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# AUTOMOTIVE FIRE APPARATUS 1975



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**See Inside Back Cover for Official NFPA Definitions**

SC-FM-75

**Standard for**  
**Automotive Fire Apparatus**

**NFPA 1901 — 1975**

**1975 Edition of NFPA 1901**

The 1975 edition of the Standard for Automotive Fire Apparatus was adopted by the National Fire Protection Association at the NFPA Fall Conference, November 18, 1975, on recommendation of the Committee on Fire Department Equipment.

**Origin and Development of NFPA 1901**

A detailed history of this standard is included in the Appendix and can be found on pages 98-99. This text is included in the National Fire Codes.

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**Standard for**  
**Automotive Fire Apparatus**

**NFPA No. 1901 — 1975**

**FOREWORD**

NFPA No. 1901, *Automotive Fire Apparatus*, is a standard presented in a form which may serve as the technical section of a complete specification for purchasing fire apparatus. The fire chief should consult his municipal attorney, engineer, and other appropriate officials for information pertaining to other specification sections such as: Information to Bidders, Special Conditions, General Conditions, Contract Form, Subcontracts, Departure from Contract, Abandonment of Contract, Proposal Form, and Bond Forms and Contractual Liabilities.

This Standard is prepared on a performance basis by the Committee on Fire Department Equipment of the National Fire Protection Association. The Standard is subject to review and revision as necessary, with all proposals for revision being considered by the entire committee. Revisions must be approved by the committee and by the membership of the NFPA at its annual meeting. All interested parties are encouraged to submit suggestions for improving the Standard.

Officials are urged to plan for systematic replacement of fire apparatus as necessary to combat obsolescence, parts replacement difficulties, increased maintenance costs, and to take advantage of improvements in fire department equipment. Emergency service adequacy and reliability should govern judgment.

It will be necessary for each purchaser to evaluate individual need, and use Special Provisions to adapt the basic standards to the intended class of service and operating conditions.

In addition to this Standard on Automotive Fire Apparatus, the NFPA Committee on Fire Department Equipment has published reports on the performance of various nozzles and in conjunction with other committees prepared the following Standards.

Officials are urged to use these publications when purchasing new equipment.

No. 194. Screw Threads and Gaskets for Fire Hose Connections.

No. 196. Fire Hose.

No. 198. Care of Fire Hose.

No. 1904. Testing, Maintenance and Use of Fire Department Aerial Ladders and Elevating Platforms.

No. 1921. Fire Department Portable Pumping Units.

No. 1931. Fire Department Ground Ladders.

## Chapter 1 Provisions Applying to All Types of Apparatus

### 1-1 General.

#### 1-1.1 Responsibility of Contractor.

**1-1.1.1** The manufacturer shall supply at time of delivery at least two copies of a complete operation and maintenance manual covering the completed apparatus as delivered, including but not limited to the truck, pump, wiring and piping diagrams, lubrication charts and fire fighting equipment.

**1-1.1.2** Responsibility for the apparatus and equipment shall remain with the manufacturer until the satisfactory completion of acceptance tests and formal acceptance by the purchaser.

NOTE: Purchaser shall specify method of delivery in Special Provisions.

**1-1.1.3** A qualified and responsible representative of the manufacturer shall deliver the apparatus and remain in the community purchasing the equipment for a sufficient time, normally three days, to instruct fire department personnel in the operation, care and maintenance of the equipment delivered.

#### 1-1.2 Design. (See A-1-1.2.)

**1-1.2.1** The apparatus shall be constructed with due consideration to the nature and distribution of the load to be sustained and to the general character of the service to which the apparatus is to be subjected when placed in service. All parts of the apparatus shall be strong enough to withstand the general service under full load. The apparatus shall be so designed that the various parts are readily accessible for lubrication, inspection, adjustment and repair.

NOTE (1). Where fire apparatus may have to operate off paved roadways, and a two-speed rear axle and/or auxiliary transmission or automatic transmission are desired, purchaser shall indicate in Special Provisions. (See A-1-1.4.1.)

NOTE (2). Where the apparatus is required to operate on any grade in excess of 10 percent, the purchaser shall indicate the maximum percent of grade in Special Provisions. (See A-11-1.1.2.)

**1-1.2.2** The apparatus shall comply with all applicable motor vehicle laws in effect at date of contract for purchase.

**1-1.2.3** Where special tools, which are not normally used or available, are required to service any components of the apparatus built or supplied by the manufacturer, such tools shall be provided with the apparatus.

**1-1.2.4** Each bid shall be accompanied by a detailed description of the apparatus and equipment which it is proposed to furnish and to which the apparatus furnished under the contract shall conform. The purpose of these specifications is to cover the furnishing and delivering to the purchaser of a complete and soundly engineered apparatus equipped as hereinafter specified. Minor details of construction and materials, where not otherwise specified, are left to the discretion of the contractor who shall be solely responsible for the design and construction of all features.

**1-1.2.5** Each bidder shall provide accurate written specifications on the vehicle bid, including but not limited to weight, wheelbase, principal dimensions, transmission and axle ratios and a certified brake horsepower curve showing maximum no-load governed speed.

**1-1.2.6** The word "gallon" where used in these specifications shall mean a U.S. gallon. (The Imperial gallon used in Canada contains approximately 1.2 U.S. gallons.)

### **1-1.3 Carrying Capacity. (See A-1-1.3.)**

**1-1.3.1** It shall be the responsibility of the manufacturer to provide GAWR and GVWR adequate to carry a 1,200 lb. personnel weight, a full water tank, the specified hose load, and a miscellaneous equipment allowance as shown in the table below.

Pumpers and water towers..... 1000 lbs.

Aerials and elevating platforms — ground  
ladders plus.....2500 lbs.

NOTE (1). If heavier equipment loads are desired, purchaser shall specify in Special Provisions.

NOTE (2). Apparatus shall be weighed to determine compliance with these provisions.

NOTE (3). Apparatus and/or chassis manufacturers are required to furnish certifications of GVWR and GAWR on a name plate affixed to the vehicle.

NOTE (4). When selecting chassis for fire apparatus it is recommended that optional heavy-duty axle equipment available from chassis manufacturers be specified when necessary to meet the requirements of this Section.

### **1-1.4 Engine Designs.**

**1-1.4.1** The engine shall be either gasoline or diesel type.  
(See A-1-1.4.1.)

NOTE (1). Purchaser shall indicate any preference in Special Provisions.

NOTE (2). The power generated by internal combustion engines may decrease with altitude increase. The loss varies with the type of engine and/or fuel and the amount of air inlet supercharging. The purchaser shall indicate in the Special Provisions the maximum elevation at which the apparatus is expected to perform if this exceeds 2,000 feet above sea level.

NOTE (3). If the engine meets the intent of this Standard, fuels other than gasoline or diesel shall be acceptable.

**1-1.4.2** An engine governor shall be installed which will limit the speed of the engine under all conditions of operation to that speed established by the engine manufacturer; this shall be the maximum no-load governed speed. (*See A-1-1.4.2.*)

**1-1.4.3** Automatic engine shut down systems shall not be provided. (*See A-1-1.4.3.*)

### **1-1.5 Cooling System.** (Gasoline or Diesel)

**1-1.5.1** The cooling system of the engine shall be pressurized and shall be adequate to maintain a temperature of the coolant in the engine not in excess of the engine manufacturer's maximum temperature rating. (*See 3-3.3.2 and 5-3.3.2.*)

NOTE (1). A coolant conditioner may be desirable. If specified, the conditioner should be of a type approved by the engine manufacturer and purchaser shall indicate in Special Provisions.

NOTE (2). Radiator sight gages may be desirable where available. If sight gages are desired, the purchaser shall specify in Special Provisions.

**1-1.5.2** Adequate and readily accessible drain cocks shall be installed at the lowest point of the cooling system and at other such points as are necessary to completely remove water from the system. These cocks shall be so designed as not to open accidentally due to vibration.

**1-1.5.3** The radiator shall be so mounted as not to develop leaks due to ordinary running and operating nor be twisted or strained when the apparatus operates over uneven ground. Radiator cores shall be compatible with commercial anti-freeze solutions and of straight tube construction for easy mechanical maintenance. (*See A-1-1.5.3.*)

NOTE: Climatic conditions may indicate that automatic radiator shutters are desirable. Where automatic radiator shutters are provided, fail-safe features and/or manual controls shall be incorporated. If automatic radiator shutters are desired, purchaser shall specify in Special Provisions.

### **1-1.6 Lubrication System.** (Gasoline or Diesel)

**1-1.6.1** The engine shall be provided with a replaceable element oil filter of the type approved by the engine manufacturer. (*See A-1-1.6.1.*)

**1-1.6.2** The engine oil fill pipe shall be large enough and so located as to permit easy filling.

### **1-1.7 Fuel System. (Gasoline or Diesel)**

**1-1.7.1** A dry type or oil bath air filter shall be provided. Air inlet restrictions shall meet the engine manufacturers recommendations. Air inlet shall be so protected as to prevent water from entering.

**1-1.7.2 (GASOLINE ENGINES ONLY)** Fuel lines and filters and/or strainers of an accessible and serviceable type, as recommended by the engine manufacturer, shall be provided. The filters or strainers shall be of a type which can be serviced without disconnecting the fuel line. Where two or more fuel lines are installed, separate fuel pumps operating in parallel with suitable check valves and filtering devices shall be provided. The fuel line(s) shall be so located or protected as not to be subjected to excessive heating from any portion of the vehicle exhaust system. The line(s) shall be protected from mechanical injury. Suitable valves and drains shall be installed. The carburetor(s) of a gasoline engine shall be nonadjustable, with the exception of the idle setting, of sufficient size to develop the rated power, and so located as not to be subjected to pocketing of vapor or excessive heating. A manual or automatic choke shall be provided. The gasoline feed system shall include an electrically operated fuel pump located within or adjacent to the fuel tank. (See A-1-1.7.3.)

**1-1.7.3 (DIESEL ENGINES ONLY)** The fuel system shall be of the commercially accepted injector type supplied by the engine manufacturer and shall be of sufficient size to develop the rated power. In addition to the normal shutoff switch, the engine shall be provided with an emergency shutoff which can be activated in an emergency to shut off the fuel and/or air supply to the engine in the event of runaway. This switch must be provided with a guard. The emergency shutoff shall include a provision to prevent the restarting of the engine after use without a special reset procedure. Provisions shall be made to rapidly reprime after filters are cleaned. (See A-1-1.7.3.)

**NOTE (1).** An electric fuel pump could serve for reprime. If an electric fuel pump is desired, purchaser shall indicate in Special Provisions.

**NOTE (2).** To prevent engine shut down due to fuel contamination, dual fuel filters in parallel, with proper valving so that each filter can be used separately, may be desired. If dual filters are desired, purchaser shall specify in Special Provisions.

**1-1.7.4** The fuel tank shall be of corrosion-resistant material and of not less than 20 gallons capacity. The capacity for apparatus with pumping equipment shall be of a size which shall permit the operation of the pumping engine for not less than two hours when operating at rated pump capacity. All joints shall be lock seamed and soldered, brazed, welded, or riveted and soldered. One or more swash partitions shall be installed. A suitable vent opening and means for draining directly from the tank shall be provided. The tank fill opening shall be not less than 1½ inches in diameter and shall be conspicuously labeled as to the type of fuel used. If the fuel tank is located above the level of the carburetor (gasoline engine) or fuel pump (diesel engine), an automatic means shall be provided to prevent fuel flow when the engine is shut down. The intake to the fuel system shall be at least a half inch above the bottom of the tank.

**NOTE:** A large capacity fuel tank is recommended when apparatus is designed for rural use. The purchaser shall indicate the desired capacity in Special Provisions.

**1-1.7.5** Tank and fill piping shall be so placed as to be protected from mechanical injury, and not be exposed to heat from exhaust or other source of ignition. Tank shall be so placed as to be easily removable for repairs.

**1-1.7.6** Only one fuel tank is to be furnished. The fuel gage installed shall indicate the proportionate amount of fuel in the tank system at any time. (*See A-1-1.7.6.*)

**NOTE:** If specified fuel tank capacity exceeds 50 gallons, dual fuel tanks should be installed, and if so, should be piped into a mutual feed line to fuel pump with check valves in each line from each tank. If such dual tank arrangement is desired, purchaser shall indicate in the Special Provisions.

### **1-1.8 Exhaust System. (Gasoline or Diesel)**

**1-1.8.1** The exhaust piping and discharge outlet shall be so located as to not expose any portion of the apparatus or equipment to excessive heating. Exhaust pipe discharge shall not be directed toward the pump operator's position. Silencing devices shall be provided. Exhaust back pressure shall not exceed the limits specified by the engine manufacturer. Where parts of the exhaust system are exposed in a manner where they are likely to cause injury to operating personnel, suitable protective guards shall be provided. (*See A-1-1.8.1.*)

## 1-2 Electrical System and Devices.

### 1-2.1 General.

**1-2.1.1** Alternator, starting device, ignition, distributors, ignition coils, and magneto shall be of moisture resistant type, accessibly mounted and protected against excessive heat.

**1-2.1.2** All electrical circuit wiring shall be made with stranded conductors of a carrying capacity commensurate with the anticipated maximum circuit loading. Insulation shall be in accordance with or superior to the recommended standards of the Society of Automotive Engineers for such loading at the potential employed. Overall covering of conductors shall be of moisture resistant type. All connections shall be made with lugs or terminals mechanically secured to the conductors. Wiring shall be thoroughly secured in place and suitably protected against heat, oil and physical injury where required.

**1-2.1.3** Circuits shall be provided with suitable overload protective devices. Such devices shall be readily accessible and protected against excessive heat, physical injury and water spray.

### 1-2.2 Power Supply.

**1-2.2.1** An electric alternator shall be provided.

It shall have an output adequate to meet the anticipated electrical load and be provided with full automatic regulation. (*See A-1-2.2.1.*)

**NOTE (1).** In view of the increasing use of power consuming devices on apparatus, the provision of alternator and rectifier equipment of sufficient output is strongly recommended. If 110-volt power is required, a separate 3-phase transformer and rectifier unit shall be provided in connection with the alternator to produce 110 volts d.c. at special outlets. Portable tools and other electrically driven equipment supplied from these outlets should be designed for d.c. operation, or with universal motors designed for use with either a.c. or d.c. current. Where either heavy-duty, or an appreciable number of electrically driven appliances are to be carried on apparatus, it is recommended that a portable a.c. generator of sufficient output be provided. If such equipment is desired, purchaser shall indicate that such equipment is desired and state the required output and the number of outlets to be provided in Special Provisions.

**NOTE (2).** Caution — with increased usage of electrical power plants, extreme caution should be exercised in use of power transmission and consuming devices as a rubber-tired vehicle is not normally grounded and any electrical malfunction could transmit an electrical shock to a person standing on the ground using electrical devices or in contact with the vehicle.

**1-2.2.2** When receptacles or other facilities providing 110-volt a.c. or d.c. power are installed, such receptacles or other fa-

cilities shall be of weatherproof type and all circuits or associated wiring shall have, at the source of 110-volt supply, overload protection rated at the carrying capacity of the conductor.

### 1-2.3 Batteries.

**1-2.3.1** Batteries shall be securely mounted and adequately protected against physical injury, water spray and engine and exhaust heat. If an enclosed battery compartment is provided, it shall be adequately ventilated and the batteries be readily accessible for examination, test and maintenance. (See A-1-2.3.1.)

**1-2.3.2** Battery capacity shall be commensurate with the size of the engine and the anticipated electrical load. Capacity shall be not less than 120 ampere-hour rating at a 20-hour discharge rate for gasoline engines and 200 ampere-hour rating at a 20-hour discharge rate for diesel engines using 12-volt starting system. When a dual battery system is supplied, each battery shall be of the capacity required for a single battery system. One or more polarized receptacles shall be provided for charging all batteries. (See A-1-2.3.2.)

NOTE (1). Dual batteries are recommended, with suitable switching arrangements by which:

Either battery may be used:

- (a) for ignition and lights alone,
- (b) for starting alone,
- (c) for starting, ignition, and lighting.

Both batteries may be used simultaneously in starting.

Neither the lighting wiring nor the ignition wiring shall be connected to both batteries except when both starter switches are operated.

The generator, or alternator, shall be connected to supply the battery which is being used for ignition and lights.

NOTE (2). Where dual batteries or higher amperage batteries are desired, purchaser shall indicate in Special Provisions.

### 1-2.4 Starting Device.

**1-2.4.1** An electrical starting device shall be provided. Its characteristics shall be such that when operating under maximum load, the current draw does not introduce a voltage drop sufficient to adversely affect function of the ignition system.

