United States Department of Agriculture

Type 2 Tactical Water Tender Specification

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National Technology and Development Program

TABLE OF CONTENTS

TABLE OF CONTENTS 2
RECORD OF REVISIONS 7
1 — GENERAL 8
1.1 General Statement 8
1.2 NFPA 1900 Compliance 8
1.3 Weight Requirement 8
1.4 Tilt Test 8
1.5 Ramp Break-Over Angle 8
1.6 Height Requirement 8
1.7 Estimated In-Service Weight and Center of Gravity 8
1.8 Specification Deviations 9
1.9 Brand Name of Equivalent Products 9
2 — CHASSIS REQUIREMENTS (FOR REFERENCE ONLY) 9
2.1 Wheelbase 9
2.2 Cab to Axle 9
2.3 After Frame 9
2.4 Tow Hooks 9
2.5 Frame Rails 9
2.6 Bumper, Front 9
2.7 Frame Extension 9
2.8 Axle, Front, Non-Driving 9
2.9 Suspension, Front 10
2.10 Brake System, Dual Air 10
2.11 Steering Column 10
2.12 Steering Wheel 10
2.13 Steering Gear 11
2.14 Exhaust System 11
2.15 Electrical System 11
2.16 Alternator 11
2.17 Battery System 11
2.18 Radio 12
2.19 Starter 12
2.20 Grille 12
2.21 Front End 12
2.22 Engine 12
2.23 Radiator 13
2.24 Transmission, Automatic 13
2.25 Transmission Controls 13
2.26 Axle, Rear 13
2.27 Suspension, Rear 13
2.28 Fuel Tank 14
2.29 Diesel Exhaust Fluid (DEF) Tank 14
2.30 Cab 14

2.31 Manuals 15
2.32 Tires and Wheels 15
2.33 Speed Limitation 15
2.34 Rear View Backup Camera System 16
2.35 Tire Pressure Monitoring System (TPMS) 16
2.36 Connected diagnostics 16

3 — CHASSIS ELECTRICAL REQUIREMENTS 16

3.1 Chassis Electrical Additional Equipment and Modifications 16
3.2 Battery Master Switch 17
3.3 “Battery On” Indicator Light 17
3.4 Electronic Control Module (ECM) Programming 17
3.5 Back Up Alarm 17
3.6 Map Light 17
3.7 Ground Lights 17
3.8 Antennas 18
3.9 Radio Pre-Wire 18
3.10 Auxiliary Lighting 18
3.11 Multiplex System 18
3.12 Rear View Backup Camera System 18
3.13 Tire Pressure Monitoring System (TPMS) 19

4 — TRAFFIC WARNING SYSTEMS 19

4.1 Traffic Warning Systems Requirements 19
4.2 Electronic Siren and Controller 19
4.3 Speaker 20
4.4 Forward Upper Zone A/B/D Lighting 20
4.5 Aft Upper Zone B/D Warning Lights 21
4.6 Upper Zone C Warning Lights 21
4.7 Lower Zone A Warning Lights 22
4.8 Forward Lower Zone B/D Warning Lights 22
4.9 Aft Lower Zone B/D Warning Lights 22
4.10 Lower Zone C Warning Lights 23
4.11 Air Horn 23
4.12 Headlight Flasher 23

5 — CHASSIS ADDITIONS AND MODIFICATIONS 23

5.1 Additional Equipment 23
5.2 Apparatus Fluid Types and Quantities 23
5.3 Seating Capacity 24
5.4 Seat Belts 24
5.5 Seat Belt Warning 24
5.6 Vehicle Height Warning 24
5.7 Final Stage Manufacturer Certification Label 24
5.8 Noise Hazard Warning 24
5.9 Air Filter Ember Protection Screen Warning 24
5.10 Cab Fresh Air Intake Filter Ember Protection Screen 25

5.11 Cab Console 25
5.12 Front Tow Hooks 25
5.13 Tow Eyes 25
5.14 Front Bumper Extension 26
5.15 Mud Flaps 26
5.16 Cab Steps, Batteries and Air Tanks 26
5.17 Exhaust System 26
5.18 Vertical Exhaust 26
5.19 Heat Protection 27
5.20 Air Line, Fuel Hose, Electrical Harness and Connector Protection 27
5.21 Cabin Air Ember Guard 27
5.22 Transmission PTO 27

6 — APPARATUS BODY DESCRIPTION 27

6.1 General Requirements 27
6.2 Body Design and Construction Requirements 28
6.3 Body Materials 28
6.4 Body Mounting 28
6.5 Grab Handles 28
6.6 Rear Bumper 29
6.7 Rear Access Ladder 29
6.8 Rear step 29
6.9 Compartmentation 29
6.10 Driver's Side Compartments 30
6.11 Passenger's Side Compartments 31
6.12 Hose Reel Compartment 31
6.13 Compartment Doors - Aluminum Overlap Type 32
6.14 Compartment Floor Mats 32
6.15 Adjustable Shelf Channels 32
6.16 Long-Handled Tool Storage 32
6.17 Tool Bracket Mounting Channels 32
6.18 Compartment Shelves 33
6.19 Stainless Steel Body Trim 33
6.20 Wheel Chock Storage Compartments 33
6.21 Hard Suction Hose Storage 33
6.22 Cab Crush Resistance 33

7 — PUMP AND PLUMBING 34

7.1 Pump General - Midship Pump 34
7.2 Pump Specifications 34
7.3 Pump Shaft 34
7.4 Seal Rings 35
7.5 Pump Impeller 35
7.6 Transmission Case 35
7.7 Gears 35
7.8 Bearings 35
7.9 Drive Unit Construction 35

7.10 PTO Shift 36
7.11 Pump Shift Indicator Lights 36
7.12 Pump Operator's Panel 36
7.13 Required Testing – Indicator Lights & Engine Speed Advancement Interlock 37
7.14 Pump Panel Lights 37

8 — VALVES, CONTROLS, GAUGES AND PLUMBING REQUIREMENTS 38

8.1 Items Provided 38
8.2 Main Pump Discharge and Intake Plumbing 38
8.3 Pump Operator's Panel Controls 38
8.4 Pump Performance Acceptance Test Plate 39
8.5 Pump Operating Instruction Plate 39
8.6 Test Gauge Connections 39
8.7 Pump Panel Labeling 39
8.8 Master Compound Gauge 39
8.9 Pump Cooler/By-Pass 40
8.10 Master Drain 41
8.11 In-Cab Gauge 41
8.12 Engine Status Center/ Remote Throttle Control 41
8.13 Automatic Pump Override 42
8.14 Water Tank Level Sight Gauge 42
8.15 Priming Pump 42
8.16 Discharge Locations 42
8.17 Intake Locations 43
8.18 Pump to Tank Line 43
8.19 Tank to Pump Line 44
8.20 Tank Fills 44
8.21 Booster Hose Reel 44
8.22 Front Spray Nozzles 45
8.23 Rear Spray Nozzles 45
8.24 Foam Proportioning System 45
8.25 Foam Tank 46
8.26 Pump Performance Test and Certification 46

9 — WATER TANK 47

9.1 Construction 47
9.2 Tank Capacity 47
9.3 Tank Certification 47
9.4 Rear Dump Manifold and Dump Valve 47

10 — BODY ELECTRICAL REQUIREMENTS 48

10.2 Electrical Equipment 48
10.3 Rear DOT Lighting 48
10.4 Taillights, Brake Lights 48
10.5 Turn Signal Lights 48
10.6 Back Up Lights 49
10.7 License Plate Bracket and Light 49

10.8 Rear Upper Marker Lights 49
10.9 Cluster/Clearance Lights and Reflectors 49
10.10 Ground Lighting 50
10.11 Rear Directional Light Bar 50
10.12 Scene Lights 50
10.13 Compartment Lights 50
10.14 NFPA 1900 and CA Title 13 Lighting Compliance 50

11 — ELECTRICAL SYSTEM PERFORMANCE TEST, LOW-VOLTAGE 51

11.1 Test Requirement 51
11.2 Test Sequence 51
11.3 Reserve Capacity Test 51
11.4 Alternator Performance Test at Idle 51
11.5 Alternator Performance Test at Full Load 51
11.6 Low Voltage Alarm Test 51
11.7 Documentation 52

12 — APPARATUS FINISH 52

12.1 Body Finish Procedure 52
12.2 Apparatus Body Color 53
12.3 Chassis Finish 53
12.4 Vehicle Marking 53
12.5 Door Decal (Shield and Vehicle Numbers) 54
12.6 Truck Identification Plate 55

13 — EQUIPMENT 55

13.1 NFPA and OSHA Compliance 55
13.2 Manuals and Drawings 55
13.3 Road Kit 56
13.4 Wheel Chocks 56

14 — WARRANTY PROVISIONS 56

14.1 Fifteen Year Apparatus Warranty 56

Record of Revisions

Date	Revision summary
March 2024	• Initial release
[Future revisions]	This space is reserved for future revisions.

1 — General

1.1 General Statement

1.1.1 The intent of this specification is to provide a two-door, standard cab chassis; Severe Service; Emergency Vocation; two-wheel drive with a set-back axle 1500-gallon water tender with upgraded cab crush protection.

1.2 NFPA 1900 Compliance

1.2.1 The apparatus described in this specification shall be compliant with the requirements of NFPA 1900, latest edition, except where noted. Any deviations from NFPA 1900 shall be noted in this specification or shall be approved in writing by the Government.

1.3 Weight Requirement

1.3.1 The in-service weight shall not exceed 90% of the front axle GAWR and 24,030 pounds on the rear axle when:

- fully loaded with water, foam and fuel,
- with 250 pounds per seat, and
- 1000 pounds of equipment evenly distributed in the storage compartments.

1.4 Tilt Test

1.4.1 The apparatus shall be tested at the estimated in-service weight in accordance with NFPA 1900.

1.5 Ramp Break-Over Angle

1.5.1 The ramp break-over angle shall be maintained with the installation of the fire package.

1.6 Height Requirement

1.6.1 Completed apparatus height shall not exceed 125 inches, including the exhaust stack and lightbar, unless approved by the Government.

1.7 Estimated In-Service Weight and Center of Gravity

1.7.1 The apparatus builder shall submit estimated in-service weights (minus equipment) for the completed apparatus, including the front axle, rear axle, and combined weight.

1.7.2 The apparatus builder shall submit estimated horizontal and vertical center-of-gravity for the completed apparatus.

1.7.3 The apparatus builder shall submit estimated front axle and rear axle weight distribution percentages, including front to rear axle ratio.

1.8 Specification Deviations

1.8.1 Deviation from the chassis or apparatus body specifications shall not be allowed without prior written approval. Any requested deviations must be submitted in writing to the Government. Verbal requests will not be considered.

1.9 Brand Name of Equivalent Products

1.9.1 Products equivalent to the brand name components specified herein may be approved by the Government. Equivalent products shall not be used unless approved in writing by the Government prior to contract award and documented in the resultant contract. After the contract award, approvals for equivalent products may be considered, and if approved, shall be documented in writing by the Government.

2 — Chassis Requirements (FOR REFERENCE ONLY)

2.1 Wheelbase

2.1.1 1.9.1 The wheelbase shall be approximately 185”.

