ft): _____

_____

Maximum grade that apparatus will climb (if over 6 degrees): _____

_____

Specify the apparatus road performance if it is to exceed the minimum specified in this standard. _____

_____

_____

_____

Specify the apparatus maximum road speed. _____

Specify the minimum and maximum ambient air temperature at which the apparatus is expected to operate. _____

_____

HOSE THREAD SIZE INFORMATION

(Size and type of thread) (e.g., 2 ½ in. NH or 4 in. Storz)

1 in. =	1½ in. =
2 in. =	2½ in. =
3 in. =	3½ in. =
4 in. =	4½ in. =
5 in. =	6 in. =
Hydrant =	

TESTING AND ACCEPTANCE

If independent certification of tests is required for the pump system, aerial device, or other systems, what independent testing organization is to certify the tests? _____

_____

_____

Who is to perform the manufacturer's pre-delivery tests? _____

_____

_____

Where is the road test to be conducted? _____

_____

_____

What tests will the contractor be required to perform on delivery? _____

_____

_____

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Specify the fire station bay size, door size, floor weight-bearing capacity, approach angle, and distance from the door to the door to the opposite side of the street curb. _____

_____

_____

APPARATUS TYPE

❑ Pumper
❑ Initial attack apparatus
❑ Mobile water supply apparatus
❑ Aerial ladder or elevating platform apparatus
❑ Quint
❑ Special service apparatus
❑ Mobile foam apparatus
❑ Other _____

What functions or services is this apparatus to perform? _____

_____

_____

_____

SUCTION HOSE

Is suction hose required? ❑ Yes ❑ No New or existing? _____

Soft or hard: _____

Size and length: _____

Connection type and size: _____

Mounting arrangement, bracket style, and location: _____

_____

_____

GROUND LADDERS

Specify the ground ladders to be carried on the apparatus. New or existing? _____

Number and Length	Make, Model, Type	Mounting Location and Bracket Type

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BREATHING APPARATUS

Specify the Self-Contained Breathing Apparatus (SCBA) to be carried on the apparatus. New or existing?_____

Quantity	Make/Model	Mounting Location

Special requirements for breathing apparatus:_____

EQUIPMENT CARRIED ON APPARATUS

Miscellaneous equipment allowance if it exceeds the standard's minimum weight: _____ lb (*See Table 2.5.1.*)

Attach a list of equipment and tools to be supplied by the contractor with the apparatus stating the item, quantity, where it is to be mounted or carried, the weight of each item, and its dimensions (L × W × H).

Attach a list of equipment and tools to be supplied by the fire department to be carried on the apparatus stating the item, quantity, where it is to be mounted or carried, contractor's responsibility for mounting, the weight of each item, and its dimensions (L × W × H).

Attach a list of equipment and tools that may be carried on the apparatus in the future stating the item, quantity, the desired mounting location or compartment where it is likely to be carried, the weight of each item, and its dimensions (L × W × H).

Attach a list of fixed and permanent components required on the apparatus showing the item, quantity, weight of each, and dimensions (L × W × H), as well as the location where it is to be carried.

Indicate the reserve GAWR required on each axle (from 0 percent to 20 percent). _____

Indicate if reserve compartment space is required above what is necessary to store the equipment on the attached four lists. _____

CHASSIS AND VEHICLE COMPONENTS

Desired chassis make/model or style: _____

Specify the desired location of the engine. _____

Type of propulsion engine:_____

Is an electric fuel pump or re-priming pump required? ❑ Yes ❑ No

Special cooling system features:_____

Is a manual emergency engine shutdown required? ❑ Yes ❑ No

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Special lubricant, coolant, or fuel or air filters required: _____

_____

_____

_____

Specify the exiting location of the exhaust system. _____

_____

Indicate the type of brake system required. _____

_____

Is an anti-lock braking system (ABS) required? ❑ Yes ❑ No

Is an auxiliary brake system required? ❑ Yes ❑ No

Specify type. _____

_____

Indicate the style/type of tires required. _____

_____

_____

Indicate whether cast spoke, steel disc, or aluminum wheels are required. _____

_____

_____

Are rear fender liners required? ❑ Yes ❑ No

Are tire chains to be used? ❑ Yes ❑ No

Type of chains: _____

Specify angle of approach or departure if greater than 8 degrees. _____

Specify the steering axle's turn angle if it exceeds the minimum current NFPA 1901 requirements. _____