### 1-2.5 Ignition System. (Gasoline Engine)

**1-2.5.1** Ignition shall be of the battery supplied distributor and coil type.

NOTE: If a dual ignition, with two sets of spark plugs and a switching arrangement which shall permit either or both sets of plugs to be fired is desired, purchaser shall indicate in Special Provisions.

**1-2.5.2** The ignition switch shall be provided with a pilot light and the ignition key, if any, shall not be removable.

**1-2.5.3** Ignition distributors or magnetos, if not fully automatic for proper spark advance, shall be provided with manual control.

### **1-2.6 Lights and Devices.**

**1-2.6.1** The rear stop, tail and directional lights shall be so mounted that they will not be obscured by equipment and men normally carried on the rear step. A red flashing light or lights visible through 360 degrees in a horizontal plane shall be installed. Lights shall comply with Federal Standards as a minimum.

Apparatus shall have hooded lights, with individual switches, providing illumination of the pump operating panel, tool and equipment compartments, steps and walkways. Switches shall be conveniently located.

**NOTE:** It is highly desirable to provide a universal mounted floodlight system. Where desired, purchaser shall indicate in Special Provisions.

**1-2.6.2** Audible warning equipment in the form of one automotive horn and one electric or electronic siren shall be provided. Control for operating the siren shall be provided for the right and left front seat positions.

**NOTE:** Where other signal devices such as additional siren, bell, air horn, buzzer, back-up alarm and/or lights are desired, purchaser shall indicate in Special Provisions.

### **1-3 Vehicle Components.**

#### **1-3.1 Braking System.**

**1-3.1.1** Service and parking brakes shall be independent and separate systems. All brakes shall be readily accessible for adjustment. (*See A-1-3.1.1.*)

**1-3.1.2** The service brake application valve shall, when applied, operate all the service brakes on the vehicle or combination of vehicles.

**NOTE:** Where air-actuated brakes are desired, as recommended in A-1-3.1.2, purchaser shall indicate in Special Provisions. Automatic moisture ejectors are recommended.

**1-3.1.3** Parking brakes shall control the rear wheels, or all wheels, and shall be of positive, mechanically actuated type with provision for securely holding in position when applied. Neither a lock-up device to retain applied pressure on hydraulic-actuated service brake systems nor a "Park" position on an automatic

transmission as a substitute for a separate parking brake system is acceptable. (See A-1-3.1.3.)

NOTE: The purchaser shall indicate maximum grade requirement for the parking brake system in Special Provisions.

**1-3.1.4** Brake performance shall comply with applicable regulations. However, as a minimum requirement, service brakes shall be capable of bringing the fully laden apparatus to a complete stop from an initial speed of 20 miles per hour in a distance not exceeding 30 feet by actual measurement on a substantially hard surface road that is free from loose material, oil or grease.

### **1-3.2 Suspension and Wheels.**

**1-3.2.1** Wheels shall be of the metal spoke or disc type.

**1-3.2.2** Front tires shall be single and rear tires single or dual. All tires shall be of pneumatic truck type.

**1-3.2.3** Each load-bearing tire and rim of the apparatus shall carry a weight not in excess of the recommended load for intermittent operation for truck tires or the size used, as published by the Tire and Rim Association, Inc., Akron, Ohio, or the tire manufacturer's published rating, when apparatus is loaded as indicated in Section 1-1.3.1. Compliance shall be determined by weighing of the load supported by the tires or each axle, all movable load to be located as it would be in service.

**1-3.2.4** Axle housings shall clear road surface at least 8 inches.

**1-3.2.5** An angle of departure of at least 8 degrees shall be maintained at the rear of the vehicle when normally loaded as indicated in Section 1-1.3.1. (See A-1-3.2.5.)

NOTE: Where road inclinations are such that a greater angle of departure is necessary, purchaser shall indicate in Special Provisions.

**1-3.2.6** Fenders and guards shall be braced and firmly secured.

NOTE: Proper clearance shall be provided for chains. Single chains for outside dual rear wheels are recommended. Where chains are desired, purchaser shall indicate in Special Provisions.

**1-3.2.7** The steering mechanism for nondriving front axles shall be capable of turning the front wheels to an angle of at least thirty degrees to either right or left. Power or power assist steering shall be provided on all fire apparatus with a front axle rating (GAWR) over 9000 pounds.

**1-3.2.8** The transmission and clutch shall be of such type as to operate smoothly and effectively under all conditions of service.

NOTE: Where automatic transmission is desired, purchaser shall indicate in Special Provisions. (See A-1-3.2.8.)

### **1-3.3 Body.**

**1-3.3.1** The apparatus body design shall be rugged with suitable ventilation and drains where needed and with good visibility to front, sides, and rear. Bodies shall provide readily accessible facilities for carrying hose, appliances and equipment, and riding space for the men.

**1-3.3.2** Front and rear hooks or rings shall be attached to the frame structure to permit ready towing of the apparatus and/or for towing other apparatus.

**NOTE:** Where hooks and/or rings are to be so located that their use does not require opening compartment doors, purchaser shall indicate in Special Provisions.

**1-3.3.3** A heavy-duty bumper shall be provided on the front of the chassis and the bumper mounting brackets shall be attached to the frame.

**1-3.3.4** Suitable holders, boxes, compartments, or other attachments shall be provided for all tools, equipment, play-pipes, and other items which the purchaser desires to carry on the apparatus. (*See Chapter 10.*) Equipment holders shall be firmly attached, and so designed that equipment will remain in place under all running conditions and permit quick removal for use.

**NOTE (1).** Where equipment other than that purchased with the vehicle must be mounted, the purchaser shall indicate in Special Provisions.

**NOTE (2).** The purchaser shall indicate the space or compartment desired for the installation of radio equipment in Special Provisions.

**NOTE (3).** Size and location may be critical depending on the nature of the radio equipment. Suitable shielding shall be specified as necessary to permit radio operation without undue interference in Special Provisions.

**1-3.3.5** All steps shall be suitably braced and be of heavy gage metal with nonskid safety surface. Minimum width of rear steps shall be 18 inches measuring from the back of the body. Rear steps shall not be required on aerial ladder trucks. (*See A-1-3.3.5.*)

**1-3.3.6** Handrails shall be between one inch and one and five-eighths inches in outside diameter heavy metal chrome plated or stainless steel tubing and shall be so arranged as to avoid snagging of the hose or equipment. The minimum clearance between handrails and any surface shall not be less than two inches.

### **1-3.4 Driving Compartment.**

**1-3.4.1** An enclosed driving compartment with seating capacity for not less than two persons shall be provided.

NOTE (1). Where a semicab is desired, the purchaser shall indicate in Special Provisions.

NOTE (2). Where additional seating capacity is desired, purchaser shall indicate in Special Provisions.

**1-3.4.2** Driver's seat shall be readily adjustable by the driver, adjustment range to be not less than three inches front to rear.

NOTE: It is desirable that a separate seat be provided for driver. Where desired, purchaser shall indicate in Special Provisions.

**1-3.4.3** A speedometer/odometer shall be provided. An odometer or recording device shall be provided to register total engine operation.

## **1-4 Metal Finish and Painting.**

### **1-4.1 Metal Finish.**

**1-4.1.1** All bright fittings shall be heavily plated with chromium. Iron fittings which are to be chromium plated shall first be copper plated.

### **1-4.2 Painting.**

**1-4.2.1** All exposed ferrous metal surfaces not chrome plated or stainless steel shall be thoroughly cleaned and prepared and shall be painted "fire department red." Base coats shall be thoroughly brushed in or sprayed on. All irregularities in painted surfaces shall be rubbed down before the application of the finishing coats. (See A-1-4.2.1.)

NOTE (1). Where undercoating is desired, the purchaser shall indicate in Special Provisions.

NOTE (2). Where a different color is desired, purchaser shall indicate in Special Provisions.

NOTE (3). Striping and decorating shall be in keeping with the lettering. The purchaser shall indicate the lettering in Special Provisions.

## **1-5 Special Provisions.**

NOTE: The preceding Articles of this chapter and each following chapter contain the minimum essential features necessary to provide a piece of fire apparatus which will be safe and serviceable. However, it is recognized that many purchasers will desire additional features of operation over and above the minimum essentials. Some of these optional features

are recognized in the various Articles by reference to the purchaser specifying in Special Provisions that they be installed. The last Article in each chapter contains a reference list of these recognized features; the purchaser is expected to attach a list of the features he desires, including any other features or restrictions not specifically mentioned, to the body of the Specifications.

- Delivery instruction 1-1.1.2
- Special power train 1-1.2.1
- Maximum grade 1-1.2.1
- Heavier loads 1-1.3.1
- Gasoline or diesel power 1-1.4.1
- Altitude of delivery 1-1.4.1
- Coolant conditioner 1-1.5.1
- Sight gages 1-1.5.1
- Automatic radiator shutters 1-1.5.3
- Electric fuel pump 1-1.7.3
- Fuel tank capacity 1-1.7.4
- Dual fuel tanks 1-1.7.6
- Alternator; receptable outlets 1-2.2.1
- Dual or high amperage batteries 1-2.3.2
- Dual ignition 1-2.5.1
- Mounted floodlight system 1-2.6.1
- Additional signal devices 1-2.6.2
- Air brakes 1-3.1.2
- Braking performance 1-3.1.3
- Angle of departure 1-3.2.5
- Tire chains 1-3.2.6
- Automatic transmission 1-3.2.8
- Tow rings or eyes location 1-3.3.2
- Equipment space and mounting 1-3.3.4
- Radio compartment 1-3.3.4
- Special cab design 1-3.4.1
- Additional seating capacity 1-3.4.1
- Separate driver's seat 1-3.4.2
- Undercoating 1-4.2.1
- Color 1-4.2.1
- Lettering 1-4.2.1
- Dual fuel filters 1-1.7.3

## Chapter 2 Definitions

Unless expressly stated elsewhere, the following terms will, for the purposes of this standard, have the meanings indicated below.

*Angle of Departure* — means the angle made between the road surface and the line drawn from the rear point of ground contact of the rear tire to any sprung projection of the truck behind the rear axle.

*Compound Gage* — means a gage reading pressure from 0 to maximum in pounds per square inch and vacuum from 0 to 30 inches of mercury (Hg).

*Gallons* — means United States gallons.

*GPM* — means gallons per minute.

*Gross Axle Weight Rating (GAWR)* — means the value specified by the vehicle manufacturer as the loaded weight on a single axle system measured at the tire-ground interfaces.

*Gross Combination Weight Rating (GCWR)* — means the value specified by the manufacturer as the loaded weight of a combination vehicle, such as a tractor-trailer unit.

*Gross Vehicle Weight Rating (GVWR)* — means the value specified by the manufacturer as the loaded weight of a single vehicle which is the sum of the weights of the chassis, body, cab, equipment, water, fuel, crew, and all other load.

*Ladder Truck* — means a truck carrying at least the standard amount of ground ladders. When equipped with an aerial ladder it shall be known as an aerial ladder truck, and when equipped with an elevating platform shall be known as an elevating platform truck. If equipped with a water tower it shall be known as a ladder truck equipped with a water tower.

*PSI* — means pounds pressure per square inch.

*PSIG* — means gage pressure in pounds per square inch (pressure above atmospheric pressure).

## Chapter 3 Provisions Applying to Apparatus Equipped with a Fire Pump

### 3-1 Design and Performance Requirements.

#### 3-1.1 Capacity.

**3-1.1.1** The rated capacity of the fire pump shall be 500, 750, 1,000, 1,250, 1,500, 1,750, or 2,000 gpm. (See A-3-1.1.1.)

**NOTE (1).** The purchaser shall indicate the desired capacity in Special Provisions.

**NOTE (2).** Where pump is expected to deliver rated capacity and pressure at an elevation of over 2,000 feet, the purchaser shall indicate the altitude, and the maximum lift, if rated capacity is to be pumped from draft, in Special Provisions. (See A-3-1.1.1.)

**NOTE (3).** Where the pump is expected to deliver rated capacity at lifts greater than 10 feet and/or through more than 20 feet of suction hose, the purchaser shall indicate in Special Provisions. (See A-3-1.1.1.)

**3-1.1.2** The pump provided shall deliver the percentage of the rated capacity shown below at the pressures indicated:

100 percent of rated capacity at 150 psi net pump pressure.

70 percent of rated capacity at 200 psi net pump pressure.

50 percent of rated capacity at 250 psi net pump pressure.

#### 3-1.2 Suction Capability.

**3-1.2.1** When dry, the pump, in both parallel and series operation (where pumps are of parallel-series type), shall be capable of taking suction and discharging water with a lift of 10 feet in not more than 30 seconds through 20 feet of suction hose of appropriate size, and not over 45 seconds for pumps of 1,500 gpm or larger capacity.

**3-1.2.2** The pump shall be capable of delivering the rated capacity at draft, at lifts up to 10 feet at any altitude under 2,000 feet above sea level, with 20 feet of suction hose with strainer attached; the suction hose to be as indicated below:

| <b>Rated Capacity<br/>(gpm)</b> | <b>Size<br/>(I.D., in.)</b> | <b>Number of<br/>Inlets Used</b> |
|---------------------------------|-----------------------------|----------------------------------|
| 500                             | 4                           | 1                                |
| 750                             | 4½                          | 1                                |
| 1,000                           | 5                           | 1                                |
| 1,250                           | 6                           | 1                                |
| 1,500                           | 6                           | 1 or 2                           |

**NOTE:** Where the purchaser desires the apparatus to be capable of meeting the test conditions for 1,500 gpm and larger pumps with the suction lines attached to the pumper from one side of the apparatus only, purchaser shall indicate in Special Provisions.

### 3-1.3 Engine Capability.

**3-1.3.1** The engine shall be capable of performing the pumping tests herein specified without exceeding the maximum no-load governed speed of the engine as shown on a certified brake horsepower curve of the type of engine used without accessories; the certification shall be by a responsible official of the engine manufacturer.

**3-1.3.2** The engine shall demonstrate its ability to deliver rated pump capacity at 165 psi net pump pressure. (*See 1-1.4.2.*)

## 3-2 Construction Requirements.

### 3-2.1 Pump.

**3-2.1.1** The fire pump shall be of the centrifugal type. It shall be carefully designed in accordance with good practice. The suitability of the materials used, the proportions of parts and waterways, clearances, absence of air pockets and flat surfaces under pressure, and freedom from vibration and pulsation of water pressure when running at all speeds will be considered in judging the acceptability of the design. Where an all bronze pump is specified, nonferrous piping and valves shall have corrosion resistance equal or superior to that of the pump. (*See A-3-2.1.1.*)

**NOTE (1).** The purchaser shall indicate whether nonferrous piping and valves shall be provided in Special Provisions.

**NOTE (2).** Where either a separate engine driven pump or front mounted pump is desired, the purchaser shall indicate in Special Provisions.

**NOTE (3).** Where pump is to be other than centrifugal, purchaser shall indicate in Special Provisions.

**NOTE (4).** The purchaser shall indicate whether a single or multistage centrifugal pump is desired in Special Provisions.

**NOTE (5).** Where an all bronze pump is desired, purchaser shall indicate in Special Provisions.

### 3-2.2 Pump Connections.

**3-2.2.1** At least one suction inlet of the same or larger size as the hose specified in Section 3-1.2.2 shall be provided. The number and location shall be such as to provide easy connection for drafting or hydrant operations.

**NOTE (1).** Additional pump suction inlets may be desired at the front or rear of the apparatus. Where auxiliary front and/or rear inlets are provided, it should be recognized that they may be less effective than side suction.

NOTE (2). If hose smaller than the size specified in Section 3-1.2.2 is to be carried on the apparatus and used with the pump, suitable adapters shall be provided on the suction inlets. Where hose larger than the size specified is desired, purchaser shall indicate in Special Provisions.

**3-2.2.2** Suction inlets shall have a removable or accessible strainer provided inside each external inlet.

**3-2.2.3** At least one gated suction inlet shall be provided. The minimum nominal size shall be 2½-inch (3-inch or 3½-inch may be substituted). If only one large suction inlet is provided, the gated inlet shall be independent. Connection to the pump shall be at least as large as the nominal size of the inlet. Where female threaded inlets vary from National (American) Standard, an adapter to National (American) Standard shall be provided.

NOTE (1). A second 2½-inch gated suction inlet is desirable especially where a pump is provided on an aerial ladder truck or elevating platform apparatus to boost pressure to a ladder pipe or elevated nozzle; where desired, purchaser shall indicate in Special Provisions.