2.2 Cab to Axle

2.2.1 The cab to axle shall be approximately 119”

2.3 After Frame

2.3.1 The after frame is approximately 70”.

2.4 Tow Hooks

2.4.1 Front, two; inside rail; frame mounted

2.5 Frame Rails

2.5.1 Heat treated alloy steel; Minimum resistance bending moment (RBM) of 1,400,000 inch-pounds; 120,000 P.S.I. yield

2.6 Bumper, Front

2.6.1 Steel; swept back; powder coated Argent Gray

2.7 Frame Extension

2.7.1 8-14 inches in front of grille; no front engine PTO capability

2.8 Axle, Front, Non-Driving

2.8.1 16,000-pound capacity; Meritor, or equivalent

2.9 Suspension, Front

2.9.1 Spring; taper leaf; parabolic; 16,000-pound capacity; with shock absorbers

2.10 Brake System, Dual Air

2.10.1 Includes:

2.10.1.1 Front brakes: 16.5 inches by 5 inches; S-Cam type; with 20 square inch long stroke brake chambers

2.10.1.2 Rear brakes: 16.5 inches x 7 inches; with 30/30 long stroke brake chamber and heavy-duty spring actuated parking brake, brake chambers relocated on rear axle for maximum ground clearance

2.10.1.3 Dust shields; front and rear axles

2.10.1.4 Slack adjusters; front and rear; automatic

2.10.1.5 Drain valve (Berg™, or equivalent); manual; with chain

2.10.1.6 Gauges; located in cab instrument panel; “Air 1” and “Air 2”

2.10.1.7 Air dryer (Bendix™ AD-IP, or equivalent); with heater

2.10.1.8 Brake lines; color and size coded nylon

2.10.1.9 Parking brake valve; with yellow knob; located on cab instrument panel

2.10.1.10 Air Brake ABS: Full vehicle wheel control system (4-channel) (Bendix™ Antilock Brake System, or equivalent)

2.10.1.11 Air compressor (Bendix™ Tu-Flo 550, or equivalent); 13.2 cubic feet per minute capacity

2.10.1.12 Spring brake modulator valve

2.10.1.13 Brake Shoes; Rear, cast

2.11 Steering Column

2.11.1 Tilting

2.12 Steering Wheel

2.12.1 2-spoke; 18-inch diameter; black

2.13 Steering Gear

2.13.1 Power (Sheppard™ M-100, or equivalent)

2.14 Exhaust System

2.14.1 Single; with after treatment device; frame mounted under cab, includes vertical tailpipe and guard

2.15 Electrical System

2.15.1 12-volt

2.15.2 Includes:

2.15.2.1 Headlights; two; LED if available

2.15.2.2 Horn; electric; single

2.15.2.3 Horn; air accommodation package; less horn

2.15.2.4 Fog lights

2.15.2.5 Electronic cruise control, controls integral to steering wheel

2.15.2.6 Starter switch; electric; key operated

2.15.2.7 Headlight dimmer switch integral with turn signal lever

2.15.2.8 Turn signal switch; self-canceling

2.15.2.9 Windshield wiper; 2-speed; integral with turn signal switch; with wash/intermittent feature

2.15.2.10 Circuit breakers; manual reset; replaces all fuses except for 5-amp wiring; chassis; color coded and continuously numbered

2.15.2.11 Delete daytime running lights

2.16 Alternator

2.16.1 12-volt direct current; 220-amp capacity (Leece-Neville™ 14923PA, or equivalent)

2.16.2 Alternator pulley; 2.4-inch diameter for increased alternator output at idle

2.17 Battery System

2.17.1 Two or three batteries; minimum 1950 cold cranking amps total; maintenance-free; steel battery box; mounted under cab rear hump

2.17.2 Jump start stud; remote mounted; driver side; below or next to battery box. Mounting within the wheel well shall not be accepted.

2.18 Radio

2.18.1 AM/FM stereo with Bluetooth; two coaxial speakers

2.19 Starter

2.19.1 12-volt direct current (Leece-Neville™ M130D, or equivalent); with thermal over-crank protection

2.20 Grille

2.20.1 Chrome

2.21 Front End

2.21.1 Tilting, fiberglass; with rubber fender extensions

2.22 Engine

2.22.1 Diesel; 50 state compliant; Cummins L9 for Fire service engine; minimum 330 horsepower; 1000 pound-foot torque. No emissions related vehicle speed or engine torque inducements or de-rates.

2.22.2 Includes:

2.22.2.1 Engine compression brake compatible with requested engine

2.22.2.2 Stop light turned on when engine compression brake is activated

2.22.2.3 Air cleaner; dual element, standard with inner cone

2.22.2.4 Throttle; hand control; stationary; mounted on steering wheel

2.22.2.5 Fuel/water separator and fuel filter in a single assembly, with water-in-fuel sensor and heater

2.22.2.6 Block heater; 120 volt/1250 watt (Phillips, or equivalent)

2.22.2.7 Fan drive (Horton™ Drivemaster®, or equivalent); two speed; direct drive

2.22.2.8 Manual fan drive override

2.22.2.9 Indicator, low coolant level with audible alarm

2.22.2.10 Cabin air intake ember screen; prevents embers larger than 0.039 inches from entering the cabin.

2.22.2.11 Engine air intake ember screen; hood mounted. Must isolate the entire air intake system including hood cavity. Air filter housing ember screens may be used in addition to this requirement but are not acceptable as a replacement. Must meet NFPA 1900 requirements.

2.22.2.12 Bug screen, mounted behind grill

2.22.2.13 Disable idle shut down feature

2.22.2.14 Expanded engine temperature effects to allow higher engine temperature operating range

2.22.2.15 Disable engine coolant temperature shutdown protection feature

2.23 Radiator

2.23.1 The chassis cooling system shall be capable of maintaining the normal engine temperature operating range at full engine load at 0 miles per hour

2.24 Transmission, Automatic

2.24.1 Emergency/Response Application with 3500 EVS_P Allison™; 6 speed automatic; wide ratio; with overdrive; with oil level sensor; with PTO provision; less retarder or equivalent.

2.25 Transmission Controls

2.25.1 Push-button type; for Allison™ 3000 and 4000 transmissions

2.26 Axle, Rear

2.26.1 Single; 27,000-pound capacity; Meritor, or equivalent; R wheel ends

2.26.2 Includes:

- Differential; locking, driver-controlled
- Drain plug, magnetic, for single rear axle
- When the apparatus is driven over 15 miles per hour, the driver-controlled rear locking differential shall automatically disengage and shall not re-engage when driven below 15 miles per hour
- Gearing for 75 mph maximum; Governed at 68 mph (Section 2.32)

2.27 Suspension, Rear

2.27.1 Spring; single; 31,000-pound capacity; with 4,500-pound auxiliary rubber spring

2.28 Fuel Tank

2.28.1 Capacity: 70-gallons; non-polished aluminum; D or rectangle style; top draw; mounted left side under cab; maximum ground clearance possible

2.29 Diesel Exhaust Fluid (DEF) Tank

2.29.1 Capacity: A diesel exhaust fluid (DEF) tank will be provided in a storage capacity ratio to meet the requirements for a 70-gallon fuel tank; mounted under the cab; maximum ground clearance possible.

2.30 Cab

2.30.1 Conventional standard cab

2.30.2 Includes:

2.30.2.1 Clearance lights; five; flush-mounted

2.30.2.2 Exterior grab handles; one; aft of driver's door; none on passenger's side of cab (due to exhaust pipe); with rubber insert

2.30.2.3 Interior grab handles; three

2.30.2.4 Exterior cab steps; four; two steps per cab door

2.30.2.5 Mirrors; exterior; two; rectangular; Must meet FMVSS 111 specifications; with breakaway type mounting brackets; heated heads thermostatically controlled, power both sides; with LED clearance lights

2.30.2.6 Gauge cluster English with electronic speedometer, tachometer, oil pressure, coolant temperature, fuel level, voltmeter, washer fluid level

2.30.2.7 Warning system; low fuel level, low oil pressure, high coolant temperature, low voltage

2.30.2.8 Gauge, transmission temperature

2.30.2.9 Gauge, applied air

2.30.2.10 Gauge; air cleaner restriction

2.30.2.11 Seat, driver's; National™ 2000; Air suspension, high back with integral headrest; vinyl; Isolated, with 2 position front cushion adjustment; minus 3 to plus 14- degree seat back adjustment; single chamber air lumbar support; arm rest on inboard side, or equivalent

2.30.2.12 Seat, passenger's; National™ 2000, Air suspension, high back with integral headrest; vinyl; Isolated, with 2 position front cushion adjustment; minus 3 to plus 14-degree seat back adjustment; single chamber air lumbar support, arm rest on inboard side, or equivalent

2.30.2.13 Red or orange; 3-point, lap and shoulder type seat belts; driver's and passenger's cab seats

2.30.2.14 Air conditioner; with integral heater and defroster

2.30.2.15 Fresh air filter for HVAC, protected by ember guard

2.30.2.16 50-state legal tinted glass

2.30.2.17 Dome light with automatic dimming, door activated and push ON/OFF

2.30.2.18 Overhead storage console with nets, CB pocket, Pearl Gray interior Deluxe cab interior trim

2.30.2.19 Molded plastic door trim panels

2.30.2.20 Molded plastic storage pocket; driver's and passenger's front cab doors

2.30.2.21 Padded cloth headliner; Black rubber floor covering; Vinyl sun visors

2.30.2.22 Cab suspension; air bag type

2.30.2.23 Accommodation package for fog lights

2.30.2.24 Single color cab exterior finish paint; 5032 Forest Service green - No. 14260 of Federal Standard No. 595 (Forest Service Green).

2.31 Manuals

2.31.1 Electronic Parts and Service manuals

2.32 Tires and Wheels

2.32.1 Steel disc wheels; painted white; with 10-stud pattern; 8.25" x 22.5" DC rims; hub piloted

2.32.2 Tires Front: 12R22.5 Michelin XZE, or equivalent; load range H; 16 plies

2.32.3 Tires Rear: 12R22.5 Michelin XDN-2, or equivalent; load range H; 16 plies

2.32.4 Included with chassis order, one spare wheel and one spare tire matching the wheels and front tires, delivered affixed to the cab and chassis.

2.33 Speed Limitation

2.33.1 The vehicle speed shall be speed governed to the NFPA 1900 requirement of 68 miles per hour

2.34 Rear View Backup Camera System

2.34.1 A rear-view backup camera and display shall be provided. The display shall have a minimum display measurement of 7 inches diagonally and be factory installed in the dash. The backup camera shall be high durability and able to withstand harsh vibration; IP69K rated; and able to withstand 7Gs of force. The camera shall be shipped loose for installation by the apparatus builder.

2.35 Tire Pressure Monitoring System (TPMS)

2.35.1 If not provided by the chassis manufacturer, a tire pressure monitoring system shall be installed. Aftermarket tire pressure monitoring systems shall be approved by the government prior to installation. Considerations for the approval of aftermarket solutions will be quality, durability, warranty, repair service, and savings to the Government.

2.36 Connected diagnostics

2.36.1 A connected diagnostics system shall be provided. Connected diagnostics shall provide a wireless connection to the engine systems to provide immediate diagnosis of engine system fault alert and clear recommendations regarding continued vehicle opertation or the need for immediate service.

3 — Chassis Electrical Requirements

3.1 Chassis Electrical Additional Equipment and Modifications

3.1.1 The apparatus chassis shall be equipped with a heavy-duty 12-volt direct current negative ground electrical system. The electrical system shall include all parts, components, switches, relays, wiring, and other devices required to assure complete, consistent and proper operation of the completed apparatus.

3.1.2 All lights are required to comply with Federal Government Codes for vehicles of this size and design shall be provided and installed. These lights shall include headlamps and front turn signals with hazard switch, cab marker and clearance lights, back up lights, stop-turn-tail and license plate lights.

3.1.3 All switches for the warning lights and other electrical equipment shall be mounted on a separate switch panel located on the center console in the cab interior. The switches shall be functionally laid out, properly identified, and shall be located within easy reach of both the driver and the officer. The warning light system shall have a “master” switch, which shall allow for the pre-selection of all warning lights. All switches shall be of a heavy-duty design.

3.1.4 The following additional electrical equipment shall be installed on, and modifications performed to, the specified cab and chassis by the apparatus builder:

3.2 Battery Master Switch

3.2.1 One battery master body disconnect switch shall be provided in the cab. The switch shall be rated for 175 amps continuous duty and 800 amps intermittent duty. The switch shall be properly labeled “ON/OFF” and located on the floorboard to the left side of the driver’s seat and placed as far aft as possible to protect against accidental actuation. A Cole Hersee brand™ brand, Model #M-2484-16, with a Model #82065 switch plate “Off/On” label meets the labeling requirement. The switch shall be positioned so to not impact the driver seat or operation of the vehicle. Terminals shall not be exposed but protected from damage and inadvertent contact.

3.3 “Battery On” Indicator Light

3.3.1 One “Battery On” indicator light, with a green lens, shall be provided on the dashboard in the cab interior within view of the driver’s seating position. This light shall illuminate anytime the battery switch is turned to the "ON" position and the brightness shall dim automatically when the chassis headlights are turned on.

3.4 Electronic Control Module (ECM) Programming

3.4.1 The cab and chassis electronic control module (ECM) shall be programmed as required to allow the use of the OEM cruise control feature as a manually controlled fast idle and as a backup to the pump operator’s panel throttle.