_____

_____

Specify if a drive axle traction control or no spin differential is required. _____

_____

Specify if rear wheel steering is required. _____

_____

Specify if a special suspension system is required front or rear. _____

_____

_____

Is an automatic or manual transmission required? _____

Indicate fuel tank capacity required. _____ gal (L) Location: _____

_____

Must tow hooks be accessible without opening compartment doors? ❑ Yes ❑ No

Is a rear license plate bracket and light required? ❑ Yes ❑ No

Specify cab trim features. _____

_____

_____

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LOW-VOLTAGE ELECTRICAL SYSTEMS AND WARNING DEVICES

Indicate whether an onboard or external battery charger or conditioner is to be provided and where located. _____

_____

_____

_____

If a battery charger or conditioner is required, indicate the required charging rate. _____

_____

Specify the location and type of receptacle. _____

_____

Is a second "battery on" pilot light on the outside of the vehicle required? ❑ Yes ❑ No

Where? _____

Is a dual battery system required? ❑ Yes ❑ No

Specify the electrical loads that are in addition to the minimum continuous electrical loads in the standard. _____

_____

_____

Specify the sequence of control for the automatic load management system if required. _____

_____

_____

_____

WARNING LIGHT INFORMATION

Location	Brand and Model	Color(s)
Front-facing cab lights		
Roof light		
Rear lights—upper		
Rear lights—lower		
Intersection lights		
Mid-body lights		

Specify the brand, model, capacity, and mounting locations of the siren(s) and speakers(s). _____

_____

_____

_____

Are air horns required? ❑ Yes ❑ No Location: _____

_____

If yes, specify type of control and its location. _____

_____

Are cab hand lights or mounted adjustable spotlights required? ❑ Yes ❑ No

Location(s): _____

_____

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Special lighting or warning features or equipment required: _____

_____

_____

Specify if additional work lighting is required and location(s) required. _____

_____

_____

Specify if additional driving or crew compartment lighting is required and location(s) required. _____

_____

_____

_____

DRIVING AND CREW COMPARTMENTS

Maximum number of fire fighters to ride in the apparatus: _____

Special seating requirements or arrangements: _____

_____

_____

Is a special hearing protection or communication system required? ❑ Yes ❑ No

Make, model, or type: _____

Special requirements: _____

_____

_____

Special arrangements for carrying tools or equipment within the driving or crew compartments and mounting locations:

_____

_____

Special step or handrail arrangements required and location(s): _____

_____

_____

If a tiller apparatus is to be provided, specify the type of communication system between the tiller operator and the apparatus driver. _____

_____

_____

Is a tilt or telescoping steering column required? _____

Specify any extra cab instrument panel features required. _____

_____

_____

Specify the type and style of driving compartment mirrors. _____

_____

_____

Specify any SCBA cab and crew area mounting requirements. _____

_____

_____

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BODY, COMPARTMENTS, AND EQUIPMENT MOUNTING

Body material: _____

_____

Compartment capacity, dimensions, or special features desired: _____

_____

_____

_____

Compartment floor material or slatted or plastic covering: _____

_____

Type and style of compartment doors: _____

_____

Specify the style of door latches, locks, or stays. _____

_____

_____

Specify the type and location of compartment lighting. _____

_____

_____

Miscellaneous body trim: _____

_____

Radio equipment to be used:

Type of mounting: _____

Desired location: _____

_____

Type of body tread plate material required: _____

_____

Type of step and platform material required: _____

_____

Color(s) of apparatus: _____

Striping and decoration: _____

_____

_____

Is cab and body rustproof treating required? _____

HOSE LOAD TO BE CARRIED FOR PRECONNECTED LINES

Length	Size	Location	Bed or Reel?

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HOSE LOAD TO BE CARRIED IN HOSE BED OR ON REELS

Length	Size	Location	Bed or Reel?