NOTE (2). Where gated inlet sizes larger than 2½-inch are desired, purchaser shall indicate in Special Provisions.

NOTE (3). Where any gated suction inlets are to be controllable at the pump operator's position, purchaser shall indicate in Special Provisions.

NOTE (4). Where bleed-off connection is desired on gated inlet, purchaser shall indicate in the Special Provisions.

**3-2.2.4** When a water tank is installed on the vehicle, the tank shall be connected to the suction side of the pump with valve controllable at the pump operator's position, unless a separate booster pump is provided for tank service. (See 6-1.2.3, Note 2.)

NOTE: Where a check valve is desired in the tank-to-pump line, purchaser shall indicate in the Special Provisions. (See A-3-2.2.4.)

**3-2.2.5** All outlets shall have National (American) Standard fire hose coupling threads. Adapter couplings, securely attached, shall be provided on each outlet if local couplings are not National (American) Standard. (See NFPA Standard No. 194—*Screw Threads and Gaskets for Fire Hose Connections*.) All outlets to which 2½-inch or larger hose may be connected shall be equipped with discharge valves which can be opened and closed smoothly and readily with the handles provided and under all rated pressures. The valves shall be capable of being locked in any position. One such outlet shall be provided for each 250 gpm rated capacity of the pump and each shall be equipped with ¾-inch drain cock or a valve with ¾-inch pipe thread connection for draining the hose line. All outlets shall be equipped with protective caps except those to which preconnected lines are attached. Outlets shall be so located and so connected to the pump discharge manifold that friction loss between the discharge manifold and the

outlets will be minimized. Piping for discharge outlets shall be the same size (or larger) as the nominal size of the valve. (See A-3-2.2.5.)

NOTE (1). An extra discharge outlet is desirable for 500 and 750 gpm pumpers; where desired, purchaser shall indicate in Special Provisions.

NOTE (2). Where 1½-inch gated outlets for preconnected lines and/or 2½- by 1½-inch reducers on 2½-inch outlets are desired, purchaser shall indicate in Special Provisions.

NOTE (3). One or more discharge outlets larger than 2½-inch may be installed on 750 gpm and larger pumpers provided that at least three (3) outlets for 750 gpm pumps and four (4) outlets for 1,000 gpm and larger pumps are installed and total of all outlets, not including preconnected discharge lines smaller than 2½-inch nominal size, is ample to develop the rated capacity of the pump at discharge rates of not more than 250 gpm through each 2½-inch outlet, 375 gpm through each 3-inch outlet, and 500 gpm through each 3½-inch outlet; where desired, purchaser shall indicate in Special Provisions.

NOTE (4). The purchaser shall indicate which discharge outlets shall be controllable at the pump operator's position in Special Provisions.

**3-2.2.6** If a tank fill line from the pump to the water tank is provided, such line shall be connected from the pump discharge manifold directly to the water tank with valve controllable at the pump operator's position. (See A-3-2.2.6.)

NOTE: Where tank fill line is desired, purchaser shall indicate in Special Provisions.

**3-2.2.7** Where separate 1½-inch discharge outlets are provided pressure loss between the pump and the discharge outlet shall not exceed 35 psi at a flow of 100 gpm.

**3-2.2.8** Suitable and readily accessible drain cocks, arranged so that either the open or closed position is clearly indicated, shall be provided to drain the pump and all water-carrying lines.

NOTE: It is recommended that the minimum inside diameter of drain lines and drain cocks be ⅜ inch.

**3-2.2.9** Where a booster pump is specified in combination with a fire pump and where the pumps are interconnected such that pressure from one pump may be transmitted to the other pump, suitable check valves or other automatic means shall be provided to avoid pressurizing in either pump beyond its maximum rated hydrostatic pressure.

### **3-3 Operating Controls and Devices.**

#### **3-3.1 Pump Operator's Position.**

**3-3.1.1** The area in which pump controls, gages, and other instruments are located shall be known as the pump operator's position.

**3-3.1.2** Adequate illumination shall be provided for all gages and controls located at the pump operator's position.

**3-3.1.3** All required marking shall be of a type permanent in nature, capable of withstanding the effects of extremes of weather and temperature and shall be securely attached.

### **3-3.2 Pump Controls.**

**3-3.2.1** Provisions shall be made for quickly and easily placing the pump in operation. The lever or other device shall be marked to indicate when in pumping position.

**3-3.2.2** Any control device used in the power train between the engine and pump shall be so arranged as to prevent it from being unintentionally knocked out of operating position. Where pumps do not operate through the road transmission and propelling power can be applied to the wheels while pumping, a device shall be provided by which the road transmission can be positively held in neutral. Where an automatic transmission is furnished, means shall be provided to maintain the transmission in the designed engine pump gear ratio. A name plate for indicating the transmission control lever position for pumping shall be provided in the cab and located in a manner so that it can be easily read from the driver's position. (See A-3-3.2.2.)

**3-3.2.3** With parallel-series centrifugal pumps, the positions for parallel operation (volume) and series operation (pressure) shall be clearly indicated. The control for changing the pump from series to parallel and vice versa shall be controllable at the pump operator's position.

**3-3.2.4** Means shall be provided for controlling pressure at the pump either through an automatic relief valve or a pressure regulator controlling the speed of the pump. The device shall be capable of operation over a range of 90 to 300 psig discharge pressure. The means provided shall be controllable by one man in the pump operator's position. (See 11-2.2.3.)

NOTE: Where pumpers are used frequently in relay operations, it may be desirable to specify means for limiting the pressure on the suction side of the pump. Where desired, purchaser shall indicate in Special Provisions.

**3-3.2.5** A priming device shall be provided if the pump is of centrifugal type. It shall be capable of meeting the suction requirements in Sections 3-1.2.1 and 11-2.2.4, and of developing a vacuum of 22 inches at an altitude of up to 1,000 feet. A booster pump will not be accepted as the priming device. Priming devices shall be of such type as to function efficiently at all times at engine speeds not exceeding the maximum no-load governed speed.

If the priming device is to utilize engine manifold vacuum, two distinct means shall be provided to prevent introduction of water into manifold. Priming device shall be controllable at the pump operator's position.

NOTE: Where a positive displacement priming pump is desired, purchaser shall indicate in Special Provisions.

**3-3.2.6** All pump controls and devices shall be installed so as to be protected against mechanical injury and/or the effects of adverse weather conditions upon their operation.

**3-3.2.7** If the pump is of the positive displacement type, at least two gear ratios or an equivalent device shall be provided between the pump and the engine; gear shift positions shall be marked "Capacity" and "Pressure."

### **3-3.3 Engine Controls.**

**3-3.3.1** A hand throttle, controlling the fuel supply to the engine and of a type that will hold its set position, shall be so located that it can be manipulated from the operator's position with all gages in full view.

**3-3.3.2** When a supplementary heat exchange cooling system is provided, proper valving shall be so installed as to permit use of water from the discharge side of the fire pump for the cooling of coolant circulating through the engine cooling system without intermixing.

### **3-3.4 Gages and Instruments.**

**3-3.4.1** All gages and instruments shall be so located as to be readily visible from the pump operator's position. They shall be so mounted that they are not subject to excessive vibration. They shall be suitably enclosed or protected except in areas where freezing temperatures are unlikely. Pumpers shall be equipped with one suction gage, located on left hand side of gage panel, not less than 4½ inches in diameter, reading from 30 inches of vacuum to at least 300 psi pressure, but not more than 600 psi pressure; and one discharge gage located to the right of suction gage not less than 4½ inches in diameter, of a type not subject to damage by vacuum and reading from 0 to at least 300 psi pressure, but not more than 600 psi pressure, except in cases where pump maximum working pressure is above 600 psi. Separate pressure gages, at least 2½ inches in diameter, shall be furnished for each 2½-inch or larger outlet of the pump. Gages shall be provided with ¼-inch standard pipe thread connections. Two plugged ¼-inch standard pipe thread connections for test gages, one on the pressure side and one on the

suction side of the pump, shall be suitably identified and readily available at the pump operator's position. Pump gage connections shall be so located as not to indicate false pressure readings.

**NOTE (1).** Where separate pressure gages are desired for outlets of the pump smaller than 2½-inch, purchaser shall indicate in Special Provisions. Such gages shall be at least 2½ inches in diameter.

**NOTE (2).** If flow meters are desired in lieu of pressure line gages on 2½-inch or larger outlets, purchaser shall indicate in Special Provisions.

**3-3.4.2** A readily accessible permanently attached weather-proof tachometer at the pump operator's position shall indicate the speed at which the engine is operating when driving the pump. Provisions shall also be made whereby the readings of the permanently attached tachometer may be checked with a hand revolution counter; these provisions shall be readily and conveniently accessible and shall not involve disconnecting the above permanent tachometer.

**3-3.4.3** An oil pressure gage and an engine-coolant temperature gage shall be located at the pump operator's position in addition to the indicator on the vehicle instrument panel.

### **3-4 Hose.**

#### **3-4.1 Suction Hose.**

**3-4.1.1** Hard suction hose when specified shall be reinforced smooth-bore rubber, of a design having a low friction loss and which will not collapse under a vacuum of 23 inches of mercury and will also withstand pressure test of 200 psi. Only expansion ring type couplings shall be used.

#### **3-4.2 Booster Hose.**

**3-4.2.1** Booster hose shall be of a good grade, rubber covered and rubber lined. Hose labelled as "Chemical Engine Hose" is considered as conforming to requirements.

**3-4.2.2** When working pressures exceed 250 psi, a high pressure booster hose with couplings attached, rated at not less than 800 psi working pressure shall be provided.

### **3-5 Special Provisions.**

Pump capacity 3-1.1.1

Altitude and maximum lift 3-1.1.1

Pump type 3-2.1.1

Bronze pump, nonferrous piping and valves 3-2.1.1

Test conditions 1500 gpm-larger 3-1.2.2

Additional inlets 3-2.2.1 and 3-2.2.3

Larger inlets 3-2.2.3

Bleed off connections 3-2.2.3

Pump inlet controls 3-2.2.3

Check valve 3-2.2.4

Large discharge outlet 3-2.2.5

Outlets 3-2.2.5

Pump outlet controls 3-2.2.5

Tank fill line 3-2.2.6

Suction pressure control 3-3.2.4

Positive displacement priming pump 3-3.2.5

Gages 3-3.4.1

Flow meters 3-3.4.1

Suction hose size 3-2.2.1

## **Chapter 4 Provisions Applying to Apparatus Equipped with a Hose Body**

### **4-1 Hose Compartment.**

#### **4-1.1 General.**

**4-1.1.1** A hose compartment (or compartments) of at least 55 cubic feet shall be provided on apparatus which is designed to carry 2½-inch and 1½-inch hose, and shall have a capacity for double-jacketed rubber-lined fire hose of not less than 1,500 feet of 2½-inch hose on pumpers and hose trucks (40 cubic feet and 1,000-foot capacity on pumper-ladder trucks) and 400 feet of 1½-inch hose. The hose compartment for 2½-inch hose shall be not less than 72 inches in length. A partition shall be provided to separate the 2½-inch and 1½-inch hose. Where water tanks are of 1,000 gallons capacity or over, see Section 6-3.3 for Mobile Water Supply Apparatus. (*See A-4-1.1.1.*)

**NOTE (1).** Where hose compartments are to be divided to permit two or more lines to be laid simultaneously, purchaser shall indicate in Special Provisions.

**NOTE (2).** Where hose sizes larger than 2½-inch or capacities larger than 1,500 feet are desired, purchaser shall indicate in Special Provisions.

**4-1.1.2** The compartments shall be of steel, reinforced at the corners. The bottom shall be in removable sections fabricated from wood or other non-metallic, non-corrosive materials. The interior shall be smooth and free from all projections such as nuts, sharp angles or brackets which might injure the hose. Baskets, reels, rear handrails and equipment holders shall not be so placed as to obstruct the placing of fire hose in the fire hose compartments. A rear handrail shall be provided where rear step is included for manpower. (*See A-4-1.1.2.*)

**NOTE:** Where removable covers are desired to protect the hose, purchaser shall indicate in Special Provisions.

## **4-2 Reel for Booster Hose.**

### **4-2.1 General.**

**4-2.1.1** Where apparatus is provided with a water tank and a fire pump or a booster pump, a hose reel, together with all necessary piping and hose connections, shall be provided. Booster hose reels shall have a capacity of not less than 200 feet of 1-inch booster hose.

**NOTE (1).** In lieu of booster hose, purchaser may specify piping, valves, and space for preconnected 1½-inch or 1-inch hose. If booster reel or preconnected 1½-inch lines are desired, purchaser shall indicate in Special Provisions.

**NOTE (2).** If a power rewind for reel is desired, purchaser shall indicate in Special Provisions.

## **4-3 Special Provisions.**

Divided hose compartment 4-1.1.1

Capacity of hose compartment 4-1.1.1

Covers for hose compartment 4-1.1.2

Preconnected 1½-inch lines 4-2.1.1

Power rewind 4-2.1.1

## **Chapter 5 Provisions Applying to Apparatus Equipped with a Booster Pump**

### **5-1 Design Requirements.**

#### **5-1.1 General.**

**5-1.1.1** Any pump mounted permanently on the apparatus and rated less than 500 gpm is a booster pump. The pump shall be capable of delivering rated capacity when taking suction from the water tank. (*See A-5-1.1.1.*)

NOTE (1). Purchaser shall indicate the rated capacity and pressure in Special Provisions.

NOTE (2). Where pump is to deliver rated capacity from draft, purchaser shall indicate in Special Provisions.

NOTE (3). A portable pump shall not be considered a booster pump within the meaning of this chapter.

NOTE (4). Purchaser shall indicate the type of pump drive desired in Special Provisions.

NOTE (5). Where pump is to be operated while apparatus is moving under power, purchaser shall indicate the desired performance at given vehicle speed in Special Provisions.

NOTE (6). Performance will depend on the chassis components that are available on the particular model selected, as well as on the pump. Purchaser should be aware of the problems involved in providing good "pump-and-roll" performance when pump is to be driven by a power takeoff from the vehicle engine.

NOTE (7). Where pump is expected to deliver rated capacity above 2,000 feet, purchaser shall indicate in Special Provisions. (*See A-3-1.1.1.*)

#### **5-1.2 Suction Capability.**

**5-1.2.1** When dry, the pump may be required to be capable of taking suction and discharging water with a lift of 10 feet in not more than 30 seconds through 20 feet of suction hose of the same nominal size as the suction connections on the pump.

NOTE: Where pump is required to take suction and discharge water from a lift of 10 feet, purchaser shall indicate in Special Provisions.

#### **5-1.3 Engine Capability.**

**5-1.3.1** The engine shall be capable of performing the pumping tests herein specified without exceeding the maximum no-load governed speed of the engine as shown on a certified brake horsepower curve of the type of engine used without accessories; the certification shall be by a responsible official of the engine manufacturer.

### **5-1.4 Power Train Capability.**

**5-1.4.1** All components in the power train from the engine to the pump shall be capable of transmitting the power required by the pump at maximum rated capacity and pressure. (*See 5-1.1.1.*)

## **5-2 Construction Requirements.**

### **5-2.1 Pump.**

**5-2.1.1** The booster pump shall be free from excessive vibration and pulsation of water pressure when running at all speeds.

**NOTE:** Where an all bronze pump is specified, piping and valves shall have corrosion resistance equal to or superior to that of the pump, and the purchaser shall so indicate in Special Provisions.

### **5-2.2 Pump Connections.**

**5-2.2.1** All outlets shall have National (American) Standard fire hose coupling threads. Adapter couplings, securely attached, shall be provided on each outlet if local couplings are not National (American) Standard. (*See NFPA Standard No. 194, Screw Threads and Gaskets for Fire Hose Connections.*)

**5-2.2.2** The size and number of external suction inlets should be commensurate with the pump capacity.

**NOTE:** The purchaser shall indicate the size, number, type, and location of desired suction connection in Special Provisions.

**5-2.2.3** All discharge outlets shall be equipped with valves which can be opened and closed smoothly and readily under all rated pressures. All outlets where hose is not preconnected shall be equipped with protective caps.

**NOTE:** The size and number of discharge outlets should be commensurate with the pump capacity and the size and number of hose lines to be supplied. (*See A-5-1.1.1.*) The purchaser shall indicate the size, number, and location of discharge outlets desired in Special Provisions.

**5-2.2.4** If a tank fill line from the pump to the water tank is provided, such line shall be connected from the pump discharge manifold directly to the water tank with valve controllable at the pump operator's position.

**NOTE:** Where a supplementary fill line from the pump to the water tank is desired, the purchaser shall specify in Special Provisions.