3.5 Back Up Alarm

3.5.1 One solid state back up alarm shall be provided at the rear of the apparatus protected from impact and debris. The back-up alarm shall be wired to the reverse circuit of the transmission and shall provide an audible alarm to the rear of the apparatus when reverse gear is selected. The alarm shall have a volume of 87 to 112 decibels while in operation.

3.6 Map Light

3.6.1 One flexible goose neck, high-intensity map light shall be provided on the cab center console. The switch for the map light shall be located on the light and shall include a diffuser to prevent glare at night.

3.7 Ground Lights

3.7.1 Two 4-inch clear LED lights shall be provided under the chassis steps, ground-facing, one on each side. These lights shall be wired to the cab door switches and a switch on the cab center console so that the light will turn on when a cab door is opened or when the vehicle is placed in “blocking mode.” The vehicle is in blocking mode when the vehicle’s

transmission is in “Park” with the parking brake set and the emergency master switch turned on with the forward-facing takedown lights off. The ground lighting “OFF” delay will be synchronized with the chassis exterior courtesy lighting delay.

3.8 Antennas

3.8.1 Two antenna bases shall be supplied and mounted on the cab roof as aft of the lightbar. The antenna cables shall be routed to the cab interior, terminating at location of radio mounting bracket.

3.9 Radio Pre-Wire

3.9.1 The chassis cab interior shall be wired with battery power, battery ground, switched power, and radio pre-broadcast wires to the siren or PA, and labeled to simplify USFS radio installation.

3.10 Auxiliary Lighting

3.10.1 A pair of white LED auxiliary lights shall be installed in the center bumper cutout, mounted to the front surface of the bumper hose tray, on either side of the license plate location. They shall be capable of being adjusted for both elevation and azimuth. The distance between the two lights shall be maximized. Each light shall produce a minimum of 3000 lumens and be equipped with a diffused lens capable of projecting light with flood pattern. The maximum size of each light shall be 3¼-inch high by 3¼- inch wide by 3¼-inch deep and shall be equipped with an integral mounting bracket and wiring harness pigtail with connector. OEM chassis wiring and dash switch shall be used for installation if so equipped; otherwise the lights shall be installed with a relay and dash-mounted switch. Any mounting fasteners used for these lights shall not damage the hose stored in the bumper hose tray. The dash switch shall be labeled “AUXILIARY LIGHTS, OFF HIGHWAY USE ONLY.” Rigid Industries™ Dually D2 Diffusion lights or equivalent shall be installed.

3.11 Multiplex System

3.11.1 A multiplexed solid-state management system for controlling the electrical system devices shall be provided. The system shall be fully programmable, and capable of performing load management functions, system monitoring and reporting. All electrical circuits and wiring shall be rated at 125% of the maximum load being imposed. Hale™ Class 1® ES-Key, Hale™ Class 1® Supernode, and Welden™ V-MUX® multiplexing systems meet this requirement.

3.12 Rear View Backup Camera System

3.12.1 A rear-view backup camera and display shall be provided. The display shall have a minimum display measurement of 7 inches diagonally and be factory installed in the dash. If an OEM camera system is not available, the builder shall propose the make and model

of system for approval by the Government. The proposed system shall be installed in-dash unless written approval is approved by the Government. The backup camera shall be high durability and able to withstand harsh vibration; IP69K rated; and able to withstand 7Gs of force. The camera shall be shipped loose for installation by the apparatus builder. Combined AM/FM/WX radio and backup display systems are acceptable if approved in writing by the Government.

3.13 Tire Pressure Monitoring System (TPMS)

3.13.1 If not provided by the chassis manufacturer, a tire pressure monitoring system shall be installed.

3.13.2 The TPMS shall provide in- cab visual and audible alerts for tire pressure deviation, critical pressure drops, and excessive temperatures. The visual display shall be from OEM gauges/lighting or from a display mounted in-dash or on the center vehicle console.

4 — Traffic Warning Systems

4.1 Traffic Warning Systems Requirements

4.1.1 Requests for equivalent products shall be considered. Considerations for the approval of equivalent products will be quality, durability, warranty, repair service, and savings to the Government. Any requests for substitution of equivalent products must be approved by the Government in writing.

4.2 Electronic Siren and Controller

4.2.1 The manufacturer shall supply and install one electronic siren and digital control panel with 6 auxiliary buttons, 4 position slide switch, 6 position rotary speaker tone selector, traffic director control button, manual siren button, and airhorn button in the cab center consol. The control panel shall be flush mounted. The location of the controller shall be convenient to both the driver and the officer. The siren shall have four basic siren tones: manual, wail, yelp, and hi-lo. The “emergency master” switch shall power the controller. The manufacturer shall install a Tomar brand, 948L- SIREN-R, or equivalent.

4.2.2 The manufacturer shall program and label the electronic siren and digital control panel’s auxiliary buttons as follows:

- Auxiliary Switch “1” – Left Alley
- Auxiliary Switch “2” – Right Alley
- Auxiliary Switch “3” – Front Flood
- Auxiliary Switch “4” – Rear Scene
- Auxiliary Switch “5” – Left Scene
- Auxiliary Switch “6” – Right Scene

4.2.3 Additional auxiliary switches shall be provided separate from the siren controller:

- Auxiliary Switch “7” - Ground Lights
- Auxiliary Switch “8” – Cabin Lighting

4.3 Speaker

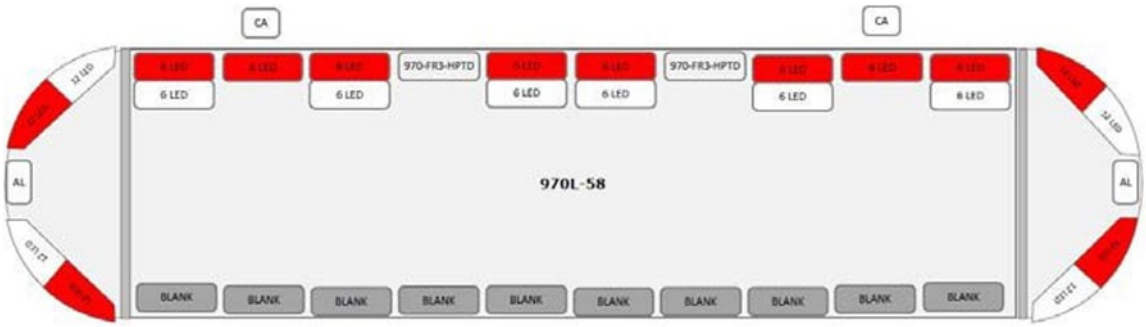
4.3.1 The manufacturer shall supply and install one 100-W siren speaker mounted behind the driver’s side of the front bumper. The manufacturer shall wire the speaker to the specified electronic siren controller. The manufacturer shall wire the lights to the Tomar brand, model, 948L-SIREN-R siren controller located on the cab center console. The manufacturer shall install Tomar brand, model SPK-100 speaker, or equivalent.

4.4 Forward Upper Zone A/B/D Lighting

4.4.1 The manufacturer shall supply and install one light-emitting diode (LED) lightbar on the cab roof, facing forward. The lightbar shall be 58 inches wide. The lightbar shall be constructed of extruded aluminum with cast aluminum end caps. The aluminum extrusion shall be clear anodized. All lightbar LED modules shall be waterproof using a vibration-welding sealing. The lightbar LED modules shall have total internal reflection (TIR) collimator optics to prevent stray warning light. The lightbar shall have one waterproof internal controller to control the entire lightbar. The internal lightbar controller shall feature CA-13 compliant flash rates and two steady-burn LED modules. The lightbar LED modules facing forward and at each end shall be able to override to steady white scene lights independently of each other. The manufacturer shall wire the lights to the Tomar brand, model, 948L-SIREN-R siren controller located on the cab center console. The manufacturer shall install Tomar brand, model 970-581-0601-1, or equivalent.

4.4.2 The lightbar shall consist of the following:

- Eight 12LED warning modules facing forward, with six red LEDs, six white LEDs and clear Lexan lenses
- Two 12LED forward facing single-color, steady burning, with twelve red LED and clear Lexan lenses
- Four 24LED module at each corner with twelve red LEDs, twelve white LEDs and clear Lexan lenses
- Two 3LED modules forward facing spot scene lights with an 8.5-degree beam pattern with clear Lexan lenses
- One 3LED spot alley module at each end cap
- The manufacturer shall permanently mount the lightbar to the cab roof and wire it to the “Lightbar” switch in the cab center console.



970-581-0601-B1

Figure 1 — LED Lighting Locations and Flashing/Steady Configuration.

4.4.3 The manufacturer shall mount the lightbar in a position that maximizes the height above the apparatus cabin.

4.4.4 The manufacturer shall mount the lightbar horizontally, not pointed upwards or downwards along the apparatus roof cabin.

4.5 Aft Upper Zone B/D Warning Lights

4.5.1 The manufacturer shall supply and install two 3-inch by 7-inch dual color LED warning lights with mounting flanges, side-facing, one per side on the upper aft corners of the apparatus. The warning lights shall consist of twenty-four LEDs, twelve LEDs red in color, twelve LEDs white in color, and with clear Lexan lens. The lights shall be waterproof using a vibration-welding sealing process. The lights shall have TIR collimator optics to prevent stray warning light. The lights shall flash red and white at 75 flashes per minute (FPM) in a simultaneous flash pattern. The warning light shall have the ability to override to steady burn white for use as an additional scene light. The manufacturer shall wire the lights to the Tomar brand, model, 948L-SIREN-R siren controller located on the cab center console. The manufacturer shall install Tomar brand, model R37D-W-RW-02, or equivalent.

4.6 Upper Zone C Warning Lights

4.6.1 The manufacturer shall supply and install two 7-inch by 9-inch dual color multi-function warning/scene LED lights with mounting flanges, rear facing, one per side, on the upper outboard rear of the apparatus. The multi-function lights shall consist of twenty-four LEDs with clear Lexan lenses. The upper half of the lights shall have twelve red warning LEDs with horizontal oriented optics. The lower half of the lights shall have twelve white LEDs with 13-degree angled down optics. The lights shall be waterproof using a vibration-welding process. The lights shall have TIR collimator optics to reduce stray warning light. The manufacturer shall wire the red LED lights to the Tomar brand, model, 948L-SIREN-R siren controller located on the cab center console. The manufacturer shall wire the white

LED lights “Rear Scene” button on the Tomar brand, 984L-SIREN-R siren controller located on the cab center console and to the “Rear Scene” switch on the rear pump operator's panel. The manufacturer shall install Tomar brand, model R79LVD13-RW-01 and R79LVD13-RW-02, or equivalent.

4.7 Lower Zone A Warning Lights

4.7.1 The manufacturer shall supply and install two 3-inch by 7-inch dual color LED warning lights with mounting flanges on the front of the apparatus, forward-facing, one per side on the lower outboard corners of the cab grille. The warning lights shall consist of twenty-four LEDs, twelve LEDs red in color, twelve LEDs white in color, and with clear Lexan lens. The lights shall be waterproof using a vibration-welding sealing process. The lights shall have TIR collimator optics to prevent stray warning light. The lights shall flash red and white at 75 flashes per minute (FPM) in a flicker flash pattern. The lights shall flash in opposite phase of each other when blocking the roadway. The manufacturer shall wire the lights to the Tomar brand, model, 948L-SIREN-R siren controller located on the cab center console. The manufacturer shall install Tomar brand, model R37D-RW-03 and R37D-W-RW-04, or equivalent.

4.8 Forward Lower Zone B/D Warning Lights

4.8.1 The manufacturer shall supply and install two dual color LED warning lights with mounting flanges on the tilt hood of the apparatus, side facing, one per side, as low and as far forward as possible on the sides of the hood. The warning lights shall consist of twenty-four LEDs, twelve red LEDs, twelve white LEDs, and with clear Lexan lenses. The warning light shall flash red at 75 fpm. The warning light shall have the ability to override to steady burn white for use as an additional scene light. The lights shall be waterproof using a vibration-welding sealing process. The lights shall have TIR collimator optics to prevent stray warning light. The manufacturer shall wire the lights to the Tomar brand, model, 948L-SIREN-R siren controller located on the cab center console. The manufacturer shall install Tomar brand, model RSDV13-RW-01, or equivalent.