If hose bed cover(s) are desired, specify type. _____

_____

_____

Specify if the fire-fighting system is to be a slip-on. _____

_____

HOSE REEL(S)

Is a booster reel required? ❑ Yes ❑ No

How many reels? _____

Location: _____

_____

Hose size and length: _____

_____

Reel rewind type: _____

Piping to reel type: _____

_____

FIRE PUMP

Is a fire pump required? ❑ Yes ❑ No New or existing? _____

_____

Pump rated capacity: _____ gpm (L/min)

Number of pump stages required: _____

_____

Pump type: _____

Pump location: _____

Pump drive type: _____

_____

Pump testing authority: _____

_____

If pump and roll is required specify:

Flow: _____ gpm at _____ psi

Vehicle speed: _____ mph

Type of primer system: _____

_____

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Special pump performance requirements:

If altitude over 2000 ft, specify altitude. _____

If lift over 10 ft, specify lift. _____

If through more than 20 ft of suction hose, specify length. _____

Type of engine to drive pump if other than the propulsion engine: _____

_____

_____

Do local water conditions require special materials for pump construction and piping? _____

_____

_____

Is the intake relief valve to be panel adjustable? _____

Location of pump operator's panel: _____

Pump panel and gage panel material: _____

Type of intake and discharge valve controls desired: _____

_____

Specify the master gages size if other than the minimum in the standard. _____

_____

Specify the individual pressure gages size if other than the minimum in the standard. _____

_____

Are the pressures gages to be replaced or augmented by flow meters? _____

_____

Are any special gages, instruments, or features required at the pump operator's position? _____

_____

_____

Are special pump and piping features required to deal with extremely low temperatures? _____

_____

_____

Is a new pump pressure governor or a relief valve to be supplied? _____

_____

PUMP INLETS AND OUTLETS

Are special adapters or valves required on the main pump intakes? _____

_____

FIRE PUMP INLETS

Size	Type of Connection	Location	Valved? Y/N

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FIRE PUMP DISCHARGE OUTLETS

List the combination of 2½ in. or larger discharge outlets required to equal or exceed 100% capacity rating of the pump.

Quantity	Size	Type of Connection	Location	Flow Requirement

DISCHARGE OUTLETS FOR PRECONNECTED HOSE LINES

Quantity	Size	Type of Connection	Location	Flow Requirement

If a deck gun is required, indicate:

New or existing? _____ Type: _____

Mounting location: _____

Piping size and arrangement: _____

Is pump panel color coding required? ❑ Yes ❑ No

AUXILIARY PUMP

Is an auxiliary pump to be supplied? ❑ Yes ❑ No New or existing? _____

Type of auxiliary pump operations: _____

Auxiliary pump performance: _____

Auxiliary pump drive type: _____

Type of auxiliary pump: _____

Auxiliary pump location: _____

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Is the auxiliary pump to be tied/connected to the main fire pump? ❑ Yes ❑ No

Do local water conditions require special materials for pump construction and piping? ❑ Yes ❑ No

AUXILIARY PUMP INLET CONNECTIONS

Size	Type of Connection	Location	Valved? Y/N

AUXILIARY PUMP DISCHARGE OUTLET CONNECTIONS

Quantity	Size	Type of Connection	Location	Flow Requirement

Where are the auxiliary pump controls to be located? _____

TRANSFER PUMP

Is a new or existing transfer pump to be supplied? _____

Pump size: _____

Pump stages: _____

Pump type: _____

Pump location: _____

Pump drive type: _____

Pump testing authority: _____

Special pump performance requirements:

If altitude over 2000 ft, specify altitude. _____

If lift over 10 ft, specify lift. _____

If through more than 20 ft of suction hose, specify length. _____

Type of engine to drive pump if other than the propulsion engine: _____

Do local water conditions require special materials for pump construction and piping? ❑ Yes ❑ No

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Location of pump operator's panel: _____

_____

Pump panel and gage panel material: _____

_____

Type of intake and discharge valve controls desired: _____

_____

Is the master pump gage to be a different size from the minimum in the standard? ❑ Yes ❑ No

If so, what size? _____

What additional gages, flow meters, instruments, or features are required at the pump operator's position? _____

_____

_____

Are special pump and piping features required to deal with extremely low temperatures? ❑ Yes ❑ No

Specify details. _____

_____

TRANSFER PUMP INLET CONNECTIONS

Size	Type of Connection	Location	Valved? Y/N

TRANSFER PUMP DISCHARGE OUTLET CONNECTIONS

Quantity	Size	Type of Connection	Location	Flow Requirement

WATER TANK

Is a new or existing water tank to be provided? _____

Water tank capacity: _____

Is a foam cell required? ❑ Yes ❑ No Location? _____

_____

Tank construction material and coating: _____

_____

Location of additional fluid level indicators: _____

_____

Type of fluid level indicators: _____

_____

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