**5-2.2.5** Suitable provisions shall be made to drain the pump and all water-carrying lines.

### **5-3 Operating Controls and Devices.**

#### **5-3.1 Pump Operator's Position.**

**5-3.1.1** The area in which pump controls, gages and other instruments are located shall be known as the pump operator's position.

**5-3.1.2** Adequate illumination shall be provided for all gages and controls located at the pump operator's position.

#### **5-3.2 Pump Controls.**

**5-3.2.1** Provisions shall be made for quickly and easily placing the pump in operation. The lever or other device shall be marked to indicate when in pumping position. A visual and/or audible signaling device shall be provided at the driver's position so as to indicate when the power take-off (PTO) mechanism is engaged.

**5-3.2.2** With parallel-series centrifugal pumps, the positions for parallel operation (volume) and series operation (pressure) shall be clearly indicated. The control for changing the pump from series to parallel and vice versa shall be located at the pump operator's position.

**5-3.2.3** Purchaser may require a relief valve or other type pressure regulator and indicate the performance thereof. If a positive displacement pump is specified, a relief valve shall be provided.

**NOTE:** Where a relief valve or pressure regulator is desired, purchaser shall indicate in Special Provisions.

**5-3.2.4** A priming device shall be provided when specified. It shall be capable of meeting the requirements of Section 5-1.3.1, and of developing a vacuum of 22-inch Hg at an altitude of 1,000 feet, unless otherwise specified, at an engine speed not exceeding the maximum no-load governed speed. Priming device shall be controllable at the pump operator's position.

**NOTE:** Where a priming device is desired, purchaser shall indicate in Special Provisions.

**5-3.2.5** All pump controls and devices shall be installed so as to be protected against mechanical injury and/or the effects of adverse weather conditions upon their operation. All required markings shall be of a type permanent in nature, capable of withstanding the effects of extremes of weather and temperature and shall be securely attached.

### **5-3.3 Engine Controls.**

**5-3.3.1** A hand throttle, controlling the fuel supply to the engine and of a type that will hold its set position, shall be so located that it can be manipulated from the operator's position with all gages in full view.

**5-3.3.2** When specified, a supplementary heat exchange cooling system, properly valved, shall be so installed as to permit use of water from the discharge side of the pump for the cooling of water circulating through the engine cooling system without intermixing.

**NOTE:** Where a supplementary heat exchange cooling system is desired, purchaser shall indicate in Special Provisions.

### **5-3.4 Gages and Instruments.**

**5-3.4.1** All gages and instruments shall be so mounted and attached that they are not subject to excessive vibration. They shall be suitably enclosed or protected except in areas where freezing temperatures are unlikely.

**5-3.4.2** Suitable discharge gage and other gages as required shall be provided at the pump operator's position.

## **5-4 Hose.**

### **5-4.1 Suction Hose.**

**5-4.1.1** Hard suction hose when specified shall be reinforced smooth-bore rubber, of a design having a low friction loss and which will not collapse under a vacuum of 23 inches of mercury and will also withstand pressure test of 200 psi. Only expansion ring type couplings shall be used.

### **5-4.2 Booster Hose.**

**5-4.2.1** Booster hose shall be of a good grade, rubber covered and rubber lined. Hose labelled as "Chemical Engine Hose" is considered as conforming to requirements.

**5-4.2.2** When working pressures exceed 250 psi, a high pressure booster hose, with couplings attached, rated at not less than 800 psi working pressure shall be provided.

**5-5 Special Provisions.**

Capacity and rated pressure 5-1.1.1

Draft capability 5-1.1.1

Pump drive 5-1.1.1

Pump and roll capability 5-1.1.1

Altitude requirements 5-1.1.1

Suction capability at draft 5-1.2.1

Bronze pump, nonferrous piping and valves 5-2.1.1

Size, number, arrangement and location of  
suction connections 5-2.2.2

Size and number of discharge outlets 5-2.2.3

Tank fill line 5-2.2.4

Pressure control 5-3.2.3

Priming device 5-3.2.4

Auxiliary cooling 5-3.3.2

## **Chapter 6 Provisions Applying to Apparatus Equipped with a Water Tank**

### **6-1 General.**

#### **6-1.1 Tank Construction.**

**6-1.1.1** All water tanks shall be of noncorrosive material or steel suitably protected against corrosion and deterioration; readily accessible clean-out holes or other means to permit complete cleaning of the tank shall be provided. All water tanks shall be constructed to be independent of the body or compartments and shall be equipped with suitable method for lifting tank out of body. This provision may be waived on tanks larger than 1,500 gallons.

**6-1.1.2** The water tank shall be provided with at least one swash partition. Any water tank shall have a sufficient number of swash partitions so that the maximum dimension of any spaces in the tank, either transverse or longitudinal, shall not exceed 46 inches, and shall not be less than 23 inches. (*See A-6-1.1.2.*)

**NOTE:** Where baffles are to be waived in elliptical tanks, purchaser shall indicate in Special Provisions.

**6-1.1.3** Swash partitions shall have suitable vents or openings at both top and bottom to permit movement of air and water between spaces as required to meet the flow requirements as specified in this Standard.

**NOTE:** Air and water trapped in tanks have been a principal cause of poor tank performance.

**6-1.1.4** Connections or outlets from tank to pump shall be suitably designed to prevent air from being entrained while pumping water from the tank.

#### **6-1.2 Tank Connections.**

**6-1.2.1** A convenient, capped fill opening of not less than 5 inches in diameter and designed so as to prevent spillage shall be provided. An easily removable, readily cleaned screen shall be installed.

**6-1.2.2** Provisions shall be made for necessary overflow and venting of tanks. Vents shall not be less than 3 inches in diameter so as to permit use of 2½-inch hydrant fill lines. The overflow outlet shall be so designed that the effect of a spill on traction of the rear tires will be minimized. (See A-6-1.2.2.)

**6-1.2.3** If equipped with other than a portable pump, connections between the water tank and the pump shall permit a flow of at least 250 gpm for tanks of 300 and up to and including 750 gallons capacity and 500 gpm for tanks over 750 gallons capacity if the pump is as specified under Chapter 3, or at least the capacity of the pump as specified under the provisions of Chapter 5. The specified rate of flow shall be maintained for not less than 80 percent of the rated capacity of the tank. (See A-6-1.2.3.)

NOTE (1). Where different flow rate is desired, purchaser shall indicate in Special Provisions.

NOTE (2). When more than one pump is provided, purchaser shall indicate to which pump or pumps the tank shall be connected in Special Provisions.

**6-1.2.4** If equipped with other than a portable pump, a bypass line of not less than ¼-inch diameter with manual control valve at the pump operator's position shall be installed from the discharge manifold directly into the tank.

NOTE: On positive displacement pumps, if the relief valve specified in Sections 3-3.2.4 or 5-3.2.3 discharges to the tank, a separate bypass is not required.

**6-1.2.5** All valves shall be operable from the pump operator's position or other accessible location where necessary controls are concentrated.

**6-1.2.6** All connections to which hose can be attached shall have National (American) Standard fire hose threads for the size of outlet and inlet provided.

NOTE: Where adapters are desired, purchaser shall indicate in Special Provisions.

### **6-1.3 Special Agents.**

**6-1.3.1** Tanks for use of wetting agents or mechanical foam shall be provided if specified. The purchaser shall also specify the type of proportioning equipment desired to control the flow of these agents into hose lines. Swash partitions shall not be required in special agent tanks with a capacity of 100 gallons or less. Larger special agent tanks shall be provided with swash partitions in the same manner as water tanks. (See 6-1.1.2, A-6-1.3.1.)

NOTE: Where proportioner and tank for proportioner are desired, purchaser shall indicate type of proportioner and size of tank in Special Provisions.

## **6-2 Water Tanks on Apparatus Other Than Mobile Water Supply Apparatus.**

### **6-2.1 Tank Capacity.**

**6-2.1.1** Water tanks shall have a minimum capacity of 300 gallons except on apparatus equipped with either an aerial ladder or an elevating platform in which case the capacity shall be a minimum of 150 gallons. (*See A-6-2.1.1.*)

NOTE (1). Purchaser shall indicate other desired tank capacity in Special Provisions.

NOTE (2). Where water level gage is desired, purchaser shall indicate in Special Provisions.

## **6-3 Mobile Water Supply Apparatus. (*See A-6-3.*)**

### **6-3.1 General.**

**6-3.1.1** Fire apparatus will not necessarily comply with the provisions of this Section.

NOTE: Where compliance with this Section is desired, purchaser shall indicate in Special Provisions.

**6-3.1.2** When so specified the vehicle shall comply with Section 6-1 of this chapter as well as the provisions of other chapters required by the purchase specifications.

### **6-3.2 Pump.**

**6-3.2.1** A pump shall be provided conforming to the requirements of Chapter 3, Chapter 5, or NFPA No. 1921-*Fire Department Portable Pumping Units*.

NOTE: Where a portable pump in addition to a booster pump or fire pump is desired, purchaser shall indicate in Special Provisions.

**6-3.2.2** Portable pumps, when specified for water tank, pumping service (*see 6-3.2.1*), shall be installed with flexible, semi-permanent connections, properly valved so they may be quickly disconnected to permit easy removal of the unit for portable pumping service.

### **6-3.3 Hose Capacity.**

**6-3.3.1** Space shall be provided to carry at least 400 feet of 2½-inch double-jacketed rubber-lined fire hose and at least 400 feet of preconnected 1½-inch hose.

NOTE (1). Where hose capacity other than 400 feet of 2½-inch and 400 feet of 1½-inch is desired, purchaser shall indicate in Special Provisions.

NOTE (2). Where booster hose is desired in lieu of 1½-inch hose, 400 feet of booster hose shall be furnished. If additional hose is specified, sufficient space shall be provided. Where desired, purchaser shall indicate in Special Provisions.

### **6-3.4 Tank.**

**6-3.4.1** The water tank shall be of 1,000 gallons capacity. (See A-6-3.4.1.)

NOTE (1). In determining capacity of the tank, due consideration should be given to the operating limitations which will be imposed by the road and other terrain conditions which must be met by this apparatus when responding to alarms. (See A-6-3.)

NOTE (2). Where tank capacity other than 1,000 gallons is desired, purchaser shall indicate in Special Provisions.

**6-3.4.2** A 2½-inch gated connection shall be installed in a convenient location for emptying and filling the tank in addition to the fill opening required by Section 6-1.2.1. For apparatus not equipped with a pump providing a 500 gpm transfer capacity, a 4-inch or larger dump valve connection shall be installed in a convenient location. For apparatus having a tank of 2,000 gallons or greater capacity, there shall be two such dump valve connections, one at each end of the tank.

NOTE: Where more than one 2½-inch or larger gated connection is desired, purchaser shall indicate in Special Provisions.

**6-3.4.3** A water level gage shall be provided adjacent to the fill and discharge connection. It shall be of a type that has no interacting mechanical parts immersed in the tank.

### **6-4 Special Provisions.**

Tank baffles 6-1.1.2

Pump connections 6-1.2.3

Tank to pump flow rate 6-1.2.3

Thread adapters 6-1.2.6

Proportioning equipment 6-1.3.1

Water tank capacity 6-2.1.1

Water level gage 6-2.1.1

Mobile water supply apparatus 6-3.1.1

Portable pump 6-3.2.1

Hose capacity 6-3.3.1

Type hose 6-3.3.1

Tank capacity 6-3.4.1

Gated tank connections 6-3.4.2

## Chapter 7 Provisions Applying to Apparatus Equipped with an Aerial Ladder

### 7-1 Aerial Ladder. (*See A-7-1.*)

#### 7-1.1 Length.

**7-1.1.1** A metal aerial ladder of two or more sections shall be provided.

**NOTE:** See A-7-1 for common aerial ladder lengths. Purchaser shall indicate the length in the Special Provisions.

**7-1.1.2** The length of an aerial ladder shall be measured by a plumb line from the top rung of the ladder to the ground with the ladder raised to its maximum angle of elevation and fully extended.

**7-1.1.3** There shall be a minimum of 18 inches width between the rails of an aerial ladder measured at the narrowest point, between the rails or the trussing.

#### 7-1.2 Operating Mechanism.

**7-1.2.1** A power-operated raising device shall be provided, so arranged that the upward movement of the ladder is rapid, smooth and without undue swaying or vibration.

Cables used to extend and to lower the fly section shall be securely attached and arranged with sufficient compensation so as to avoid undue stresses and strains.

Where the raising device includes moving cylinders or other moving parts, these shall be so arranged as to provide adequate hand clearance with the sides of the ladder or suitable hand guards shall be provided to prevent injury to the operator.

**7-1.2.2** A power-operated turntable shall be provided for revolving the aerial ladder, so arranged that it will rotate with little resistance. The mechanism of the turntable shall be so constructed that the platform and the aerial ladder can be operated in a complete circle, clockwise and counterclockwise, to enable the ladder to be put in any position.

**NOTE:** Where conditions warrant a leveling device, purchaser shall indicate in Special Provisions.

#### 7-1.3 Aerial Ladder Equipment.

**7-1.3.1** A detachable ladder pipe shall be provided. The horizontal traverse shall not exceed 15 degrees on either side of center. (*See 10-4 for required equipment.*)

Brackets for carrying the detachable ladder pipe shall be provided on the truck near the upper end of the ladder. These brackets shall have two metal rungs of the same spacing as the ladder rungs so that the ladder pipe brackets will not have to be readjusted to secure the pipe to the aerial ladder. (See A-7-1.3.1.)

**NOTE:** Where pulleys and cables for vertical control of the stream from the turntable are desired, the purchaser shall indicate in Special Provisions.

**7-1.3.2** Folding steps shall be placed near the top of the aerial ladder for the use of the ladder pipe operator.

**7-1.3.3** If the top rung of the fly section is too wide to attach the hook of a pompier or life belt, provision shall be made so that the nozzle operator may tie in.

**NOTE:** Where an axe and/or a plaster hook mounted inside of the fly section of the aerial ladder is desired, purchaser shall indicate in Special Provisions.

**7-1.3.4** Suitable lighting shall be provided at the base of the ladder arranged to illuminate the ladder in any position of operation.

**NOTE (1).** Where an additional spotlight attached to the top of the aerial is desired, purchaser shall indicate in Special Provisions. (See A-7-1.3.4.)

**NOTE (2).** Where reflective material or other special treatment is desired to make the top of the aerial ladder, extendible ground jacks, and the sides of the ladder turntable more visible at night, purchaser shall indicate in Special Provisions.

## **7-2 Control Devices and Mechanisms.**

### **7-2.1 General.**

**7-2.1.1** There shall be a place to be known as the operator's position where the operator of the aerial ladder shall stand. Aerial ladder operational controls shall be operable from that position. The position shall be such that the operator's line of sight is parallel or coincides with the axis of the ladder when in any position. It is preferable that control devices be grouped in a convenient manner on a pedestal or panel.

Adequate steps and suitable hand holds or rails shall be provided to reach the turntable of the aerial ladder from either side.

The turntable platform shall be provided with a safety railing of chrome plated or stainless steel tubing at least 30 inches high, extending along the outside of the turntable in back of the operator's position. (See A-7-2.1.1.)

**7-2.1.2** Control devices clearly marked, suitably lighted, and arranged so that they cannot be moved accidentally, shall be provided to:

- a. immobilize the vehicle;
- b. transfer power application to the ladder mechanism;
- c. stabilize the vehicle;
- d. lock in and release the ladder from its bed;
- e. control elevation, rotation and extension of the ladder;
- f. indicate the angle of elevation and the load limit of the ladder;
- g. control the engine from the operator's position.

**NOTE:** These control functions are in the order of operation normally followed when putting an aerial ladder into service.

## **7-2.2 Immobilization Controls.**

**7-2.2.1** A suitable control shall be provided at the driver's position to lock driving wheels at the wheel brake drums. Brake performance shall comply with the requirements of Section 1-3.1.

**7-2.2.2** When the aerial ladder is mounted on a tractor-trailer chassis, a suitable device shall be installed which will prevent transmission of the load on the aerial ladder to the rear springs of the tractor.

**7-2.2.3** Four wheel chocks shall be provided.

## **7-2.3 Power Transfer Control.**

**7-2.3.1** Controls shall be provided at the driver's position to transfer the power from the road drive to the aerial ladder mechanism. A visual and/or audible signaling device shall be provided at the driver's position so as to indicate when the power take-off (PTO) mechanism is engaged.

## **7-2.4 Ladder Bed Lock.**

**7-2.4.1** A lock shall be provided which will prevent action and movement of the aerial ladder in its bed when the vehicle is in motion.