4.9 Aft Lower Zone B/D Warning Lights

4.9.1 The manufacturer shall supply and install two 3-inch by 7-inch dual color LED warning lights with mounting flanges on the aft of the apparatus, side-facing, one per side on the lower aft corners of the apparatus. The warning lights shall consist of twenty-four LEDs, twelve LEDs red in color, twelve LEDs white in color, and with clear Lexan lens. The lights shall be waterproof using a vibration-welding sealing process. The lights shall have TIR collimator optics to prevent stray warning light. The lights shall flash red and white at 75 flashes per minute (FPM) in a simultaneous flash pattern. The warning light shall have the ability to override to steady burn white for use as an additional scene light. The manufacturer shall wire the lights to the Tomar brand, model, 948L- SIREN-R siren controller located on the cab center console. The manufacturer shall install Tomar brand, model R37D-W-RW-02, or equivalent.

4.10 Lower Zone C Warning Lights

4.10.1 The manufacturer shall supply and install two 3-inch by 7-inch dual color LED warning/back-up lights on the rear of the apparatus, rear-facing, one per side on the lower rear of the apparatus above the rear step in the bottom position of the common housing with the DOT lights. The warning lights shall consist of twenty-four LEDs, twelve LEDs red in color, twelve LEDs white in color, and with clear Lexan lens. The lights shall be waterproof using a vibration-welding sealing process. The lights shall have TIR collimator optics to prevent stray warning light. The lights shall flash red and white at 75 flashes per minute (FPM) in a simultaneous flash pattern. The warning light shall have the ability to override to steady burn white for use as a back-up light. The manufacturer shall wire the lights to the Tomar brand, model, 948L-SIREN-R siren controller located on the cab center console. The manufacturer shall install Tomar brand, model R37D-W-RW-01(right) and R37D-W-RW-02 (left), or equivalent.

4.11 Air Horn

4.11.1 One Buell™ brand, Model #1063, or equivalent, 15-inch air horn shall be provided and mounted under the hood on the passenger's side. One-foot switch shall be provided on the driver's side cab floor, and one momentary pushbutton switch shall be provided on the upper right corner of the officer's side top surface of the cab center console.

4.12 Headlight Flasher

4.12.1 The manufacturer shall supply and install one solid-state headlight flasher wired for daytime operation. The flasher shall be a multipurpose type with a high beam activated cut out option. The manufacturer shall wire the flasher to the Tomar brand, model, 948L-SIREN-R siren controller "Wig Wag" switch located on the cab center console, through the parking brake valve, so that it is disabled when the parking brake is applied. The manufacturer shall install Tomar brand, model HF-1 flasher, or equivalent.

5 — Chassis Additions and Modifications

5.1 Additional Equipment

5.1.1 The following additional equipment shall be installed on, and modifications performed to, the specified cab and chassis by the apparatus manufacturer:

5.2 Apparatus Fluid Types and Quantities

5.2.1 A permanently mounted label, showing the recommended fluid types and quantities for the apparatus chassis and associated components, shall be provided in the apparatus cab interior near the driver's seating position.

5.2.2 This label shall list the recommended fluid types and quantities for the following components:

- Chassis Engine Lubricant
- Chassis Engine Coolant
- Chassis Power Steering Fluid
- Chassis Transmission Fluid
- Chassis Drive Axle Lubricant
- Pump Gearbox Lubricant

5.3 Seating Capacity

5.3.1 A warning label, listing the seating capacity of the completed apparatus, shall be provided in the apparatus cab interior. This label shall be located so that it is visible from all seating positions.

5.3.2 This apparatus shall have a seating capacity of two personnel.

5.4 Seat Belts

5.4.1 3-point shoulder harness type seat belts shall be provided for both seating positions.

5.4.2 All seatbelts shall be red or orange in color.

5.5 Seat Belt Warning

5.5.1 A warning label, stating: "DANGER - Personnel Must Be Seated And Seat Belts Must Be Fastened While Vehicle Is In Motion Or DEATH OR SERIOUS INJURY MAY RESULT," shall be provided in the apparatus cab interior. This label shall be located so that it is visible from all seating positions.

5.6 Vehicle Height Warning

5.6.1 A warning label, listing the overall height, length and GVWR of the completed apparatus, shall be provided in the apparatus cab interior. This label shall be located so that it is visible from the driver's seating position.

5.7 Final Stage Manufacturer Certification Label

5.7.1 A Final Stage Manufacturer vehicle certification label shall be provided and installed in the apparatus cab driver's door jamb area

5.8 Noise Hazard Warning

5.8.1 A warning label, stating: "WARNING: Noise Hazards Occur During Siren Operation," shall be provided and installed in the apparatus cab interior. This label shall be located so that it is visible from all seating positions.

5.9 Air Filter Ember Protection Screen Warning

5.9.1 A warning label, stating: “This apparatus is equipped with an air filter ember protection screen; routine inspection is required,” shall be provided and installed in the apparatus cab interior. This label shall be located so that it is visible from the driver’s seating position.

5.10 Cab Fresh Air Intake Filter Ember Protection Screen

5.10.1 A warning label, stating: “This apparatus is equipped with a cab fresh air filter ember protection screen; routine inspection is required”, shall be provided and installed in the apparatus cab interior. This label shall be located so that it is visible from the driver’s seating position.

5.11 Cab Console

5.11.1 The cab shall be equipped with an operator's control console located between the front driver's and officer's air ride seats. This console shall be sized to accommodate customer-mounted radios. The console shall be fabricated from steel and painted with a matte black finish. The console shall be securely mounted to the cab floor. The driver’s and officers’ side panels for the center console shall be extended as a continuous piece outward at a 90-degree angle from the bottom of the console. The center console shall be secured using the inboard mounting studs of the driver’s and officers’ air ride seat bases. There shall be two attachment points on the left horizontal extension of the console under the driver’s seat base. There shall be two attachment points on the right horizontal extension of the console under the officers’ seat base.

5.11.2 The console shall contain the following controls and switches:

- One emergency master switch
- One 2½-inch diameter backlit compound gauge, 0 to 400 pounds per square inch
- One electronic siren and lighting controller
- One Fire Research Corporation™ brand Model #WL2500, or equivalent, mini display tank level gauge
- One map book storage compartment
- One switch for the rear dump valve
- Four switches for the front and rear-mounted spray nozzles
- Two 12-volt power outlets and 2 USB charging ports

5.12 Front Tow Hooks

5.12.1 Two original equipment front tow hooks shall be supplied with the chassis from the chassis manufacturer.

5.13 Tow Eyes

5.13.1 Two heavy-duty tow eyes shall be provided at the rear of the apparatus, below the rear step. The tow eyes shall be mounted to the chassis frame.

5.14 Front Bumper Extension

5.14.1 A front bumper extension shall be provided at the forward end of the chassis frame rails. The bumper extension shall be covered with aluminum diamond plate. The cover shall be removable for servicing of plumbing. Support bracing shall be provided as required. The ends of the aluminum diamond plate cover shall be radiused and ground smooth.

5.14.2 When completed, the overall length of the apparatus shall not exceed 300 inches.

5.14.3 Front Fenders, Rubber

5.14.4 An extruded black rubber fenderette shall be installed on each front wheel well opening on the chassis tilt hood.

5.15 Mud Flaps

5.15.1 One pair of flexible rubber mud flaps shall be provided on both sides of the apparatus body behind the rear wheels. The mud flaps shall not bear company logo.

5.15.2 The mud flaps shall extend down far enough to be effective but shall not allow the flaps to become entangled with the rear tires when the apparatus is backing up.

5.16 Cab Steps, Batteries and Air Tanks

5.16.1 All cab steps shall be modified in such a manner as to provide maximum ground clearance.

5.16.2 The chassis-mounted battery box shall be relocated in such a manner as to provide maximum ground clearance.

5.16.3 The chassis-mounted air tanks shall be relocated in such a manner as to provide maximum ground clearance.

5.17 Exhaust System

5.17.1 The exhaust system shall remain unmodified and as received from the chassis manufacturer. The exhaust system shall be mounted in a horizontal configuration under the passenger’s side of the cab.

5.18 Vertical Exhaust

5.18.1 A vertical exhaust pipe shall be mounted at the passenger’s side rear corner of the cab. The vertical exhaust shall be sufficiently shielded or wrapped to prevent burn injuries to personnel who may come in contact with the exhaust pipe while entering or exiting the chassis passenger’s side door. The maximum height of the exhaust shall be 117 inches from the ground to the top of the exhaust.

5.19 Heat Protection

5.19.1 The exhaust after-treatment system shall be sufficiently shielded or wrapped to protect the underside of the chassis cab during active regeneration. Heat from regeneration shall not be detected by personnel seated inside the cab.

5.20 Air Line, Fuel Hose, Electrical Harness and Connector Protection

5.20.1 All air lines, fuel lines and electrical harnesses below the chassis frame rails shall be protected with a fireproof sleeve. All air lines and connectors to the air tank(s) located between the chassis steps shall be protected with a fireproof sleeve. All protected and wrapped lines shall have continuous coverage, to include the line to tank connections.

5.21 Cabin Air Ember Guard

5.21.1 The cabin air filter shall be protected by an ember guard with a maximum mesh opening of 0.039 inches.

5.22 Transmission PTO

5.22.1 A transmission power take-off (PTO) unit shall be provided and installed on the chassis automatic transmission to drive the firefighting water pump. The PTO shall be a 10-bolt type, with a minimum torque rating of 300-pound feet (intermediate duty), and an engine speed ratio that provides the required pump performance. The PTO driveshaft shall be equipped with 1350 series universal joints. The PTO shift shall be located in the cab interior in a location accessible to both the driver’s and officer seating positions.

6 — Apparatus Body Description

6.1 General Requirements

6.1.1 The body shall be designed for fire/rescue service operations only. Commercially designed bodies intended for use in other vocations or applications are unacceptable in quality, construction, design or durability.

6.1.2 The apparatus body design shall be consistent with current fire vehicle engineering technology and design standards.

6.1.3 The apparatus body shall be constructed from materials consistent with current fire vehicle industry manufacturing standards.

6.1.4 Apparatus compartment doors shall be constructed from materials consistent with current fire vehicle industry manufacturing standards.

6.1.5 Prebuild plans for the apparatus body shall include:

6.1.6 Detailed descriptions of body construction type, style, materials, compartments and components.

6.1.7 Drawings showing the location of plumbing discharges and intakes

6.1.8 Drawings showing the pump operator's panel layout

6.1.9 Any additional information as shall be requested by the Government

6.2 Body Design and Construction Requirements

6.2.1 The body shall be completely modular in design, thereby allowing its transfer to a new chassis, without cutting or welding, in the event of an accident or chassis replacement.

6.3 Body Materials

6.3.1 All materials utilized in the fabrication of the body shall be of the correct type, alloy, and thickness to withstand the intended usage and provide protection against cracking, corrosion or metal fatigue. All materials utilized shall be of open stock origin, available to all apparatus manufacturers and commonly available through local sources, for the rapid and economical repair or modification of the body. Any use of proprietary parts or materials in the construction of the body shall be unacceptable, due to the potential for delays or difficulties in the event future repairs or service become necessary.

6.4 Body Mounting

6.4.1 The front body support system shall be an integral design with .250" thick steel deep section cross member The deep section cross member shall be attached to the right side and the left side lower front compartment weldments with six (6) grade 8; 3/8-inch diameter bolts on each side of the apparatus. The front cross member shall be attached to the chassis by means of an elastomer spring mounting system with limited travel. This design allows for maximum chassis flexing without undue stress transfer to the apparatus body. The right and left side rear compartments shall be attached to a steel rear body support. The steel support shall be attached to the chassis frame extensions by means of an elastomer spring mounting system to form a modular integral body support system. The apparatus body shall not rest upon the chassis truck rails and must be separated entirely from the steel frame of the chassis to prevent galvanic action. Loose fitting U-bolt body mounting systems are not acceptable due to the likeliness of the apparatus body shifting or becoming detached from the chassis upon rear end impact. Four mounts of this design shall be provided, two on each side of the body.

6.5 Grab Handles

6.5.1 Two 1-1/4" diameter, aluminum handrails with chrome plated stanchions shall be supplied and installed on the upper rear of the apparatus body. A second grab handle shall be provided, and a suitable location determined if necessary.

6.5.2 One (1) 1-1/4" diameter, aluminum handrails with chrome plated stanchion, with a minimum length of 24 inches, shall be provided and installed on the rear of the apparatus body, on the driver's side of the roll up door for the hose reel compartment, mounted vertically.