**7-2.4.2** The lock release or control shall be located at the driver's or tillerman's position or at the turntable or may be automatically performed when actuating the controls required in Sections 7-2.3 or 7-2.5.

### **7-2.5 Stabilization Controls.**

**7-2.5.1** At least two ground jacks shall be provided, one on each side of the apparatus at the turntable location and with the widest practicable spread between their feet when in operating position. Where extendible ground jacks are provided, these shall be arranged so that jacks may be used simultaneously on both sides of the apparatus. Positive safety stops shall be provided to prevent overextension.

**7-2.5.2** The ground contact area of each jack shall not be less than 140 square inches and in addition, foot plates of ample strength shall be provided with each jack capable of increasing the ground contact area of each jack to not less than 320 square inches. The jack foot pad shall be capable of swiveling in at least one direction. If foot pad swivels in one direction only, it shall be in a plane normal to the axis of the apparatus.

**7-2.5.3** Where jacks depend upon an I-beam or other structural member to carry the weight of the ladder, portions of the truck, and live loads incident to fire fighting operations, the I-beam or structural member shall be of ample strength to carry the load without bending, twisting or other failure. Where axle jacks or locks are also provided to secure the tractor frame to the tractor rear axle below the ladder turntable, the jacks or locks shall be of a positive type which will operate on all types of terrain or gradients on which the truck may be called upon to perform.

### **7-2.6 Elevation, Rotation, and Extension Controls.**

**7-2.6.1** A control for elevating the ladder out of its bed to the maximum angle of elevation and returning it shall be provided at the operator's position. This control shall be arranged to permit the operator to regulate the speed of elevation within safe limits determined by the manufacturer. A manual or other positive locking device shall be provided so that the desired angle of elevation can be maintained indefinitely without dependence upon engine power.

**7-2.6.2** Controls for rotating the turntable 360 degrees in either direction shall be arranged to permit the operator to regulate the speed of rotation within limits determined by the manufacturer. The turntable shall be fitted with strong friction or other positive locking device so as to retain it in any desired position. Suitable indicators, clearly visible at night, shall be provided to facilitate correct alignment of the turntable with the ladder bed.

**7-2.6.3** Controls shall be installed at the operator's position for extending the fly sections of the aerial ladder to any desired height between the fully retracted and fully extended positions; the same control may also be used to retract the sections. Safety provisions shall prevent damage at full retraction or extension. Provisions shall be made so that, in the event of failure of extension mechanism during operation, the descent of the ladder shall be kept at a speed which will prevent damage to the ladder structure or danger to personnel. Stops shall be provided to properly align the sections without damage to the ladder or the cable mechanism when the ladder is retracted.

**7-2.6.4** A lock that controls ladder rung locks or pawls shall be provided at the base of the ladder adjacent to the operator's position to prevent movement of the sections when the power is shut off or in the event of loss of pressure in hydraulic circuits. This lock shall be arranged for use when aligning rungs. The control for the pawls shall be such that the on and off position may be clearly determined by the operator without it being necessary to see the pawls. To prevent damage to the ladder due to application of power when the pawls are locked, it is desirable to have an automatic device to prevent retraction of the ladder sections until the pawls have been released.

**7-2.6.5** Auxiliary or supplemental controls shall include a hand wheel or crank with which the operator can manually rotate the ladder. If this is of a design that might cause injury if left in operating position when power is applied, a locking device shall be included which will prevent power operation of the turntable when the manual control is engaged. Manual controls shall be provided which will permit releasing of the pawls and retraction of the ladder in the event of power failure.

## **7-2.7 Angle of Elevation Indicator and Load Limit.**

**7-2.7.1** A device, clearly visible from the operator's position, shall be provided to indicate the angle of elevation of the ladder at all times. Either a load indicator or an instruction plate visible from the operator's position shall show the recommended safe load under existing conditions of ladder elevation and extension when the ladder is supported at the top and when the ladder is supported at the base only (as with water tower operation). If automatic load limit controls are installed, provision shall be made for overriding the controls to obtain required extension in an emergency.

## **7-2.8 Engine Controls.**

**7-2.8.1** A supplementary engine starting control shall be provided on or adjacent to the operator's control pedestal. (See A-7-2.8.1.)

**7-2.8.2** The engine speed shall be automatically regulated. A suitable engine throttle shall be provided and shall be governed to prevent operation of the ladder at excessive speeds.

**7-2.8.3** Where hydraulic power is used for ladder operations, an oil pressure gage shall be provided at the ladder operator's position indicating the hydraulic pressure. The oil reservoir filler shall be so located as to be readily accessible for checking, conspicuously marked "Hydraulic Oil," and shall have a cap suitably secured.

## **7-3 Chassis.**

### **7-3.1 General.**

**7-3.1.1** Either a single-chassis vehicle, *i.e.*, a ladder truck and engine on a common chassis, or a tractor-drawn vehicle shall be furnished.

**NOTE:** Purchaser shall indicate in Special Provisions whether a single chassis or tractor-drawn apparatus is desired.

### **7-3.2 Single Chassis.**

**7-3.2.1** On a single chassis the aerial ladder turntable shall be located immediately to the rear of the cab compartment.

**NOTE:** If rear mounted turntable is desired, purchaser shall indicate in Special Provisions.

### **7-3.3 Tractor-Drawn Vehicles.**

**7-3.3.1** A tractor-drawn vehicle shall consist of a 4-wheel tractor with a suitable "fifth wheel" mounted upon the rear of the chassis to carry the forward end of the aerial ladder trailer unit.

**7-3.3.2** A tiller wheel shall be provided to steer the rear wheels of the trailer unit. A windshield shall be provided for the tillerman and equipped with a power-operated constant speed windshield wiper.

**7-3.3.3** Suitable seating shall be provided for the tillerman with adequate foot rest to provide leverage for steering. The tiller seat shall be so located as to provide good visibility toward the front and permit the tillerman to closely judge clearances on each side

of the ladder trailer. There shall be a suitable signal, horn or buzzer with control at the tiller seat to permit the tillerman to signal the driver.

**7-3.3.4** Where the tiller wheel arrangement is such that the wheel and spindle must be removed to raise the aerial or remove ground ladders, provisions shall be made that will prevent the replacement of the steering wheel and tiller seat until the spindle has been inserted.

#### **7-4 Special Provisions.**

Length of aerial ladder 7-1.1.1

Leveling devices 7-1.2.2

Cable for vertical control 7-1.3.1

Specially mounted equipment 7-1.3.3

Spotlight; reflective equipment 7-1.3.4

Tractor-drawn unit 7-3.1.1

Rear mounted turntable 7-3.2.1

## **Chapter 8 Provisions Applying to Apparatus Equipped with an Elevating Platform**

### **8-1 Elevating Platform. (*See A-8-1.*)**

#### **8-1.1 General.**

**8-1.1.1** A metal elevating platform device consisting of two or more booms or sections with a passenger carrying platform assembly shall be provided.

#### **8-1.2 Height.**

**8-1.2.1** The nominal height of an elevating platform assembly shall be measured by a plumb line from the top surface of the platform to the ground, with the platform raised to its position of maximum elevation.

**NOTE:** Purchaser shall indicate the height desired in Special Provisions.

#### **8-1.3 Operating Mechanism and Functions.**

**8-1.3.1** A power-operated raising and extending device shall be provided, so arranged that movement of the platform is rapid, smooth, and without undue sway or vibration. It shall be so designed, and provided with adequate power, to allow multiple movements of the elevating booms or sections simultaneously. All cables, if and where used, shall be securely attached and arranged with sufficient compensation to avoid undue stresses and strains.

**8-1.3.2** A platform-leveling system shall be provided and so designed that the platform, together with its rated load, will be supported and maintained level in relation to the turntable regardless of the position of the booms or sections. Where the raising device includes moving cylinders or other external moving parts, these shall be arranged to provide adequate hand clearance or guards so as to prevent injury to operators or occupants of the platform.

**8-1.3.3** A power-operated turntable shall be provided for revolving the platform and booms or sections, so arranged that it will rotate with little resistance. The mechanism of the turntable shall be so constructed that the booms or sections and platform can be rotated continuously clockwise and counter-clockwise to enable the platform to be faced in any direction through 360 degrees.

**8-1.3.4** The rotating mechanism shall provide sufficient power to rotate the platform in either direction while carrying the manufacturer's rated load and with the turret nozzle in operation at its rated capacity in any normal position of use.

### 8-1.4 Platform and Equipment.

**8-1.4.1** The platform shall have a minimum floor area of 14 square feet and shall be provided with a guard railing between 42 and 45 inches high on all sides. The railing shall be constructed so that there is no opening below it greater than 24 inches. There shall be two gates below the top railing, each of which shall be provided with suitable safety latches. A kick plate not less than 4 inches high shall be provided around the floor of the platform. Drain openings shall be provided to prevent water accumulation on the platform. A heat-protective shield shall be provided on the platform for the protection of the operator. For elevating platform apparatus equipped with a ladder, either aerial or on a boom, the use of a parallelogram, vertical closing, gravity-type gate for ladder access to and from the platform may be considered as meeting the continuous railing intent of this section.

**8-1.4.2** A permanently installed turret nozzle shall be provided on the platform, supplied by a water system incorporated with the booms or sections. The nozzle shall be equipped so as to allow the platform operator to control its rotation and elevation. The nozzle shall provide for rotation through at least 45 degrees either side of center, and for elevation and depression through at least 45 degrees above and below horizontal. A stop shall be provided to limit movement to 45 degrees above horizontal.

**NOTE:** Where outlets for hand hose lines are desired on the platform, the purchaser shall indicate in Special Provisions. This will require the installation of a valve on the turret nozzle.

**8-1.4.3** The water supply system shall be capable of delivering 750 gpm at the turret nozzle with a pressure loss of not more than 75 psig with the platform at maximum elevation. The system shall have a capability of withstanding 100 psig nozzle pressure while delivering the rated capacity of the turret nozzle. If a shut-off valve is provided at the basket, it shall be of a screw-operated type. The water supply shall be supplied at ground level through suitable piping with provision for at least three 2½-inch hose connections (or other sizes with equivalent capacity) with clappers in each inlet; a suitable pressure gage shall be provided at this point. Nozzle tips provided shall be 1⅜, 1½ and 1¾ inches and a spray nozzle of at least 500 gpm capacity. Tips shall have 2½-inch National (American) Standard fire hose coupling thread. (See A-8-1.4.3.)

**NOTE (1).** Where gated inlets are desired, purchaser shall indicate in Special Provisions.

**NOTE (2).** Where manually operated dump valve is desired, purchaser shall indicate in Special Provisions.

**8-1.4.4** A spotlight, of not less than 100,000 candlepower, shall be provided on the platform for the use of the operator. Suitable lighting shall be provided to illuminate the platform in any position of operation, affording visibility for the lower operator.

**8-1.4.5** A two-way voice communication system shall be provided between the platform and the lower control station.

NOTE: Where an axe and/or plaster hook shall be mounted accessible to the platform and where reflective material or other special treatment to make the platform, ground jacks, and the sides of the booms or sections more readily visible at night is desired, purchaser shall indicate in Special Provisions.

## **8-2 Control Devices and Mechanisms.**

### **8-2.1 General.**

**8-2.1.1** There shall be two control stations, one to be known as the platform control station, and the other as the lower control station where the lower operator shall stand. All elevation, extension, and rotation operational controls shall be operable from both of these positions. The control devices shall be grouped in a convenient manner on a pedestal or panel in both cases. The lower control station shall be such that the operator can easily observe the platform while operating the controls.

**8-2.1.2** Control devices shall be clearly marked, suitably lighted, and arranged so that they cannot be moved accidentally.

### **8-2.2 Immobilization of Vehicle.**

**8-2.2.1** A suitable device shall be provided at the driver's position to lock driving wheels of the chassis at the wheel brake drums. Brake performance shall comply with the requirements of Section 1-3.1.

**8-2.2.2** Four wheel chocks shall be provided.

### **8-2.3 Platform Boom or Section Bed Lock.**

**8-2.3.1** A lock shall be provided which will prevent action and movement of the retracted elevating platform booms or sections in their bed until the ground jacks are placed in position to stabilize the vehicle. The lock release or control shall be located at the driver's position or at the lower control station, or the release may be automatically performed when the controls required

to transfer power from road drive to boom or section operation are activated, or when the ground jacks are lowered. A spring-return override control for the lock release shall be provided at the lower control station.

### **8-2.4 Stabilization of Vehicle.**

**8-2.4.1** Ground jacks shall be provided on each side of the apparatus with the widest practicable spread between their feet when in operating position. When extendible ground jacks are provided, these shall be arranged so that they may be used simultaneously on both sides of the apparatus. Positive safety stops shall be provided to prevent overextension.

**8-2.4.2** The ground contact area of each jack shall be not less than 140 square inches, and, in addition, foot plates of ample strength shall be provided with each jack, capable of increasing the ground contact area of each jack to not less than 575 square inches. The jack foot pad shall be capable of swiveling in at least one direction. If foot pad swivels in one direction only, it shall be in a plane normal to the axis of the apparatus.

**8-2.4.3** Any I-beam or other structural member through which the jacks carry the weight of the booms or sections, portions of the truck, and live loads incident to fire fighting operations, shall be of ample strength to carry these loads without evidence of bending, twisting, or other failure.

### **8-2.5 Platform Operating Controls.**

**8-2.5.1** Controls for elevation of the platform booms or sections out of their bed, extending them to their maximum elevation, and returning them to their bed, shall be provided at both the lower control station and the platform control station. These controls shall be arranged to permit the operator to regulate the speed of these operations within safe limits as determined by the manufacturer. A manual or other positive locking device shall be provided so that the desired angle of elevation can be maintained indefinitely without dependence upon engine power. Provisions shall be made to prevent damage at full retraction or extension. Provision shall be made that, in the event of failure of any extending mechanism during operation, the gravity descent of the platform shall be kept at a speed which will prevent damage to the equipment or danger to personnel. Stops shall be provided, if necessary, to properly align the booms or sections without damage to the equipment when the platform is retracted.

**8-2.5.2** Controls for rotating the turntable 360 degrees in either direction shall be provided and arranged so as to permit either the platform control operator or the lower control operator to regulate the speed of rotation within safe limits as determined by the manufacturer.

**8-2.5.3** The turntable shall be so designed that it may be retained in any position while the turret nozzle is in operation.

**8-2.5.4** Suitable indicators, clearly visible at all times, shall be provided to facilitate correct alignment of the turntable with the bed of the booms or sections.

**8-2.5.5** Provisions shall be made so that, in the event of failure of the normal operating power source, an auxiliary source of power shall be readily available.

**8-2.5.6** A control or device shall be provided at both the lower control station and the platform control station to allow either operator to completely deactivate the platform controls. During deactivation of the platform controls, the lower controls shall remain operable.

## **8-2.6 Engine Controls.**

**8-2.6.1** A supplementary engine starting control shall be provided at the lower control station. (*See A-7-2.8.1.*)

**8-2.6.2** If the engine speed is not automatically regulated or predetermined, a suitable engine throttle shall be provided at the lower control station, but shall be limited so as to prevent operation of the platform at excessive speeds.

**8-2.6.3** A tachometer shall be provided on the instrument panel in the driving compartment for indicating engine speeds.

**8-2.6.4** Where hydraulic power is used, a pressure gage shall be provided in the hydraulic system. The oil reservoir filler shall be so located as to be readily accessible for checking, conspicuously marked "Hydraulic Oil," and shall have a cap suitably secured.

**8-2.6.5** A visual and/or audible signaling device shall be provided at the driver's position so as to indicate when the power take off (PTO) mechanism is engaged.

### **8-3 Load Limitations.**

#### **8-3.1 General.**

**8-3.1.1** Either load indicators or instruction plates located at both control stations shall show the recommended safe load of the platform.

**8-3.1.2** The platform shall be capable of carrying its rated load safely in any position of operation. Positive stops shall be provided to limit platform travel to those positions of operation recommended by the manufacturer. The minimum payload capacity of the platform shall be 700 pounds. The weight of the turret nozzle and tips shall not be considered part of the rated payload. (*See A-8-3.7.2.*)

#### **8-3.2 Turret Nozzle Operation.**

**8-3.2.1** The apparatus shall be so designed that when using the turret nozzle with a  $1\frac{3}{4}$ -inch tip, regardless of the position of the platform and the direction of the stream, the equipment can be safely operated while discharging water at the rate of 750 gpm.

### **8-4 Special Provisions.**

Height of elevating platform assembly 8-1.2.1

Outlets for hand hose lines and valves on turret nozzle  
8-1.4.2

Gated inlets, dump valve 8-1.4.3

Specially mounted equipment, reflective equipment 8-1.4.5

## **Chapter 9 Provisions Applying to Apparatus Equipped with a Water Tower**

### **9-1 Water Tower Apparatus. (See A-9-1.)**

#### **9-1.1 General.**

**9-1.1.1** A water tower consists of a metal elevating tower of two or more beams or sections equipped with a water tower nozzle capable of providing a large capacity mobile and elevated stream.

#### **9-1.2 Height and Horizontal Reach.**

**9-1.2.1** The nominal height of a water tower assembly shall be measured by a plumb line from the discharge end of the nozzle to the ground, with the nozzle raised to its position of maximum elevation. The horizontal reach of the water tower nozzle shall be the distance from the center of the turntable or pedestal to the end of the nozzle with the assembly fully extended at right angles to the apparatus.

**NOTE:** Purchaser shall indicate the height and reach desired in Special Provisions.

#### **9-1.3 Operating Mechanism and Functions.**

**9-1.3.1** A power-operated raising and extending device shall be provided, so arranged that movement of the assembly and nozzle is rapid, smooth, and without undue sway or vibration. It shall be so designed, and provided with adequate power, to allow multiple movements of the elevating booms or sections. All cables and hydraulic circuits, if and where used, shall be securely attached and arranged with sufficient compensation to avoid undue stresses and strains. Where provided for controlling the nozzle, hydraulic circuits shall be protected or shielded against the effect of extremes in temperatures encountered in fire fighting.

**9-1.3.2** A power-operated turntable or pedestal shall be provided for revolving the booms or sections to direct the nozzle in the desired direction, so arranged that it will rotate with little resistance. The mechanism of the turntable or pedestal shall be so constructed that the booms or sections carrying the nozzle can be rotated continuously clockwise and counter-clockwise to enable the nozzle to be faced in any direction through 360 degrees.

**9-1.3.3** The mechanism shall be provided with sufficient power and stability to rotate the tower with the turret nozzle in operation at its rated capacity in any normal position of use.

**9-1.3.4** The apparatus shall be so designed that when discharging water at the rated capacity of the unit, the equipment can be operated safely regardless of the position of the tower and the direction of the stream.

#### **9-1.4 Tower and Equipment.**

**9-1.4.1** A permanently installed nozzle shall be provided at the top of the tower and supplied by a permanent water system. The nozzle shall be equipped so as to allow the operator to control its rotation and elevation. The nozzle, as distinct from the supporting boom, shall provide for rotation through at least 45 degrees either side of center. The nozzle and boom shall provide for elevation and depression of the nozzle through at least 45 degrees above and below horizontal. If a variable flow and variable pattern spray nozzle is provided on the tower, a control shall be provided at the operator's pedestal to permit selection of the desired stream pattern and flow.

NOTE (1). Where facilities for discharging foam from the tower are desired, purchaser shall indicate in Special Provisions.

NOTE (2). If salt water is to be used in the system, purchaser shall indicate in Special Provisions.

**9-1.4.2** The water supply system shall be capable of delivering 750 gpm to the tower nozzle with a pressure loss of not more than 75 psig with the tower at maximum elevation. The system shall have a capability of withstanding 100 psi pressure at the nozzle while delivering the rated capacity of the water tower. The water supply system shall be supplied by suitable piping with sufficient capacity to handle the specified flow. Not less than three 2½-inch hose connections (or other sizes with equivalent capacity) with clappers in each inlet shall be provided for supplying the apparatus. If apparatus is equipped with a fire pump, it shall be connected to the water tower and be capable of discharging 750 gpm through the tower nozzle.

NOTE: Where gated inlets are desired, purchaser shall indicate in Special Provisions.

**9-1.4.3** A suitable pressure gage shall be installed at the control pedestal to indicate the water pressure at the base of the tower or lower boom section.

**9-1.4.4** Nozzle tips provided shall be 1⅜, 1½, and 1¾ inches, and a spray nozzle of at least 500 gpm capacity. Where a variable flow spray nozzle capable of discharge range of between 500 and 1,000 gpm is provided, these additional tips need not be furnished.

**9-1.4.5** A spotlight, of not less than 100,000 candlepower, shall be provided on the apparatus by which the operator may observe the effect of the stream.

## **9-2 Control Devices and Mechanisms.**

### **9-2.1 General.**

**9-2.1.1** A control station shall be provided for the water tower operator at or adjacent to the turntable. The control devices shall be grouped in a convenient manner on a pedestal or panel. The control station shall be such that the operator easily can observe the boom and nozzle while operating the controls.

**NOTE:** It is desirable to have the controls so located that the operator will not be standing on the ground when operating the tower in order to avoid possible injury in case of apparatus contact with live electric lines.

**9-2.1.2** Control devices shall be clearly marked, suitably lighted, and arranged so that they may not be moved accidentally.

**9-2.1.3** A suitable device shall be provided at the driver's position to lock driving wheels of the chassis at the wheel brake drums. Brake performance shall comply with the requirements of Section 1-3.1.

**9-2.1.4** Four wheel chocks shall be provided.

**9-2.1.5** Ground jacks shall be provided on each side of the apparatus with widest practicable spread when in operating position. Ground jacks shall be arranged so that they may be used simultaneously on both sides of the apparatus with due compensation for normal differences in ground level. Positive safety stops shall be provided to prevent overextension. The ground contact area of each jack shall not be less than 140 square inches and in addition, foot plates of ample strength shall be provided with each jack capable of increasing the ground contact area of each jack to not less than 320 square inches. The jack foot pad shall be capable of swiveling in at least one direction. If foot pad swivels in one direction only, it shall be in a plane normal to the axis of the apparatus.

**9-2.1.6** Any structural member through which the jacks carry the weight of the booms or sections, portions of the truck, and live loads incident to fire fighting operations, shall be of ample strength to carry these loads without evidence of bending, twisting, or other failure.

## **9-2.2 Water Tower Operating Controls.**

**9-2.2.1** Controls for elevation of the water tower booms or sections out of their bed, extending them to their maximum elevation and vertical reach, returning them to their bed, shall be provided at the control station. These controls shall be arranged to permit the operator to regulate the speed of these operations within safe limits as determined by the manufacturer. A manual or other positive locking device shall be provided so that the desired angle of elevation can be maintained indefinitely without dependence upon engine power. Provision shall be made to prevent damage at full extension or retraction. Provision shall be made that, in the event of failure of any extending mechanism, the gravity descent of the water tower shall be kept at a speed which will prevent damage to the equipment or danger to personnel. Stops shall be provided to properly align the booms or sections without damage to the equipment when the water tower is retracted.

**9-2.2.2** Controls for rotating the turntable 360 degrees in either direction shall be provided and arranged so as to permit the operator to regulate the speed of rotation within safe limits as determined by the manufacturer.

**9-2.2.3** The turntable shall be so designed that it may be retained in any position unattended when the turret nozzle is in operation.

**9-2.2.4** Suitable indicators, clearly visible at all times, shall be provided to facilitate correct alignment of the turntable with the bed of the booms or sections.

**9-2.2.5** Provision shall be made so that in the event of failure of the normal operating power source, an auxiliary source of power shall be available to permit operation of the water tower in any of its normal operating positions.

## **9-2.3 Engine Controls.**

**9-2.3.1** If the engine speed is not automatically regulated or predetermined, a suitable engine throttle shall be provided at the control station. It shall be governed to prevent operation of the water tower at excessive speeds.

**9-2.3.2** A tachometer shall be provided on the instrument panel in the driving compartment for setting engine speeds.

**9-2.3.3** Where hydraulic power is used, the oil reservoir filler shall be located so as to be readily accessible for checking, conspicuously marked "Hydraulic Oil," and shall have a cap suitably secured.

**9-2.3.4** Positive stops shall be provided to limit boom or section travel to those positions of operation determined as safe by the manufacturer.

**9-2.3.5** A visual and/or audible signaling device shall be provided at the driver's position so as to indicate when the power take-off (PTO) mechanism is engaged.

### **9-3 Special Provisions.**

Height and reach of water tower assembly 9-1.2.1

Foam facilities 9-1.4.1

Salt water use 9-1.4.1

Gated inlets 9-1.4.2

## Chapter 10 Equipment for Various Types of Apparatus

### 10-1 Equipment.

#### 10-1.1 General. (*See A-10-1.1.*)

**10-1.1.1** Each article lists that equipment which shall be provided with each piece of apparatus. (See the Appendix for equipment which is recommended to be carried by every piece of apparatus of a particular type but which need not be supplied as new equipment for every piece of apparatus purchased, although it is strongly recommended that new equipment be provided. Also see the Appendix for additional optional equipment.)

**10-1.1.2** If no list of equipment is attached by the purchaser, the manufacturer shall supply that equipment listed as basic equipment which shall be provided for the particular type of apparatus being purchased.

**10-1.1.3** The manufacturer shall provide such brackets and compartments as are necessary for the basic equipment and other equipment specified in Special Provisions.

**NOTE:** Where added equipment brackets are desired, purchaser shall indicate in Special Provisions.

### 10-2 Equipment Carried on Pumpers. (*See A-10-2 and A-10-1.1.*)

**10-2.1** Basic equipment shall be provided as follows unless otherwise specified by purchaser:

1 14-foot metal ladder with folding hooks.

1 fire department metal solid beam extension ladder to extend 24 feet. (*See NFPA No. 1931-Fire Department Ground Ladders.*) (*See A-10-2.1.*)

**NOTE:** Where wood ladders or trussed type, or if different lengths are desired, purchaser shall indicate in Special Provisions.

2 axes, 1 pick-head and 1 flat-head type (6 pounds).

2 electric hand lights, 6-volt dry cell or 4-volt wet cell minimums.

- 2 approved portable fire extinguishers. The variety shall be suitable for use on Class A, B, and C fires. The minimum sizes shall be 20 BC rating in dry chemicals, 10 BC rating in CO<sub>2</sub> and 2 A rating in water-type extinguishers.

NOTE: Purchaser shall indicate the number and type desired in Special Provisions. (*See NFPA Standard No. 10-Portable Fire Extinguishers.*)

- 1 pike pole or plaster hook (6-foot minimum).

NOTE: Purchaser shall indicate length in Special Provisions.

Hard or soft suction hose. (*See 3-2.2.1, 3-4.1.1, 5-4.1.1, 11-2.2.7, 11-2.2.8.*)

NOTE: Purchaser shall indicate the type, diameter, and length of hose desired in Special Provisions.

- 1 swivel connection with suction hose thread on one end and local large hydrant thread on the other end.
- 1 swivel connection with pump suction thread on one end and local 2½-inch hose thread on the other end.
- 1 strainer of adequate capacity for suction hose, if hard suction hose is specified.
- 200 feet of 1-inch booster hose if apparatus is equipped with booster hose reel. (*See 3-4.2.1 and 4-2.1.1.*)

NOTE: Where different size or length of hose is desired, purchaser shall indicate in Special Provisions.

- 1 1-inch booster hose shutoff nozzle of combination straight-stream and spray type capable of delivering not less than 12 gpm at 100 psi nozzle pressure, if apparatus is equipped with booster hose reel. (*See 3-4.2.1 and 4-2.1.1.*)

NOTE: Where any equipment is to be omitted, purchaser shall indicate in Special Provisions.

### **10-3 Equipment Carried on Mobile Water Supply Apparatus** (*See A-10-3.1.*)

**10-3.1** Basic equipment shall be provided as follows unless otherwise specified by purchaser:

- 1 16-foot metal extension ladder.
- 2 axes, one pick-head and one flat-head type (6 pounds).
- 2 electric hand lights, 6-volt dry cell or 4-volt wet cell minimums.
- 2 approved portable fire extinguishers. The variety shall be suitable for use on Class A, B, and C fires. The minimum sizes shall be 20 BC rating in dry chemicals, 10 BC rating in CO<sub>2</sub> and 2 A rating in water-type extinguishers.

NOTE: Purchaser shall indicate the number and type desired in Special Provisions. (See NFPA Standard No. 10-Portable Fire Extinguishers.)

- 1 pike pole (specify length; 6-foot minimum).
- 30 feet of smooth-bore suction hose (appropriate size and type).
- 1 strainer of adequate capacity for the suction hose.
- 400 feet of 2½-inch double-jacketed, rubber-lined fire hose, coupled.
- 400 feet of 1½-inch double-jacketed, rubber-lined fire hose, coupled.
- 2 1½-inch shutoff nozzles capable of discharging either a spray or a straight stream.

NOTE (1). Where outside suction inlets are not provided, the hard suction hose and strainer are to be omitted.

NOTE (2). Where any equipment is to be omitted, purchaser shall indicate in Special Provisions.

#### **10-4 Equipment Carried on Ladder Trucks.** (See A-10-4 and A-10-4.1.)

**10-4.1** Basic equipment which shall be provided as follows unless otherwise specified by purchaser:

The following list of metal ladders shall apply. Ladders shall conform to the provisions of NFPA No. 1931-*Fire Department Ground Ladders*. Ladders over 20 feet shall be truss type. Lengths shall be measured when extended and shall not be the simple sum of the lengths of the sections. Widths shall be consistent with lengths, and extension ladders shall have pawls. (See A-10-4.1.)

- 1 40-foot extension ladder.
- 1 35-foot extension ladder.
- 1 28-foot extension ladder.
- 1 20-foot single ladder with folding roof hooks.
- 1 16-foot single ladder with folding roof hooks.
- 1 14-foot extension ladder.
- 1 10-foot collapsible ladder.

NOTE (1). Where a different list of ladders is desired, purchaser shall indicate in Special Provisions.

NOTE (2). Where wood ladders are desired, purchaser shall indicate in Special Provisions.

NOTE (3). Where ladders over 20 feet are to be solid side type, purchaser shall specify in Special Provisions.

If apparatus is equipped with an aerial ladder, provide the following:

1 ladder pipe suitable for quickly attaching to ladder with  $1\frac{1}{4}$ -,  $1\frac{3}{8}$ -,  $1\frac{1}{2}$ -inch tips.

100 feet of 3-inch double-jacketed, rubber-lined fire hose, coupled.

1 2-inlet valve siamese with  $\frac{3}{8}$ -inch minimum diameter drain (2 female, 1 male connections).

1 gated shutoff valve for male outlet on siamese.

NOTE (1). Where 3 inlet clappered siamese or different size is desired, purchaser shall indicate in Special Provisions.

NOTE (2). Where other size and length of lead hose is desired, purchaser shall indicate in Special Provisions.

2 pick-head axes (6 pounds).

2 flat-head axes (6 pounds).

2 crowbars, 50-inch minimum.

1 claw tool.

2 approved portable fire extinguishers. The variety shall be suitable for use on Class A, B, and C fires. The minimum sizes shall be 20 BC rating in dry chemicals, 10 BC rating in  $\text{CO}_2$  and 2 A rating in water-type extinguishers.

NOTE: Purchaser shall indicate the number and type desired in Special Provisions. (*See NFPA Standard No. 10-Portable Fire Extinguishers.*)

4 electric hand lights, 6-volt dry cell or 4-volt wet cell minimums.

2 6-foot pike poles.

2 8-foot pike poles.

2 12-foot pike poles.

2 scoop shovels.

2 shovels, plain.

125 feet rope ( $\frac{5}{8}$ -inch diameter).

125 feet rope ( $\frac{3}{4}$ -inch diameter).

NOTE: Purchaser shall indicate the grade of rope desired in Special Provisions.

4 pompier belts.

NOTE: Where any equipment is to be omitted, purchaser shall indicate in Special Provisions.

## 10-5 Equipment Carried on Pumper-Ladder Trucks.

**10-5.1** Basic equipment which shall be provided as follows unless otherwise specified by purchaser (*see A-10-5.1*):

The basic equipment shall be that specified in both Sections 10-2.1 and 10-4.1; on individual items of equipment, the larger number shall be that required.

**NOTE:** Where any equipment is to be omitted, purchaser shall indicate in Special Provisions.

## 10-6 Equipment Carried on Salvage Trucks.

**10-6.1** The following is a list of basic tools and equipment which shall be carried on salvage trucks:

- 1 box sprinkler equipment containing:
  - 12 standard sprinkler heads (assorted temperatures and types).
  - 6 sprinkler stoppers or wedges.
  - 1 set sprinkler head wrenches for the types of heads carried.
  - 1 box assorted pipe plugs and caps.
- 3 stillson wrenches, 10-, 14-, 16-inch sizes.
- 2 monkey wrenches.
- 20 salvage covers.
- 2 floor runners, 3 by 18 feet.
- 1 roll 15-pound tar paper or plastic sheeting, at least 8 mil.
- 4 brooms.
- 4 mops.
- 2 mop wringers, with buckets.
- 1 water vacuum cleaner.
- 6 18-inch squeegees with handles.
- 3 scoop shovels.
- 1 submersible pump.
- 2 10-foot metal ladders with folding roof hooks.
- 2 8-foot pike poles.
- 125 feet rope ( $\frac{1}{2}$ -inch diameter).
- 125 feet rope ( $\frac{3}{8}$ -inch diameter).