6.6 Rear Bumper

6.6.1 A full-width bumper shall be provided at the rear of the body. The bumper shall be fabricated from a formed steel C-channel, with a horizontal 90-degree break at both the upper and lower edges and capped ends. The rear bumper shall have a height of 12 inches and shall be finish painted black.

6.6.2 A rear step with tread surface, shall be provided in the center of the rear bumper for accessing the hose reel at the upper rear center of the body.

6.6.3 A warning plate shall be affixed to the rear of the apparatus in a conspicuous place. The warning plate shall read: "WARNING: DO NOT RIDE ON REAR STEP WHILE VEHICLE IS IN MOTION. DEATH OR SERIOUS INJURY MAY RESULT"

6.7 Rear Access Ladder

6.7.1 An access ladder, fabricated of aluminum tubing with aluminum non-slip rungs and round side rails, shall be installed at the rear of the apparatus body on the passenger's side. Maximum rung spacing shall not exceed 14 inches. The ladder shall be secured to the apparatus at the rear, utilizing hard points incorporated into the rear of the body. The height of the ladder vertical side rails shall extend beyond the top of the body to facilitate access to the top area. The ladder shall be finished in grey Dura-Coat® prior to installation.

6.8 Rear step

6.8.1 A lift up, flip down step shall be provided on the rear-facing vertical surface of the rear bumper, located directly below the access ladder.

6.9 Compartmentation

6.9.1 All compartment walls and ceilings shall be fabricated from 14-gauge galvanneal steel or other material which shall be approved by the government. All compartment floors shall be fabricated from 12-gauge galvanneal steel or other material which shall be approved by the government and shall be of a sweep-out design. All compartments shall be welded for strength and shall be sealed from the elements.

6.9.2 All compartments shall be individual and free standing. No compartment shall share a common wall, floor or ceiling, unless so designed to be transverse with an adjacent compartment. Fasteners from the exterior of the apparatus body or adjacent compartments shall not penetrate any compartment walls or ceilings.

6.9.3 All compartment interiors shall be free of exposed electrical harnesses or plumbing components.

6.9.4 All enclosed compartments shall be water and dust tight. No louvers are to be provided in any of the compartments.

6.9.5 All compartments shall be as large as possible, as determined by the design of the apparatus. The approximate compartment sizes required are listed below:

6.10 Driver's Side Compartments

6.10.1 One compartment shall be provided on the driver's side of the apparatus body forward of the rear wheels. The compartment shall extend from the pump operator's panel to forward of the wheel well area. A ROM brand or equivalent, mill finish aluminum roll-up door, with locking lift bar handle shall be provided in this compartment.

6.10.2 .

Description	Nominal Dimension
Compartment dimension ±0.25 inch	50 inches wide by 39 inches high by 24 inches deep lower and 50 inches wide by 19 inches high by 10 inches deep upper Total dimension will be 50 inches wide by 59 inches high with a clear door opening of 44 inches wide by 54 inches high.

6.10.3 One compartment shall be provided on the driver's side of the apparatus over the wheel well. A ROM brand or equivalent, mill finish aluminum roll-up door, with locking lift bar handle shall be provided on this compartment

Description	Nominal Dimension
Compartment dimension ±0.25 inch	60 inches wide by 46 inches high by 10 inches deep

6.10.4 One compartment shall be provided on the driver's side of the apparatus body aft of the rear wheels. A ROM™ brand, or equivalent, mill finish aluminum roll-up door, with a locking lift bar handle, shall be provided on this compartment.

Description	Nominal Dimension
Compartment dimension ±0.25 inch	31 inches wide by 59 inches high by 24 inches deep

6.11 Passenger's Side Compartments

6.11.1 One compartment shall be provided on the passenger's side of the apparatus body forward of the rear wheels. This compartment shall be capable of storing a 1,500-gallonsnap tank. A ROM™ brand, or equivalent, mill finish aluminum roll-up door, with a locking lift bar handle, shall be provided on this compartment.

6.11.2

Description	Nominal Dimension
Compartment dimension ±0.25 inch	50 inches wide by 34 inches high by 24inches deep lower and 50 inches wide by 19 inches high by 10 inches deep upper Total dimension will be 50 inches wide by 57 inches high with a clear door opening of 44 inches wide by 49 inches high.

6.11.3 A compartment shall be provided on the driver's side of the apparatus over the wheel well. A ROM brand or equivalent, mill finish aluminum roll-up door, with locking lift bar handle shall be provided on this compartment.

Description	Nominal Dimension
Compartment dimension ±0.25 inch	60 inches wide by 27 inches high by 10 inches deep

6.11.4 One compartment shall be provided on the passenger's side of the apparatus body aft of the rear wheels. A ROM™ brand, or equivalent, mill finish aluminum roll-up door, with a locking lift bar handle, shall be provided on this compartment.

6.11.5

Description	Nominal Dimension
Compartment dimension ±0.25 inch	31 inches wide by 40 inches high by 24 inches deep

6.12 Hose Reel Compartment

6.12.1 One compartment shall be provided at the center rear of the apparatus body. The compartment shall be provided with a hose connection and a quick disconnect electrical connection to allow for the servicing or removal of the hose reel located in the compartment. A ROM™ brand, mill finish aluminum roll-up door, with a locking lift bar handle, or equivalent, shall be provided on this compartment.

Description	Nominal Dimension
Compartment dimension ±0.25 inch	37 inches wide by 31 inches high by 24 inches deep

6.13 Compartment Doors - Aluminum Overlap Type

6.13.1 The ROM brand, or equivalent, roll-up doors shall be fabricated from double wall anodized aluminum slats. Nylon end shoes, sliding in the door sidetracks, shall be provided on each slat to assure smooth operation and avoid the requirement for lubrication.

6.13.2 Each slat shall be designed with an inner seal to prevent water from entering the compartment, and to assist with absorbing shock and eliminating clatter.

6.13.3 The roll up doors shall be designed to work over an extreme temperature range. The latch shall be a lift bar, with lock, to allow one hand opening.

6.14 Compartment Floor Mats

6.14.1 All enclosed side body compartments shall have floor mats installed, custom cut to fit the compartment floors. The floor mats shall be black in color and shall be easily removable to allow the compartment to be cleaned. The floor mats shall be designed to provide ventilation to the equipment stored in the compartment, and to protect the stored equipment from direct contact with the metal compartment floor surfaces.

6.15 Adjustable Shelf Channels

6.15.1 A minimum of four vertically mounted steel Unistrut™ channels shall be provided and installed in all enclosed body compartments for the current or future installation of infinitely-adjustable shelving, slide out trays or equipment brackets. The channels shall be designed as to allow the use of spring-loaded, self- tightening extrusion nuts inside the channels to install the specified shelving.

6.16 Long-Handled Tool Storage

6.16.1 The shelves in the passenger’s side compartment aft of the rear wheels shall be reduced in width to create an unobstructed vertical space in the aft section of the compartment for the storage of long- handled tools.

6.17 Tool Bracket Mounting Channels

6.17.1 Three parallel horizontally mounted steel Unistrut™ channels shall be mounted on the rear wall of the long-handled tool storage area. These channels shall be located in the compartment in a configuration to allow the customer mounting of tool brackets. The channels shall be designed as to allow the use of spring-loaded, self-tightening extrusion nuts inside the channels to install the specified tool brackets.

6.18 Compartment Shelves

6.18.1 Five adjustable shelves shall be provided and installed in the specified body compartments. The shelves shall be fabricated from 0.125-inch bright finish smooth aluminum plate, with a 90-degree break on the inboard and outboard sides, 1-inch in height. A 1-inch by 1-inch aluminum angle shall be provided on both ends of the shelf to enclose the ends and attach the shelf to the mounting channels. The shelves shall be free of welds, sharp corners or rough edges. The shelves shall be attached to the Unistrut™ channels fastened to the compartment side walls and shall be infinitely adjustable. Spring-loaded extrusion nuts and locking fasteners shall be provided.

6.18.2 The shelf locations shall be as follows:

- Three in the driver's side compartment aft of the rear wheels
- Two in the passenger's side compartment aft of the rear wheels
- The shelves in the passenger's side compartment shall be reduced in width to accommodate the long- handled tool storage area.

6.19 Stainless Steel Body Trim

6.19.1 All enclosed compartment door thresholds shall be covered with horizontal polished stainless-steel scuff guards to provide paint protection against chips and scratches.

6.19.2 All vertical exterior body corners shall be covered with polished stainless-steel angles to act as body corner scuff guards and to provide paint protection against chips and scratches.

6.20 Wheel Chock Storage Compartments

6.20.1 Two wheel chock storage compartments, each with a painted locking door, shall be provided in the wheel well areas, one on each side of the apparatus body, aft of the rear wheel well openings.

6.21 Hard Suction Hose Storage

6.21.1 Storage for hard suction hose up to 3-inch in diameter and 8 feet in length shall be provided and located on the passenger's side of the apparatus body, above the passenger side compartments.

6.22 Cab Crush Resistance

6.22.1 A rear of cab headboard structure shall be constructed of a minimum 4-inch by 4-inch structural steel tubing.

6.22.2 The headboard shall be fastened to the lower mounting structure of the water tank and extend to approximately 1 inch above the profile of the cab of the vehicle.

6.22.3 The headboard shall follow the profile of the cab.

6.22.4 Two vertical support arms shall be fastened from the headboard to inboard portion of the water tank.

6.22.5 Two 45-degree support arms shall be fastened to the outboard portion of the water tank.

6.22.6 Design of the headboard shall be submitted to the Government for approval

7 — Pump and Plumbing

7.1 Pump General - Midship Pump

7.1.1 The midship fire pump shall be a Darley™ Model HM 350, or equivalent, 300 GPM single-stage P.T.O. driven pump, with mechanical seal, mounted behind the chassis cab. The pump shall be of a centrifugal design, with a cast iron pump body, bronze fitted. The pump discharge shall be equipped with a spring-loaded full flow check valve. No discharge or intake relief valves are to be provided in the pump and plumbing system.

7.2 Pump Specifications

7.2.1 As installed on the apparatus, the pump shall be capable of delivering 200 GPM at 300 psi output pressure from a 5-foot lift through 24 feet of 3-inch suction hose with strainer and also from the apparatus water tank when installed on an apparatus.

7.2.2 In addition, the pump manufacturer shall certify that the pump can deliver the following capacities at net pump pressure from draft:

- 300 GPM @ 150 psi net pump pressure
- 200 GPM @ 300 psi net pump pressure

7.2.3 Under the following conditions:

- An altitude of not more than 2000 feet above sea level
- Atmospheric pressure of 29.9 inches of mercury (corrected to sea level)
- Water temperature of 60 degrees Fahrenheit (15.6 degrees Celsius)
- Through a single intake with 20 feet of 3-inch suction hose equipped with a suction hose strainer
- With a lift of 10 feet

7.2.4 When dry, the pump shall be capable of taking suction and discharging water with a lift of 10 feet or more in not more than 30 seconds.

7.3 Pump Shaft

7.3.1 The shaft shall be splined, with a broached impeller hub for greater resistance to wear, torsional vibration, and torque imposed by the chassis engine.

7.4 Seal Rings

7.4.1 The seal rings shall be of a renewable double labyrinth type design, fabricated from bronze.

7.5 Pump Impeller

7.5.1 The pump impeller shall be of bronze construction, accurately machined, hard ground and balanced. The impeller shall be splined to the pump shaft for a precise fit and durability.

7.5.2 Water sealing shall be accomplished by a spring-loaded mechanical seal, which shall automatically adjust for wear.

7.6 Transmission Case

7.6.1 The transmission case shall be fabricated from a cast iron alloy and shall provide an adequate oil reservoir capacity for low operating temperatures. Supplementary cooling of the transmission shall be unacceptable.

7.7 Gears

7.7.1 All gears shall be of a 1½-inch face helical design. The gears shall be precision cut from heat-treated alloy steel for quiet operation and long life.

7.8 Bearings

7.8.1 The bearings shall be of a deep groove radial type design, oversized for long life. The bearings shall be protected at all openings from road dirt and water splash with double lip oil seals.