**NOTE:** Purchaser shall indicate the grade of rope desired in Special Provisions.

- 2 axes (6 pounds).
- 1 crowbar, 36-inch minimum.
- 2 pinch bars.
- 2 sledge hammers.
- 3 claw hammers.
- 1 box of assorted nails.
- 2 padlocks, keys and hasps.
- 1 heavy-duty stapler.
- 4 assorted hand saws.
- 1 power saw (chain or heavy-duty rotary type).
- 1 smoke ejector, 5,000 cfm minimum capacity.
- 1 electric generator set of at least 2,500 watt rating.

NOTE: Where generator is not portable, additional wire cable is desirable. If built-in-wire connections are made to receptacles on the truck, a 3-wire system is recommended with either portable or fixed generator.

- 3 portable floodlights (500 watt).
- 6 50-foot lengths of cable with locking type connectors 14-3 gage or heavier.
- 3 pigtail ground adapters, 2 wire to 3 wire 14-3 gage or heavier with 12-inch minimum length.
- 2 100-foot lengths of cable with locking type connectors.
- 2 electric hand lights, 6-volt dry cell or 4-volt wet cell minimums.
- 1 first-aid kit (24-unit fire department assortment).
- 2 approved portable fire extinguishers. The variety shall be suitable for use on Class A, B, and C fires. The minimum sizes shall be 20 BC rating in dry chemicals, 10 BC rating in CO<sub>2</sub> and 2 A rating in water-type extinguishers.

NOTE: Purchaser shall indicate the number and type desired in Special Provisions. (*See NFPA Standard No. 10-Portable Fire Extinguishers.*)

- 1 roll heavy-duty cellophane tape, 2-inch width.
- 1 deodorizer unit, power operated.
- 2 self-contained breathing apparatus (NIOSH approved, one-half hour rating minimum); masks must also meet requirements of State law where applicable.

NOTE (1). At least one spare tank for each unit shall be available on responding apparatus. Where added tanks are desired, purchaser shall indicate in Special Provisions.

NOTE (2). Where any equipment is to be omitted, purchaser shall indicate in Special Provisions.

**10-7 Special Provisions.**

Additional equipment A-10-2.1, A-10-3.1, A-10-4.1, A-10-5.1

Additional wire cable 10-6.1, A-10-4.1

Equipment brackets 10-1.1.3

Option on ladders 10-2.1, 10-4.1, A-10-2.1

Number and type of extinguishers 10-2.1, 10-3.1, 10-4.1, 10-6.1

Equipment to be omitted 10-2.1, 10-3.1, 10-4.1, 10-5.1, 10-6.1

Type, diameter and length of suction hose 10-2.1, 10-3.1

Total length and size of booster hose 10-2.1

Length of plaster hook or pike pole 10-2.1

Large diameter hose A-10-2.1

Nozzle tip sizes A-10-2.1

Grade of rope desired 10-4.1, 10-6.1, A-10-2.1

Spare tanks for breathing apparatus 10-6.1, A-10-2.1, A-10-4.1,  
A-10-5.1

Type of hose hoist A-10-2.1, A-10-4.1

Additional suction hose A-10-2.1

Preconnected 1½-inch hose and nozzles A-10-2.1

Type of siamese 10-4.1

Type of lead hose 10-4.1

## **Chapter 11 Acceptance Tests and Requirements**

### **11-1 Road Tests — All Apparatus.**

#### **11-1.1 Acceptance Procedure.**

**11-1.1.1** Acceptance tests on behalf of the purchaser shall be as prescribed and conducted prior to delivery or within 10 days after delivery, by the manufacturer's representative in the presence of such person or persons as the purchaser may designate in the requirements for delivery.

**11-1.1.2** The apparatus, loaded with a full complement of hose and men, a full water tank, and equipment allowances as specified in Section 1-1.3.1, shall meet the tests on paved roads, dry and in good condition. The tests shall be on the basis of two runs, in opposite directions over the same route, the engine not operating in excess of the manufacturer's maximum rpm. (*See A-11-1.1.2.*)

#### **11-1.2 Tests.**

**11-1.2.1** From a standing start, through the gears, the vehicle shall attain a true speed of 35 mph within 25 seconds in the case of pumpers, and a true speed of 35 mph in 30 seconds in the case of apparatus carrying over 800 gallons of water or apparatus equipped with aerial ladders or elevating platforms.

**11-1.2.2** From a steady speed of 15 mph the vehicle shall accelerate to a true speed of 35 mph within 30 seconds. This shall be accomplished without moving gear selector.

**NOTE (1).** Where apparatus is designed for service involving long runs at steady speed or is a large water supply tanker, this requirement may be waived or modified. (*See A-11-1.2.2.*)

**NOTE (2).** Where this acceleration test is to be waived, purchaser shall indicate in Special Provisions.

**11-1.2.3** The vehicle shall attain a top speed of not less than 50 mph.

**NOTE:** Where an increased top speed is desired, purchaser shall indicate in Special Provisions. It is recommended that specified speed not be increased for aerial ladder or elevating platform trucks.

**11-1.2.4** The vehicle shall demonstrate ability to comply with the requirements of Section 1-3.1.4.

**11-2 Acceptance Requirements.** (Applies only to apparatus equipped with a fire pump, Chapter 3.)

### **11-2.1 Tests Performed by the Manufacturer.**

**11-2.1.1** The fire pump on the completed vehicle shall be thoroughly run in by the manufacturer before being delivered, by operating for a minimum of two hours at draft delivering rated capacity at 150 psi net pump pressure for at least one hour, 70 percent of rated capacity at 200 psi net pump pressure for at least  $\frac{1}{2}$  hour and 50 percent of rated capacity at 250 psi net pump pressure for at least  $\frac{1}{2}$  hour.

**11-2.1.2** All pumps are to be tested by the pump manufacturer for 10 minutes hydrostatically at a pressure of 350 psig. Two stage series-parallel pumps are to be tested by the pump manufacturer either hydrostatically or hydrodynamically at a discharge pressure of 500 psig.

### **11-2.2 Certification Tests.**

**11-2.2.1** A three-hour certification test shall consist of drafting water and pumping rated capacity against a net pump pressure of 150 psi for a continuous period of two hours, followed by two  $\frac{1}{2}$ -hour periods of continuous pumping, during one of which at least 70 percent of the rated capacity shall be delivered at net pump pressure of 200 psi and during the remaining  $\frac{1}{2}$  hour, 50 percent of the rated capacity shall be delivered at a net pump pressure of 250 psi.

**11-2.2.2** The apparatus shall also be given a 10-minute overload test to demonstrate its ability to develop 10 percent excess power (*see 3-1.3.2*). The test shall consist of discharging rated capacity from draft at 165 psi net pump pressure.

**11-2.2.3** A test shall be conducted to check the performance of the automatic pump pressure control (*see 3-3.2.4*) pumping from draft and discharging rated capacity at 150 psig pressure. With the pressure control set in accordance with manufacturer's instructions, after all outlet valves have been closed slowly, pump discharge pressure shall not have increased more than 30 psig from its original value.

After the 150 psig test has been completed, the discharge shall be reestablished at rated capacity at 150 psig pressure. Pressure shall then be reduced to 90 psig by using the throttle and preceding automatic pump pressure control test procedure shall be repeated.

Automatic pump pressure control test in accordance with the procedure described at 150 psig shall also be conducted with pump discharging 50 percent of rated capacity at 250 psig.

**11-2.2.4** A vacuum test, using the pump priming device, with capped suctions, shall develop 22 inches of vacuum at altitudes of up to 1,000 feet and hold the vacuum with a drop of not in excess of 10 inches in 10 minutes. For every 1,000 feet of elevation, the required vacuum shall be reduced 1 inch. The primer shall not be used after the 10 minute test period has been started. The test shall be made with discharge outlets uncapped. (See 3-3.2.5.)

**11-2.2.5** Tests shall be made with all accessories and power-consuming appliances attached.

**11-2.2.6** The stops during tests shall be only such as are necessary for changing hose and nozzles. During and after the tests, the engine, pump, transmission, and all parts of the machine shall show no undue heating or excessive strain or vibration and the engine shall show no loss of power, overspeed, or other defect.

**11-2.2.7** For pumpers less than 1500 gpm capacity, tests shall be made with 20 feet of hard suction hose in a single line. For 1500 gpm or larger pumpers, one or two 20-foot suction lines shall be used. External and internal strainers shall be used on all tests. (See 3-2.2.1.)

**11-2.2.8** Pumping tests should be conducted preferably with a vertical lift of not more than ten feet. The vertical lift is the vertical distance from the surface of the water to the center of the pump suction inlet. The net pump pressure is the sum of the pump discharge gage pressure, corrected for any gage error, plus the vertical distance from water level to the gage (lift), plus suction losses. The formula given converts the height of lift in feet to pressure in psi and the use of Table 11-2.2.8 provides suction loss allowances in accordance with size of suction hose and the number of lengths in use. (See A-11-2.2.8.)

$$\frac{\text{Height of lift (feet) plus Suction loss (Table 11-2.2.8)}}{2.3} = \text{Suction allowances, psi}$$

**11-2.2.9** Where water tanks are specified, the specified rate of flow shall be maintained throughout the discharge period for at least 80 percent of the rated capacity of a tank 300 gallons and larger. (See 6-1.2.3.)

**Table 11-2.2.8 Allowances for Friction Loss in the Suction Hose**

| Rated Capacity of Pumper gpm | Diameter of Suction Hose in inches | Allowance (feet)           |                                            |
|------------------------------|------------------------------------|----------------------------|--------------------------------------------|
|                              |                                    | For 10 ft. of Suction Hose | For Each Additional 10 ft. of Suction Hose |
| 500                          | 4                                  | 6                          | plus 1                                     |
|                              | 4½                                 | 3½                         | plus ½                                     |
| 750                          | 4½                                 | 7                          | plus 1½                                    |
|                              | 5                                  | 4½                         | plus 1                                     |
| 1000                         | 4½                                 | 12                         | plus 2½                                    |
|                              | 5                                  | 8                          | plus 1½                                    |
|                              | 6                                  | 4                          | plus ½                                     |
| 1250                         | 5                                  | 12½                        | plus 2                                     |
|                              | 6                                  | 6½                         | plus ½                                     |
| 1500                         | 6                                  | 9                          | plus 1                                     |
| 1500                         | 4½ (dual)                          | 7                          | plus 1½                                    |
| 1500                         | 5 "                                | 4½                         | plus 1                                     |
| 1500                         | 6 "                                | 2                          | plus ½                                     |
| 1750                         | 6                                  | 12½                        | plus 1½                                    |
| 1750                         | 4½ (dual)                          | 9½                         | plus 2                                     |
| 1750                         | 5 "                                | 6½                         | plus 1                                     |
| 1750                         | 6 "                                | 3                          | plus ½                                     |
| 2000                         | 4½ "                               | 12                         | plus 2½                                    |
| 2000                         | 5 "                                | 8                          | plus 1½                                    |
| 2000                         | 6 "                                | 4                          | plus ½                                     |

NOTE: The allowance computed above for the capacity test should be reduced by 1 pound for the allowance on the 200-pound test and by 2 pounds for the allowance on the 250-pound test.

EXAMPLE: 1000-gallon pumper, 9-foot lift, 20 feet of 5-inch suction:

$$\text{Pressure Correction} = \frac{9+8+1\frac{1}{2}}{2.3} = 8 \text{ psi.}$$

### 11-2.3 Data Required of the Manufacturer.

**11-2.3.1** The manufacturer must supply, at time of delivery, at least one copy of:

- (1) Engine manufacturer's certified brake horsepower curve showing the maximum no-load governed speed. (See Section 1-1.2.5.)
- (2) Manufacturer's record of pumper construction details — Form 3000-375A. (See Appendix.)
- (3) Pump manufacturer's certification of suction capability. (See Section 3-1.2.2.)

- (4) Pump manufacturer's certification of hydrostatic test. (See Section 11-2.1.2.)
- (5) The certification of inspection for Fire Department Pumper by a nationally recognized testing laboratory (see Appendix for sample form).

NOTE: It is suggested that the fire insurance rating organization having jurisdiction be contacted concerning local requirements.

**11-2.3.2** A test plate shall be provided at the pump operator's position which gives the rated discharges and pressures together with the speed of the engine as determined by the manufacturer's test for each unit, the position of parallel-series pump is used, and the no-load governed speed of the engine as stated by the engine manufacturer on a certified brake horsepower curve. The plate shall be completely stamped with all information at the factory and attached to the vehicle prior to shipping.

#### **11-2.4 Tests on Delivery.**

**11-2.4.1** If a pump test, conducted by the manufacturer, is desired at the point of delivery, this test shall be run in accordance with those provisions of Section 11-2.2 which the purchaser specifies.

NOTE (1). It is suggested that the fire insurance rating organization having jurisdiction be contacted concerning local requirements.

NOTE (2). Where the point of delivery is over 2,000 ft. of elevation, the overload test described in Section 11-2.2.2 should be performed to ensure that the engine will develop adequate power at point of delivery. (See A-3-1.1.1.)

NOTE (3). Where a test at delivery is desired, purchaser shall indicate in Special Provisions.

#### **11-3 Tests — Booster Pump.**

##### **11-3.1 Manufacturer's Tests.**

**11-3.1.1** Pump discharge chamber and discharge connections shall be tested by the pump manufacturer for 10 minutes at a pressure of 100 psi in excess of the maximum rated pressure.

##### **11-3.2 Tests on Delivery.**

**11-3.2.1** A pump test, conducted by the manufacturer, may be desired at the point of delivery. Pumping tests shall prove the following: capacity and pressure, Section 5-1.1.1; engine capability, Section 5-1.3.1; suitability of pump controls, Section 5-3.2; and engine controls, Section 5-3.3; suction capability, Section 5-1.2.1, if applicable.

NOTE: Where a test at delivery is desired, purchaser shall indicate in Special Provisions.

## **11-4 Tests — Piping and Tank Capacity.**

### **11-4.1 Tank Flow Capability.**

**11-4.1.1** A test shall be conducted to determine the ability of the equipment to provide, on level ground, the flow indicated in Section 6-1.2.3.

NOTE: Where a different flow is desired, purchaser shall indicate in Special Provisions.

### **11-4.2 Tank Capacity.**

**11-4.2.1** A test shall be conducted to determine if the water tank has at least the capacity specified.

## **11-5 Tests — Aerial Ladders.**

### **11-5.1 Structural Strength Tests.**

**11-5.1.1** The aerial ladder shall be designed and so powered that from a horizontal position it will lift a weight of 200 pounds on the free end of the main section of the ladder, in addition to any equipment mounted on the aerial ladder for which provision is specified.

NOTE: See NFPA No. 1904, *Testing, Use and Maintenance of Fire Department Aerial Ladders and Elevating Platforms*.

### **11-5.2 Operation Tests.**

**11-5.2.1** A complete cycle of aerial ladder operation shall be carried out after starting the engine, setting the jacks, and transmitting power to the ladder. Elevating the ladder out of the bed, rotating ladder 90 degrees and extending ladder to full specified height shall be completed smoothly and without undue vibration in not over 60 seconds. The ladder shall be retracted, the turntable rotation completed and the ladder lowered to its bed after which a thorough inspection shall be made of all moving parts with special attention being given to the security and adjustment of the ladder cables. The test should include successful operation of all ladder controls.

## **11-6 Tests — Elevating Platforms.**

### **11-6.1 Stability Test.**

**11-6.1.1** A test of the apparatus shall be performed to demonstrate that the platform and booms or sections are so designed and powered that at maximum horizontal reach a load

representing 150 percent of the manufacturer's rated payload capacity can be placed on the platform and rotated a complete 360 degrees. This test shall be performed on firm level ground with the jacks firmly set.