7.9 Drive Unit Construction

7.9.1 The drive unit, as well as the entire pump, shall be completely manufactured at the pump manufacturer's factory.

7.9.2 The drive unit shall be of sufficient size to withstand full torque during pumping operations.

7.9.3 The pump driveline from the PTO to the pump shall be installed within the PTO, driveline, and transmission manufacturer’s recommendations and limits. The PTO output shaft and the pump input shaft shall be parallel, and the driveline u-joints shall be phased to minimize vibration. The driveline shall utilize a 2-joint universal driveline design where possible, otherwise a 4-joint universal driveline consisting of an intermediate shaft, parallel to the PTO shaft and two separate 2-joint drivelines de- phased is required. The apparatus manufacturer shall submit a driveline design showing u-joints, u-joint angles, u-joint sizes, u-joint torque ratings, and the driveline phasing plan and calculations to the Government for approval prior to installation of pump driveline.

7.10 PTO Shift

7.10.1 The pump shall be driven through a power take off (PTO) mounted on the chassis transmission. The PTO shall be equipped with a two-position, positive locking, electric-over-hydraulic shift control, located in the cab interior within reach of the driver's seating position. The PTO shifting mechanism shall be interlocked with the parking brake and the chassis transmission to provide throttle control per NFPA requirements. Throttle authority on the pump panel shall be active only when 1) PTO is engaged, 2) the parking brake is set, and 3) the transmission is in neutral or park or 1) the PTO is engaged, 2) the parking brake is set and 3) the transmission is in neutral or park. Throttle authority in the cab shall be active at all times with the PTO engaged or disengaged, with the parking brake on or off and the transmission selector in any position. The PTO shall be capable of being engaged with the parking brake on or off and the transmission selector in any position.

7.11 Pump Shift Indicator Lights

7.11.1 Three indicator lights shall be provided in the cab interior.

7.11.2 The "PUMP ENGAGED" light shall illuminate to indicate that the PTO is engaged.

7.11.3 The "OK TO PUMP" light shall be illuminated when 1) the PTO is engaged, 2) the parking brake is set and 3) the transmission is in neutral or park.

7.11.4 The "OK TO PUMP AND ROLL" shall be illuminated when 1) the PTO is engaged, 2) the parking brake is off and 3) the transmission is in any forward gear, reverse, or neutral. When the "OK TO PUMP AND ROLL" indicator is illuminated the "OK TO PUMP" indicator shall not be illuminated.

7.12 Pump Operator's Panel

7.12.1 The pump operator's control panel shall be located at the driver's side forward corner of the apparatus body. The pump panel shall be fully removable and shall be fabricated from 0.125-inch clear anodized aluminum plate.

7.12.2 All controls and gauges shall be located on the pump operator's panel and shall be properly labeled.

7.12.3 A layout drawing of the pump operator's panel shall be supplied to the purchaser prior to the start of construction.

7.12.4 The unit shall have two indicator lights on the side control panel, "THROTTLE READY" and "OK TO PUMP."

7.12.5 The "THROTTLE READY" light shall be illuminated when the parking brake is engaged and when the chassis transmission is in "Neutral" or "Park." The "THROTTLE READY" light shall also illuminate when the "OK TO PUMP" light is illuminated.

7.12.6 The “OK TO PUMP” light shall be illuminated when 1) the PTO is engaged, 2) the parking brake is set and 3) the transmission is in neutral or park.

7.12.7 An engine speed advancement interlock system shall be provided to prevent advancement of the engine speed at the pump operator’s panel unless the apparatus has a “THROTTLE READY” indication.

7.13 Required Testing – Indicator Lights & Engine Speed Advancement Interlock

7.13.1 A test is required before delivery to ensure that the “PUMP ENGAGED,” “OK TO PUMP,” “OK TO PUMP-AND-ROLL,” and “THROTTLE READY” indicator lights are properly configured and activate in the proper conditions as described by the table in(below). The engine speed advancement interlock system shall be tested to verify that the engine speed cannot be increased at the pump operator’s panel unless the proper conditions can be met.

7.13.2 Table – Indicator Light Test Conditions and Verifications

Transmision Type	Chassis Transmission Gear Selected	Parking Brake Status	Pump Shift Control Action Status (Driving Compartment)	Indicator Status (Driving Compartment)	Indicator Status (Pump Operator’s Panel)	Engine Speed Control in Cab	Engine Speed Control at Pump Operator’s Panel
Automatic	Neutral or Park	On	Disengaged	None	“Throttle Ready”	Yes	Yes
Automatic	Neutral or Park	Off	Disengaged	None	None	Yes	No
Automatic	Neutral or Park	On	Engaged	“Pump Engaged” and “OK to Pump”	“Throttle Ready” and “OK to Pump”	Yes	Yes
Automatic	Neutral or Park	Off	Engaged	“Pump Engaged” and “OK to Pump”	None	Yes	No
Automatic	Any Gear other than neutral	On	Engaged	“Pump Engaged” and “OK to Pump”	None	Yes	No
Automatic	Any Gear other than neutral	Off	Engaged	“Pump Engaged” and “OK to Pump”	None	Yes	No
Automatic	Any Gear other than neutral	On	Disengaged	None	None	Yes	No
Automatic	Any Gear other than neutral	Off	Disengaged	None	None	Yes	No

7.14 Pump Panel Lights

7.14.1 Two LED light modules, with chrome flanges, shall be provided to illuminate the pump operator's panel. The lights shall be Whelen™ brand, Model #PELCC, or equivalent.

8 — Valves, Controls, Gauges and Plumbing Requirements

8.1 Items Provided

8.1.1 The following pump, plumbing, controls, gauges, and accessories shall be provided as indicated below. The plumbing requirements outlined below shall be considered a minimum standard, and shall be followed by the apparatus manufacturer without exception:

8.2 Main Pump Discharge and Intake Plumbing

8.2.1 The discharge and intake valves specified shall be either of a direct-actuated quarter turn design or shall be provided with control rods that are directly connected from the valve handle to the driver's side pump operator's panel. The valves or valve controls shall be provided with a locking feature.

8.2.2 All discharges shall have NST thread chrome bleed-off caps and chains, unless designed to be pre-connected, or otherwise specified.

8.2.3 All valves shall be Akron™ 8800 series swing-out style, or equivalent. All valves shall be designed to operate under normal conditions up to 500 P.S.I. and shall have dual seats to work in both pressure and vacuum environments.

8.2.4 All valves and controls shall be easily accessible for service, repair or replacement.

8.2.5 Where vibration or chassis flexing may damage or loosen piping, the piping shall be equipped with Victaulic™ couplings.

8.2.6 The main suction and discharge plumbing shall be welded stainless steel pipe or high-pressure flexible hose. The flexible hose shall be designed to withstand the normal operating pressures of the pump. All high-pressure hose shall be installed with a swivel or Victaulic™ coupling on at least one end of the hose. The completed plumbing system shall be hydro dynamically tested at 400 P.S.I. The nominal sizes of the plumbing supplying the pump and discharges shall be as follows:

- Main suction — 3-inch NH
- Discharges — 1½-inch NH, 2½-inch NH
- Hose reel — 1-inch NPSH

8.2.7 A drawing of the plumbing configuration at the rear of the apparatus body shall be supplied to the purchaser prior to the start of construction.

8.3 Pump Operator's Panel Controls

8.3.1 The following components shall be provided on, and/or controlled at the pump operator's panel:

8.4 Pump Performance Acceptance Test Plate

8.4.1 An identification plate shall be provided on the pump operator's panel to indicate the performance ratings of the pump. The plate shall provide performance information, including engine RPM, at the following flows and pressures from a 5-foot lift through 24 feet of 3-inch suction hose with a strainer:

- 250 GPM at 150 psi
- 200 GPM at 300 psi

8.5 Pump Operating Instruction Plate

8.5.1 An identification plate shall be provided on the pump operator's panel which indicates valve position ("O" = open, "X" = close) for the following operations:

- Tank to Fire
- Suction to Fire
- Suction to Tank
- Drain Plumbing
- Drain Tank and Plumbing Prime

8.6 Test Gauge Connections

8.6.1 The plumbing system shall be provided with two test ports on the pump panel exterior; one plumbed to the intake side and one plumbed to the discharge side of the water pump. These test ports shall be installed to provide a means for connecting certified test gauges when testing the pump's performance. The test ports shall be located for easy access and shall be correctly labeled.

8.7 Pump Panel Labeling

8.7.1 All controls, discharges, intakes, pressure gauge, and other pump panel components that are not provided with a pre-printed legend or trim plate shall be labeled as required for ease of operation. This labeling shall be accomplished through the use of identification tags. The tags shall be self-adhesive and shall be installed on the pump control panel with chrome plated bezels. The tags shall be placed adjacent to the components in such a way as to clearly distinguish the item that they are identifying.

8.8 Master Compound Gauge

8.8.1 One master compound gauge shall be provided on the pump operator's panel. The gauge shall be a graduated from 30 inches of vacuum to 0 P.S.I. to 400 P.S.I., with a minimum diameter of 4½ inches, back lit for nighttime operations and glycerin filled. The glycerin in

the bourdon tube shall be retained by the flexible rubber plug. The gauge shall be equipped with a drain cock (vent) at the gauge connection. A Class 1® brand, or equivalent gauge meets this requirement.

8.9 Pump Cooler/By-Pass

8.9.1 A pump cooler/by-pass line shall be installed to the water tank fill tower to cool the pump when it is engaged and not discharging water.

8.9.2 The pump cooler/bypass line shall be tapped from the pump discharge plumbing before the full-flow check valve. The tap shall be one-half inch NPT and connect to a one-half inch NPT, horizontally mounted, cast bronze “Y” strainer. The “Y” strainer shall be rated at 500 pounds per square inch at 150 degrees Fahrenheit and have a 20-mesh screen. The “Y” strainer outlets shall consist of a one-half inch NPT face outlet and a three- eighths inch NPT blowdown (cleanout) outlet. A three-eighths inch quarter-turn NPT valve shall be directly connected to the blowdown (cleanout) outlet. A three-eighths inch flexible, braided pigtail shall be installed to direct water flow to the ground during cleanout. A metal tag shall be attached to the “Y” strainer clean out valve stating “#12 - PUMP COOLER “Y” STRAINER CLEAN OUT.”

8.9.3 The one-half inch NPT face outlet of the strainer shall be connected to a one-quarter inch NPT check valve. After the one-quarter inch check valve, the line shall be reduced to a one-quarter inch inside diameter line and run to the pump operator’s control panel. A one-quarter inch, quarter-turn valve shall be mounted on the pump operator’s control panel. The valve shall be labeled, “#17 – PUMP BYPASS” and have labels to designate the “OPEN” and “CLOSED” positions. The valve handle position for the #17 valve shall be vertical when open and horizontal when closed. The one-quarter inch inside diameter line shall run from the rear panel mounted valve (#17) to the top of the tank and discharge into the tank with a bulkhead fitting mounted halfway up the fill tower. The inlet side of the bulkhead fitting shall have a 90-degree elbow pointing downward to accept the incoming one-quarter inch pump line. The outlet side of the bulkhead fitting shall terminate with a 90-degree elbow directing flow downwards into the tank.

8.9.4 Water flow in the pump cooler/by-pass line shall be between 4.5 GPM and 5.5 GPM at 400 P.S.I. pump pressure. If flow exceeds these limits, an orifice restriction may be installed to reduce flow, provided the orifice can be easily removed for cleaning.

8.9.5 A warning label shall be affixed near the #17 valve that states “Pump Damage and Serious Injury May Occur if the Pump is Operated with the #17 Valve Closed.”

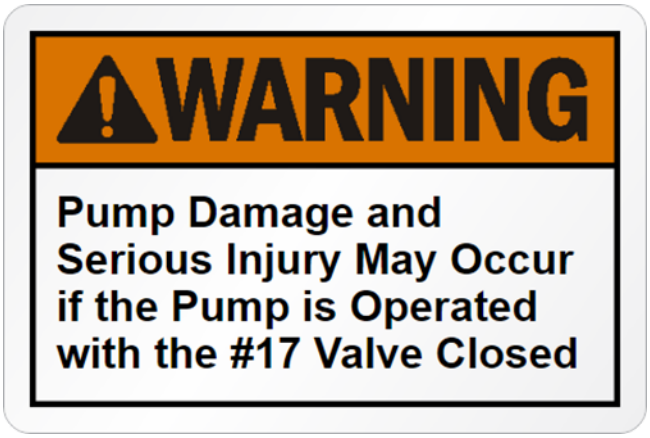


Figure 2 — Warning Label

8.10 Master Drain

8.10.1 One multiple port drain valve, fabricated from bronze, shall be provided at the passenger's side forward corner of the body. The valve shall be opened by turning a rotary hand wheel. The valve shall be plumbed to drain both the discharge and intake sides of the pump, and other plumbing components as required. The valve shall be plumbed between the inline check valve on the main pump discharge and the foam manifold check valve. The valve shall be placed as low as possible to provide proper drainage of the components plumbed to it. The valve shall be rated to 600 P.S.I. minimum, and shall be suitable for daily actuation

8.11 In-Cab Gauge

8.11.1 One pressure gauge shall be provided on the cab center console, within view of the driver's seating position, to monitor the pump's discharge pressure. The gauge shall be glycerin filled, with a minimum diameter of 2½ inches, graduated 0 to 400 P.S.I., and back lit for nighttime operations. The glycerin in the bourdon tube shall be retained by a flexible rubber plug. The gauge shall be equipped with a drain cock (vent) and the gauge connection. A Class 1® brand gauge, or equivalent meets this requirement.

8.12 Engine Status Center/ Remote Throttle Control

8.12.1 One FRC™ brand, PumpBoss (PBA200) Pressure Governor or equivalent shall be provided on the pump operator's panel to provide chassis engine monitoring and critical warnings. The ESC shall be a weatherproof display with super- bright digits.

8.12.2 The Pressure Governor shall continuously display chassis engine RPM, oil pressure, engine coolant temperature, and electrical system voltage, along with providing critical warnings. The warning levels for low oil pressure, high engine coolant temperature, low voltage (programmed for 11.8 volts direct current - default setting), and high voltage shall be independently programmable. The Pressure Governor shall provide visual warnings

and an output for controlling an audible warning when alarm levels are reached. The Pressure Governor shall also provide a message center that displays total pump hours.

8.13 Automatic Pump Override

8.13.1 A pump override system shall be provided to automatically return the chassis engine to idle if the pump discharge pressure drops below 50 P.S.I.

8.13.2 A toggle switch, properly labeled, shall be located on the pump operator's panel to allow the operator to disengage the automatic shutdown feature when required.

8.14 Water Tank Level Sight Gauge

8.14.1 One sight tube level gauge located on the front tank head on the driver's side shall be provided to monitor the water tank liquid level. This level gauge shall be fabricated from clear acrylic tubing, with stainless steel rods down each side for protection of the sight tube. A chromed shut off valve, with a built-in drain, shall be provided at the bottom of the gauge to drain water from the tube in cold weather. A vent line shall be installed at the top of the sight tube and routed to the water tank fill tower to exhaust trapped air to the atmosphere. The sight gauge shall be visible to the driver by looking in the exterior mirror.

8.15 Priming Pump

8.15.1 One positive displacement, oil less, rotary vane, electric motor-driven priming pump, conforming to the NFPA requirements, shall be provided. The primer pump body shall be fabricated from heat-treated anodized aluminum for wear and corrosion resistance. The priming pump shall be capable of producing a minimum of 20 Hg of vacuum at 2000 feet above sea level. The apparatus shall be able to prime and pump from a 10-foot lift in 30 seconds and prime and pump from a 17-foot lift in 45 seconds.

8.15.2 The primer pump electric motor shall be of a 12-volt direct current totally enclosed design. The priming pump shall not require lubrication from an external source. The priming pump shall be operated by a single push-pull control valve mounted on the pump operator's panel. The control valve shall be of all bronze construction and labeled #6 Primer.

8.15.3 The primer control shall be connected to the top of the pump inlet and to the highest point (hump) in the plumbing. This shall be accomplished with two separate lines from the primer control. The line from the primer control to the top of the pump inlet shall be½-inch inside diameter, and the line from the primer control to the highest point in the plumbing shall be ⅜-inch inside diameter.

8.16 Discharge Locations

8.16.1 One 1½-inch discharge, labeled #3 Discharge, plumbed to the on-board foam system, shall be provided at the driver's side forward corner of the apparatus body. The discharge shall be plumbed with stainless steel pipe or 1½-inch flexible high pressure hose and shall

terminate with 1½-inch NSTM threads with a 1½-inch NSTF chrome cap and chain. The discharge valve shall be locally controlled with a TS style handle.

8.16.2 One 1½-inch discharge, labeled #3 Discharge, plumbed to the on-board foam system shall be provided at the passenger's side forward corner of the apparatus body. The discharge shall be plumbed with stainless steel pipe or 1½-inch flexible high pressure hose and shall terminate with 1½-inch NSTM threads with a 1½-inch NSTF chrome cap and chain. The discharge valve shall be locally controlled with a TS style handle.

8.16.3 One 1½-inch discharge, labeled #3 Discharge, plumbed to the on-board foam system, shall be provided at the rear of the apparatus body on the passenger's side. The discharge shall be plumbed with stainless steel pipe or 1½-inch flexible high pressure hose and shall terminate with 1½-inch NSTM threads with a 1½-inch NSTF chrome cap and chain. The discharge valve shall be locally controlled with a TS style handle.

8.16.4 One 2½-inch water-only discharge, labeled #19 Water Only, shall be provided at the center rear of the apparatus body. The discharge shall be plumbed with stainless steel pipe and/or 2½-inch flexible high pressure hose and shall terminate with 2½-inch NSTM threads with a 2½-inch NSTF chrome cap and chain. The discharge valve shall be locally controlled with a TS style handle.

8.16.5 One 2½-inch water-only discharge, labeled #19 Water Only, shall be provided through the center of the front bumper. The discharge shall be plumbed with stainless steel pipe or 2½-inch flexible high pressure hose and shall terminate with 2½-inch NSTM threads with 2½-inch NSTF chrome cap and chain. The discharge valve shall be locally controlled with a TS style handle.

8.17 Intake Locations

8.17.1 One 3-inch intake, with strainer, labeled #8 Overboard Suction, shall be provided at the driver's side of the apparatus, forward of the pump operator's panel below the 1½-inch #3 Discharge. The intake shall be plumbed with stainless steel piping or flexible high-pressure hose. The valve shall terminate in 3-inch NSTM threads, with a 3-inch NSTF chrome cap with chain. The intake valve shall be locally controlled with a TS style handle.

8.17.2 One 3-inch intake, with strainer, labeled #8 Overboard Suction, shall be provided at the left rear of the apparatus body. The intake shall be plumbed with stainless steel piping or flexible high-pressure hose. The valve shall terminate in 3-inch NSTM threads, with a 3-inch NSTF chrome cap with chain. The intake valve shall be locally controlled with a TS style handle.

8.17.3 There shall be no humps in the suction plumbing.

8.18 Pump to Tank Line

8.18.1 One 1½-inch manually controlled inline valve, labeled #2 Pump to Tank, shall be installed between the pump discharge and the water tank fill inlet. The locking push pull control for the tank fill line shall be located at the pump operator's panel.

8.19 Tank to Pump Line

8.19.1 One 3-inch inline valve, labeled #1 Tank to Pump, shall be installed between the water tank outlet and the pump inlet. The valve shall be air actuated and shall be controlled from the pump operator's panel. An air toggle switch shall be provided on the pump operator's panel to control the valve. The switch shall be provided with a hinged red safety cover. Closing the safety cover shall open the valve. The valve and air cylinder shall be installed so that the tank to pump valve is in the open position when the cylinder rod is retracted, and the protective cover is closed. A 3-inch spring-loaded inline check valve shall be provided in the tank to pump line to prevent damage to the water tank when the apparatus is connected to a pressurized water source. All valving and piping shall be 3-inch without restrictions.

8.20 Tank Fills

8.20.1 One 1½-inch tank fill, labeled Tank Fill, shall be provided at the passenger side rear of the apparatus body. The tank fill shall be plumbed with stainless steel piping or flexible high-pressure hose. The valve shall terminate in 1½-inch NSTM threads, with a 1½- inch NSTF chrome cap with chain. The tank fill valve shall be locally controlled with a TS style handle.

8.20.2 One 2½-inch tank fill, labeled Tank Fill, shall be provided on the pump operator's panel at the forward driver's side of the apparatus body. The tank fill shall be plumbed with stainless steel piping or flexible high-pressure hose. The valve shall terminate in 2½- inch NSTM threads, with a 2½-inch NSTF chrome cap with chain. The tank fill valve shall be locally controlled with a TS style handle.

8.20.3 The two tank fill inlets shall be connected to a common pipe that terminates in a fill dome on the top of the water tank. The fill dome shall provide an air gap between the tank fills and the water tank interior.

8.21 Booster Hose Reel

8.21.1 One booster hose reel plumbed to the on-board foam system shall be provided in the compartment located at the upper center rear of the apparatus body. The hose reel shall be a Hannay™ brand or equivalent, with a capacity of 100 feet of 1-inch booster hose. The hose reel frame shall be fabricated from steel, with a silver painted finish. The hose reel inlet connection shall be a 1-inch, 90-degree swivel, designed to withstand 1000 P.S.I., which shall be plumbed from the pump with 1-inch flexible high pressure hose and a 1-inch inline valve, locally controlled with a TS handle. The inlet valve, labeled #4 Reel,

shall be located in the opening in the body directly below the reel, offset to the passenger's side of the opening.

8.21.2 The reel shall be provided with a #227 ⅓ horsepower, 12-volt direct current, electric motor for rewinding the hose on to the reel. This motor shall be controlled with a push button momentary switch located at the passenger's side of the opening in the body directly below the reel. The booster reel shall have provisions for manual rewind. The pinion shaft for the manual rewind gear shall have an adjustable tension brake, controlled at the reel.

8.21.3 The hose reel shall be equipped with a 1-inch NPSH male thread.

8.21.4 One polished stainless-steel hose roller and 4-way guide assembly shall be provided on the outboard side of the reel.

8.22 Front Spray Nozzles

8.22.1 Two spray nozzles plumbed to the on-board foam system, shall be provided and installed beneath the front bumper of the apparatus. One nozzle shall be provided on the driver's side end of the front bumper and one nozzle shall be provided on the passenger's side end of the front bumper. The nozzles shall be plumbed with stainless steel piping or flexible high-pressure hose. Two electric over air-actuated inline valves shall be provided, one in the plumbing to each front spray nozzle. Two toggle switches shall be provided on the cab center console to control the front spray nozzle valves. The switches shall be provided with hinged red safety covers. Closing the safety covers shall close the valves. The nozzles shall be capable of being put into operation during "pump and roll" operations. Nozzle valves and plumbing shall be enclosed or protected.

8.23 Rear Spray Nozzles

8.23.1 Two spray nozzles plumbed to the on-board foam system, shall be provided and installed beneath the rear bumper of the apparatus. One nozzle shall be provided on the driver's side end of the rear bumper and one nozzle shall be provided on the passenger's side end of the rear bumper. The nozzles shall be plumbed with stainless steel piping or flexible high-pressure hose. Two electric over air-actuated inline valves shall be provided, one in the plumbing to each rear spray nozzle. Two toggle switches shall be provided on the cab center console to control the rear spray nozzle valves. The switches shall be provided with hinged red safety covers. Closing the safety covers shall close the valves. The nozzles shall be capable of being put into operation during "pump and roll" operations. Nozzle valves and plumbing shall be enclosed or protected.

8.24 Foam Proportioning System

8.24.1 The pump system shall be equipped with a Foam-Pro™ Model 1601 foam injection system, plumbed to the specified discharges. This product is an automatic foam proportioning system, with electronically- controlled, direct concentrate injection occurring on the discharge, or pressure, side of the main water pump. The system shall reliably and

accurately meter Class A fire suppressant foam agents. These foam agents are typically proportioned at ratios of 0.2% to 0.5% of foam concentrate in solution. The proportional injection system shall ensure that only the specified amount of foam concentrate is used. The system shall be simple to operate and shall have a maximum pressure loss of 3 P.S.I. at 100 GPM. A microprocessor control device shall be provided, which incorporates a closed-loop feedback signal for more accurate proportioning in variable flow conditions. A stainless-steel Victaulic™ foam manifold or mainline check valve, that meets manufacturer specifications, must be installed to prevent foam solution from returning to the pump, suction water source or engine water tank.