### **11-6.2 Operational Tests.**

**11-6.2.1** After starting the engine, setting the jacks, and transmitting power to the platform booms or sections a complete cycle of platform operation shall be carried out as follows: With one man operating the machine from the lower control station, raise the platform from a bedded position, extend to full specified height and rotate through a 90-degree turn. This shall be completed smoothly and without undue vibration in not over 150 seconds. The platform shall then be retracted and lowered to its starting position after which a thorough inspection shall be made of all moving parts, with special attention given to inspection of the platform leveling system. This test shall be repeated in not over 150 seconds employing the controls at the platform control station. The effectiveness of the lower control station override shall be demonstrated.

### **11-6.3 Operation-Turret Nozzle and Water System.**

**11-6.3.1** The apparatus shall be set up to operate the turret nozzle to demonstrate its ability to comply with Sections 8-1.4.2, 8-1.4.3, and 8-3.2.1.

## **11-7 Tests — Water Towers.**

### **11-7.1 Operational Test.**

**11-7.1.1** After starting the engine, and transmitting power to the water tower booms or sections, a complete cycle of operation shall be carried out as follows: With one man operating the machine from the control station, raise the water tower, rotate through a 90-degree turn, and extend to full specified height. This shall be completed smoothly and without undue vibration in not over 150 seconds. The tower shall then be retracted and lowered to its starting position after which a thorough inspection shall be made of all moving parts.

### **11-7.2 Water Tower and System.**

**11-7.2.1** The apparatus shall be set up to operate the water tower nozzle to demonstrate its ability to comply with Sections 9-1.3.3, 9-1.4.2 and 9-2.3.4.

**11-8 Special Provisions.**

Acceleration requirements 11-1.2.2

Top speed 11-1.2.3

Tests on delivery 11-2.4.1, 11-3.2.1

Tank flow rate 11-4.1.1

Warranty provisions (*See Appendix.*)

TIA  
NFPA 1901  
Reference: 3-3.4.4  
3-3.4.4.1  
3-3.4.4.2  
3-3.4.5  
5-3.4.3  
5-3.4.3.1  
5-3.4.3.2  
5-3.4.4

**Tentative Interim Amendment 1901-75-1 to the  
Standard for Automotive Fire Apparatus**

NFPA 1901 — 1975

In accordance with the Regulations Governing Committee Projects, the NFPA Committee on Fire Department Equipment has processed and approved the following Tentative Interim Amendment to the 1975 edition of the Standard for Automotive Fire Apparatus, NFPA 1901. This amendment was approved for release by the Standards Council on June 6, 1978.

*Add new paragraphs to Chapters 3 and 5 as follows:*

**3-3.4.4** Where the pump is driven by the vehicle engine and an automatic transmission is furnished, two green indicator lights shall be provided. One indicator light shall be installed at the pump operator's position immediately adjacent to and preferably above the throttle control with a legend reading: "*Warning: Do not open throttle unless light is on.*" The second indicator light shall be installed in the cab of the vehicle in plain view from the driver's normal position, with a legend reading: "*OK to Pump.*"

*Exception: This requirement shall not apply where the only pump operator's position is also the driver's position and the pump can be operated while the vehicle is moving under power. (See also 3-3.4.5.)*

**3-3.4.4.1** Where the pump has a split-shaft PTO and is installed between the chassis transmission and the driving axle, the indicator lights specified in 3-3.4.4 shall be energized only when the pump transmission is in the pumping position.

— (Continued) —

3-3.4.4.2 Where the pump is driven by a transmission mounted (SAE) PTO, or front-of-engine crankshaft PTO with the transmission in neutral, the indicator light specified in 3-3.4.4 shall be energized only when the chassis transmission is in neutral.

3-3.4.5 Where the pump can be operated while the vehicle is moving under power, a visual indicator at the driver's position shall be provided to advise the driver when the pump is engaged.

5-3.4.3 Where the pump is driven by the vehicle engine and an automatic transmission is furnished, two green indicator lights shall be provided. One indicator light shall be installed at the pump operator's position immediately adjacent to and preferably above the throttle control with a legend reading: "Warning: Do not open throttle unless light is on." The second indicator light shall be installed in the cab of the vehicle in plain view from the driver's normal position, with a legend reading: "OK to Pump."

*Exception: This requirement shall not apply where the only pump operator's position is also the driver's position and the pump can be operated while the vehicle is moving under power. (See also 5-3.4.4.)*

5-3.4.3.1 Where the pump has a split-shaft PTO and is installed between the chassis transmission and the driving axle, the indicator lights specified in 5-3.4.3 shall be energized only when the pump transmission is in the pumping position.

5-3.4.3.2 Where the pump is driven by a transmission mounted (SAE) PTO, or front-of-engine crankshaft PTO with the transmission in neutral, the indicator light specified in 5-3.4.3 shall be energized only when the chassis transmission is in neutral.

5-3.4.4 Where the pump can be operated while the vehicle is moving under power, a visual indicator at the driver's position shall be provided to advise the driver when the pump is engaged.

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NATIONAL FIRE PROTECTION ASSOCIATION  
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## **Appendix to Standard**

### **Introduction**

#### **General**

The purchase of new fire apparatus involves a major investment and should be treated as such. Fire apparatus is complex mechanical equipment which should not be purchased in a haphazard manner. Purchase should be made only after detailed study of the needs, taking into consideration other equipment the department may own or plan to buy.

This Standard is designed for use in buying various types of apparatus including pumpers, mobile water supply apparatus, aerial ladders, and elevating platform equipment. The Standard is designed to assure sound equipment capable of good performance, without inclusion of restrictive features. The tests are an important feature and should be required to assure that the completed apparatus will meet the specified performance.

#### **Study of Apparatus Needs**

An important step in buying apparatus is to study and determine the needs of the department. Competent advice should be obtained from knowledgeable and informed sources including experienced and capable fire chiefs, fire protection engineers, trade journals, training instructors, and maintenance personnel. The fire insurance rating authority should be consulted.

The equipment lists presented in this Standard are related to the type of apparatus being considered. Since new apparatus must be fully equipped in order to provide effective service, this Standard contemplates the provision of new equipment along with the apparatus. If some suitable equipment is already available within the department, provision of all new equipment may not be justified. Similar judgment is necessary when departmental operations involve auxiliary apparatus and two-piece companies. The Appendix to this Standard should be used to assist in the evaluation and determination of a fire department's basic needs.

#### **Compliance with Federal Standards**

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 trucks. 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 manufacturers face heavy penalties for infraction of these rules and therefore cannot accept specifications which would require them to perform unlawfully, or to delete required items or to include any that are illegal.

Additional requirements are placed on apparatus manufacturers and the engine manufacturers (both gasoline and diesel) which are based upon the Clean Air Act and enforced by the Environmental Protection Agency. These standards have resulted in major changes in the performance of many engines. Neither the engine manufacturer nor the apparatus manufacturer may modify engines once they are certified to EPA. The EPA standards often make mandatory the installation of larger engines than may have been previously used, in order to obtain the same apparatus performance.

As some types of fire apparatus are extremely complex and require long production lead times, Chapter 49 CFR, Part 571.8, of the Federal regulations makes provision for the standards applicable at the time of contract to be those to which the vehicle shall comply at time of delivery provided delivery takes place within two years of contract.

## **Writing the Specifications**

This Standard provides the basic technical section for purchasing fire apparatus. Fire apparatus manufacturers are expected to be familiar with the Standard. Usually all that is required is to indicate which chapters or sections are to apply to the apparatus being purchased and to set forth the Special Provisions which will be a part of the specifications. It is recognized that many purchasers will desire additional features of operation over and above this basic Standard. The last Article in each chapter contains a reference list of these features.

## **Preparing Specifications**

It is important to set a date for the formal opening of bids. This date should be far enough in advance for the engineering departments of apparatus manufacturers to study the specifications and estimate the cost of the apparatus. At least a month is recommended. More time may be required if engineering drawings of the proposed apparatus are required. Bidders should understand that the apparatus will be subjected to the performance tests outlined in this Standard.

Many purchasers find it is desirable to provide for an interim inspection at the assembly plant of the successful bidder. The advantages of such a provision include the opportunity to evaluate construction prior to final assembly and painting. The specifications should detail particulars of such an inspection trip.

### **Studying the Proposals**

Look for deviations from your specifications and obtain clarification where necessary. Discuss the financial arrangements. Be sure to have a stipulated delivery date. Obtain a written statement as to method of delivery, whether by rail or over the road. Where the apparatus is to be equipped with a fire pump, the manufacturer should be required to furnish impartial verification of capability meeting purchase pumping specifications. Acceptance tests should be performed before the apparatus is accepted by the purchaser as meeting the specifications.

With a performance specification defining quality, it is usually possible to obtain more favorable bids since there is genuine competition and the specifications are not overly restrictive. Manufacturers' proposals may include amendments and exceptions. Frequently, these changes are offered to meet price requirements or because an individual manufacturer may prefer to build apparatus in a manner more convenient to him. If the intent of the original specification is not changed and the bid is favorable, the purchasing committee may accept these amendments with the approval of the fire chief. On the other hand, extreme care should be taken not to permit exceptions which merely devalue the apparatus and give a bidder an advantage.

If the purchaser has specifically provided for alternates when calling for bids, extra care must be exercised when evaluating proposals — combinations of complicated bid information can become a headache.

### **Awarding the Contract**

Before signing a contract, make certain that the successful bidder has a complete and thorough understanding of the specifications. If any changes are agreed upon, these should be stated in writing and be signed by both parties. Be sure to have a positive understanding of every item since it is much better to reach an agreement in advance of signing the contract. When the chief and the purchasing body are satisfied, the contract should be signed, and not before.

Bidders should also understand that prior to acceptance following delivery, the apparatus, loaded with water, hose, and equipment, will be weighed to verify compliance with gross vehicle weight rating and axle weight distribution.

## **Acceptance**

Normally, the chief of the fire department (or his designated representative) is the acceptance authority, exercising this authority following satisfactory completion of tests and inspections for compliance with purchase specifications.

## **Your Obligation**

The fire department, whether paid or volunteer, tax or solicitation supported, has an obligation to the citizens it protects. This fact should be paramount when buying apparatus. The primary obligation is to provide apparatus which will best protect persons and property. A bargain-rate, ill-suited truck can be a waste of taxpayers' money and, if purchased for other than fire fighting utility, may give a false sense of security.

### **A. Advisory Statements.**

This Appendix presents advisory information as an assist in the development of the technical section of a complete specification for purchasing fire apparatus. Where applicable, the subdivisions are numbered to correspond with the paragraph numbers of the Standard.

**A-1-1.2** When local operating conditions necessitate apparatus of unusual design, the purchaser should indicate the requirements in the Special Provisions. Height, width, under-vehicle clearance, wheelbase, turning radius, length, etc., may occasionally need special attention. As an example: a community having many narrow winding streets must have apparatus capable of readily negotiating switchbacks without delay.

**A-1-1.3** The carrying capacity of a vehicle is apparently one of the least understood features of design and one of the most important. All vehicles are designed for "rated GVWR" or maximum total weight, which should not be exceeded by the apparatus manufacturer or by the purchaser after he has placed the vehicle in service. For tractor-drawn vehicles, the design should be adequate for "rated GCWR" weight. There are many factors which make up the rated GVWR, including the design of the springs or suspension system, the rated axle capacity, the rated tire loading, and the distri-

bution of the weight between the front and rear wheels. One of the most critical factors is the size of the water tank; as water weighs approximately  $8\frac{1}{3}$  pounds per gallon, a 500-gallon water tank will mean an additional weight of about two tons on the vehicle. A value of 10 pounds per gallon may be used when estimating the weight of the tank and its water, making about  $2\frac{1}{2}$  tons for a 500-gallon tank.

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 may cause a front-end skid and, over bumpy roads, may 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 may result in a rear-end skid, or difficulty in traveling over unpaved roads or in mud. Further, overloading of either front or rear wheels might require that the tires be of different sizes.

Overloading the vehicle by the manufacturer through his design, or by the purchaser through his specifying a small chassis with a large water tank, or by the purchaser adding a great deal of equipment after the vehicle is in 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 may also seriously affect handling characteristics, making steering particularly difficult.

Fire apparatus must be able to perform its intended service under adverse conditions which may require operation off paved streets or roads. Chassis components should be selected with the rigors of service in mind. It is not good practice to employ under-rated or especially rated frames, axles, or transmissions even though the finished vehicle may be able to pass the road tests under favorable conditions.

The Standard does not contain any minimum for size of engine as the size of the engine must be chosen to correspond with the conditions of design and service. The size of engine is usually determined by the carrying capacity of the vehicle rather than the capacity of the pump with the possible exception of large capacity pumps. These suggested specifications contain, in Chapter 11, road tests which are designed to prove that the engine supplied is of adequate size.

**A-1-1.4.1** Many fire departments have favored high torque low-speed engines for fire department service because such engines have good performance characteristics both when negotiating

city traffic and when driving fire pumps. However, high-speed engines are frequently employed for fire apparatus, particularly in the cases of commercial truck chassis. Where high-speed engines are selected for use in fire apparatus which may have to operate off paved highways, it is recommended that one of the following components be specified in the Special Provisions: A two-speed rear axle with high numerical ratio in low range; and auxiliary transmission; or an automatic transmission. For most rural fire truck chassis, a two-speed rear axle is recommended.

**A-1-1.4.2** The maximum no-load governed speed is established by the engine manufacturer as a safe limit of engine speed. The governor will prevent the engine from exceeding the safe speed. Most engine manufacturers allow a plus tolerance of 2 percent for maximum no-load governed speed.

**A-1-1.4.3** A shut down beyond the control of the truck operator during fire fighting and/or rescue operations can result in loss of water flow from the pump or loss of operation power for an aerial device which could severely endanger personnel.

**A-1-1.5.3** When a regular production model commercial chassis is used, it is recommended that the heavy-duty radiator option be included when such is available. Radiators with bolted top and bottom tanks and removable side braces, if available, are considered preferable.

**A-1-1.6.1** Full flow oil filters are mandatory with some diesel engines.

**A-1-1.7.3** Installation of two or more fuel pumps should be designed so that failure of one pump will not nullify the performance of the others. It should be remembered that commercial trucks are designed for over-the-road operation and the fuel system and battery are at least partially cooled by the flow of air resulting from the motion. When a commercial truck is used for fire apparatus, care must be taken that vapor lock does not develop in the fuel system due to the heat developed when the vehicle is standing with the engine driving the pump. Proper ventilation of battery compartment is also important.

**A-1-1.7.6** It is not a recommended practice to add a second tank to a commercial vehicle when the original tank is too small, since such tanks are seldom designed for dual tank use. Where large fuel capacity is required, dual tanks designed for the purposes are acceptable. In such circumstances, it is undesirable for a pump operator to be required to manually open or close valves to provide additional fuel supply to the engine and, further, there should be

a free flow from both tanks so that fuel will not remain unused in any tank for long periods. The tanks should be arranged with check valves in the line with free flow to a mutual feed line. Unfortunate incidents have occurred where operators have used the fuel in one tank, switched to another tank, and neglected to refill the first tank on return to the station. It is also desirable that the fuel gage be so installed that the operator can immediately determine the amount of fuel still remaining in his fuel system without mental addition of various fuel tank capacities.

**A-1-1.8.1** Emissions from exhaust discharge pipes should be directed away from any fire fighting tools since such emissions contain an oily substance that could make the tools difficult to handle and possibly dangerous to use.

**A-1-2.2.1** An alternator is normally the permanent source of electric power on the fire apparatus. Problems may arise because the purchaser specifies receptacle outlets to provide current for operating lights, power tools or similar equipment.

An alternator produces alternating current varying between 12 and 14 volts; if 110 volts is desired, a transformer must be used. However, the alternator produces 3-phase current and it is essential that the power consumed be balanced on the phases within the limits recommended by the manufacturer. Therefore, either a 3-phase transformer or not more than one transformer on a single phase is necessary; use of two transformers or lack of balance between phases will endanger the alternator.

The alternator begins to produce a usable amount of current at alternator speeds of 800 rpm and produces the maximum current, dependent upon alternator rating, at speeds of 1400 to 1600 rpm. However, the alternating current produced has a frequency (in cycles per second) of one tenth the alternator speed (in revolutions per minute) so that it has a frequency which varies from 80 to 160 or more cycles per second. Therefore, motors designed to operate only on 60 cycle a.c. current will soon burn out. This means that a rectifier must be installed with the transformer mentioned above and motors of power tools operated from the alternator must be of universal (a.c. - d.c.) type or d.c. type.

Further, an alternator will only produce a limited amount of current, much of which must be used for charging the battery and operating lights, radio, and other vehicle equipment; the only current available for operating floodlights or power tools is that which is over and above the vehicle requirements.

Another method of producing 110 volts power is through the use of a power inverter which produces 110 volts AC current and can