8.24.2 The proportioner shall maintain accurate foam concentrate proportioning and injection rates over water discharge flows of 5 to 200 GPM, and shall maintain accurate proportioning and injection rates from 0 to 400 P.S.I. The proportioner shall be provided with a 1½-inch NPT flowmeter, Foam Pro™ Model 2660, or equivalent. It shall be installed using 2-inch Victaulic™ couplings. The system shall provide flexibility in operation by maintaining a constant concentration of foam solution over a variable range of water stream flow rates and pressures. The proportioning rate shall be adjustable from 0.1% to 1.0% of the specified water discharge flow with an accuracy of 5%.

8.24.3 The foam system shall have a pump operator's panel-mounted manual flowmeter. A visible low foam concentrate solution supply warning device shall be incorporated into the instrument panel.

8.24.4 The system shall be compatible with nozzle aspirating systems, where nozzle flow volume must be adjustable on demand, while maintaining a constant quality foam solution.

8.24.5 Foam concentrate shall be provided from the onboard foam concentrate storage tank.

8.24.6 The foam proportioner shall be installed in a compartment below the pump operator's panel on the driver's side of the apparatus body.

8.25 Foam Tank

8.25.1 One 10-gallon capacity foam tank shall be provided and plumbed to the onboard foam system. The tank shall be fabricated from polypropylene and shall not be an integral component of the structure of the water tank. The foam tank fill tower lid shall be labeled as to the type of foam concentrate contained within the tank. The foam tank shall be located on the horizontal aluminum diamond plate surface above the lower forward compartments on the driver's side of the apparatus body. The foam tank shall have a vertical translucent strip foam level gauge in the outward-facing tank wall.

8.26 Pump Performance Test and Certification

8.26.1 Upon completion, the apparatus shall undergo a complete pumping test that conforms to the requirements of NFPA Standard 1900 (latest edition) for the size and type of pump provided. The test shall consist of a continuous one-half hour test pumping at rated

capacity and rated net pump pressure, a vacuum test of the primer system and plumbing, a tank discharge flow test and a pressure test of the apparatus piping. The chassis engine and transmission, the pump and other components of the apparatus shall show no undue heating, leaks, or other defects. The results of the test shall be documented to establish the performance of the apparatus and to further ensure that the unit shall perform satisfactorily when placed into service. A plaque, indicating the pump test results, shall be provided on the pump operator's panel. The test results shall be certified in writing, with the certification provided to the purchaser for their records at the time of delivery of the completed apparatus.

9 — Water Tank

9.1 Construction

9.1.1 The water tank shall be constructed of Polypropylene and include a lifetime warranty, The tank shall be rectangular, and Tee shaped in design to maintain a low center of gravity. It shall be constructed of 1/2" polypropylene and Mac226 sheet stock.

9.1.2 The water tank shall have baffles and vents compliant to NFPA 1900 as applicable. The tank fill tower shall be located at the rear of the booster tank.

9.1.3 A sump shall be located on the tank bottom, centered approximately 40" from the front of the tank. The sump shall have two polypropylene fittings. One fitting shall face to the side for the standard tank sump, and one shall be supplied for use as a tank clean-out plug. The sump shall have anti-swirl fins.

9.1.4 Removable lifting eyes shall be located on the top of the tank to allow the water tank to be lifted without damaging the tank.

9.2 Tank Capacity

9.2.1 The water tank shall have a usable capacity of 1500 gallons.

9.3 Tank Certification

9.3.1 The water tank capacity shall be certified prior to delivery. This certification shall be recorded on the manufacturer's record of construction and on a certification form.

9.4 Rear Dump Manifold and Dump Valve

9.4.1 The apparatus shall have one dump valve manifold at the rear.

9.4.2 One 5-inch electrically operated butterfly valve shall be provided at the center rear of the apparatus. The valve shall be plumbed directly into the water tank to serve as a water tank dump valve and shall be installed at the lowest point possible. The valve shall be external of the body, in the opening directly below the hose reel.

9.4.3 The rear dump manifold shall extend at least 4 inches, but not more than 6 inches, past the rear bumper to allow proper flow when the tank level is low.

9.4.4 Two toggle switches shall be provided to control the valve, one on the cab center console and one at the rear of the apparatus body. Both switches shall be provided with a hinged red safety cover. Closing the safety covers shall close the valve.

9.4.5 The dump valve shall be plumbed to discharge to the rear at the driver's side aft corner of the apparatus.

10 — Body Electrical Requirements

10.1.1 General Requirements

10.1.2 All apparatus body electrical components shall be served by independent circuits which shall be separate and distinct from the apparatus cab and chassis electrical circuits. All wiring supplied and installed by the apparatus manufacturer shall be installed in flexible split convoluted loom and shall be color coded and function labeled at 6-inch intervals. All wiring supplied and installed by the apparatus manufacturer shall be grease, oil and moisture resistant; and shall be securely fastened with insulated metal clamps and nylon wire ties. Solderless insulated connectors shall be utilized at all splice joints and shall be enclosed with heat shrink tubing for extra corrosion protection. Automatic reset type circuit breakers shall be provided wherever possible.

10.2 Electrical Equipment

10.2.1 The following electrical components shall be provided and installed on the completed apparatus by the apparatus builder:

10.3 Rear DOT Lighting

10.3.1 The rear DOT lighting shall consist of the following components:

10.4 Taillights, Brake Lights

10.4.1 The manufacturer shall supply and install two 3-inch by 7-inch single color LED stop, tail, and turn lights on the rear of the apparatus, rear-facing, one per side on the lower rear of the apparatus above the rear step in the top position of the common housing with the DOT lights. The stop, tail, turn lights (STT) shall consist of twelve LEDs red in color and with clear Lexan lens. The lights shall be waterproof using a vibration-welding sealing process. The lights shall have TIR collimator optics to prevent stray light. The manufacturer shall install Tomar brand, model R37L-STT, or equivalent.

10.5 Turn Signal Lights

10.5.1 The manufacturer shall supply and install two 3-inch by 7-inch single color LED stop, tail, and turn lights on the rear of the apparatus, rear-facing, one per side on the lower rear of the apparatus above the rear step in the middle position of the common housing with the DOT lights. The stop, tail, turn (STT) lights shall consist of twelve LEDs amber in color and with clear Lexan lens. The lights shall be waterproof using a vibration-welding sealing process. The lights shall have TIR collimator optics to prevent stray light. The manufacturer shall install Tomar brand, model R37L-STT, or equivalent.

10.6 Back Up Lights

10.6.1 The manufacturer shall supply and install two vertical three-position frames at the rear of the apparatus body, one each side to house the STT and warning/back-up lights per 4.7.1. The frames shall have a chrome finish. The manufacturer shall install Tomar brand, model R37-BZ3, or equivalent.

10.7 License Plate Bracket and Light

10.7.1 One clear LED type light fixture, with a license plate mounting bracket, shall be provided at the rear of the body.

10.8 Rear Upper Marker Lights

10.8.1 Four red LED marker lights, with stainless steel guards, shall be provided at the upper rear of the body. Two of the lights shall be located in the upper outboard corners of the body, one on each side, facing to the rear of the apparatus. Two of the lights shall be located in the upper aft corners of the body, one on each side, facing to the sides of the apparatus. Weldon™ brand, Model #9186-1500-10, or equivalent, shall be installed.

10.9 Cluster/Clearance Lights and Reflectors

10.9.1 Three red LED marker lights, with stainless steel guards, shall be provided at the rear of the body, centered in the upper section of the body. Weldon™ brand, Model #9186- 1500-10, or equivalent, shall be installed.

10.9.2 Two red LED marker lights, with stainless steel guards, shall be provided on the vertical surfaces at the lower rear corners of the body, one on each side, facing to the sides of the apparatus. Weldon™ brand, Model #9186-1500-10, or equivalent, shall be installed.

10.9.3 Two self-adhesive red reflectors shall be provided on the rear bumper, one on each end, facing to the sides of the apparatus.

10.9.4 Two self-adhesive red reflectors shall be provided on the rear bumper, one on each end, facing to the rear of the apparatus.

10.9.5 Two self-adhesive amber reflectors, one on each side of the body, shall be provided on the forward lower corners of the apparatus body, forward of the rear wheels, facing to the sides of the apparatus.

10.10 Ground Lighting

10.10.1 Two 4-inch clear LED lights shall be provided under the rear bumper. The lights shall be mounted to illuminate the ground. The lights shall be wired to the “Ground Lights” switch on the cab center console.

10.11 Rear Directional Light Bar

10.11.1 The manufacturer shall supply and install one traffic advisor light bar on the rear of the apparatus body, rear facing. The manufacturer shall wire the traffic advisor light bar to the Tomar brand, model, 948L-SIREN-R siren controller located on the cab center console. The manufacturer shall install Tomar brand, model LSTICK-14TD8-B, or equivalent.

10.12 Scene Lights

10.12.1 The manufacturer shall provide and install rear scene lights as described in 4.6.1 of this specification.

10.12.2 Two multipurpose 4¾-inch diameter lights shall be provided, one on each side of apparatus, side-facing, on stanchions at the forward end of the water tank. The lights shall be wired to the “Left and Right Scene” switches on the cab center console. Trucklite™ brand, or equivalent, lights shall be installed.

10.13 Compartment Lights

10.13.1 LED strip lighting shall be provided and installed in each exterior compartment. Full length LED strip lighting shall be installed behind the door frame on the left side, right side and top. The strip lighting shall be positively attached to the inside of the compartment and shall be easily removable for replacement or repair. No adhesive tape shall be used to mount the lights of mounting clips. The LED strip lighting provided shall have a maximum spacing of 1” inch between the light-emitting diodes. Code 3® Model #CW0803, sized per compartment dimensions, or equivalent, shall be installed.

10.13.2 Door ajar and compartment light switches shall not be provided in the compartment door jambs. The compartment lights shall be controlled with a master switch on the cab center console.

10.14 NFPA 1900 and CA Title 13 Lighting Compliance

10.14.1 All lighting and flash patterns shall be NFPA 1900 (latest edition) and California Title 13 compliant.

11 — Electrical System Performance Test, Low-Voltage

11.1 Test Requirement

11.1.1 The fire apparatus low voltage electrical system shall be tested as required by this section and the test results shall be certified by the apparatus manufacturer. The certification shall be delivered to the purchaser with the documentation for the completed apparatus. The tests shall be performed when the air temperature is between 0 degrees Fahrenheit and 110 degrees Fahrenheit (18 degrees Celsius and 43 degrees Celsius).

11.2 Test Sequence

11.2.1 The three tests defined below shall be performed in the order in which they appear. Before each test, the chassis batteries shall be fully charged until the voltage stabilizes at the voltage regulator set point and the lowest charge current is maintained for 10 minutes. The failure of any of these tests shall require a repeat of the test sequence.

11.3 Reserve Capacity Test

11.3.1 The chassis engine shall be started and kept running until the chassis engine and engine compartment temperatures are stabilized at normal operating temperatures and the chassis battery system is fully charged. The chassis engine shall be shut off and the minimum continuous electrical load shall be applied for 10 minutes. All electrical loads shall be turned off prior to attempting to restart the chassis engine. The chassis battery system shall then be capable of restarting the chassis engine. The failure to restart the chassis engine shall be considered a failure of this test.

11.4 Alternator Performance Test at Idle

11.4.1 The minimum continuous electrical load shall be applied with the chassis engine running at idle speed. The chassis engine temperature shall be stabilized at normal operating temperature. The chassis battery system shall be tested to detect the presence of a chassis battery current discharge. The detection of chassis battery current discharge shall be considered a failure of this test.

11.5 Alternator Performance Test at Full Load

11.5.1 The total continuous electrical load shall be applied with the chassis engine running up to the engine manufacturer’s governed speed. The test duration shall be a minimum of two hours. The activation of the electrical system load management system shall be permitted during this test. The activation of an alarm due to excessive chassis battery discharge, as detected by the system required by NFPA (current edition), or an electrical system voltage of less than 11.8 volts direct current for a 12-volt direct current nominal system, for more than 120 seconds, shall be considered a failure of this test.

11.6 Low Voltage Alarm Test

11.6.1 Following the completion of the tests described above, the chassis engine shall be turned off. With the chassis engine turned off, the total continuous electrical load shall be applied and shall continue to be applied until the excessive battery discharge alarm activates. The chassis battery voltage shall be measured at the battery terminals.

11.6.2 The test shall be considered to be a failure if the low voltage alarm has not yet sounded 140 seconds after the voltage drops to 11.70 volts direct current for a 12-volt direct current nominal system. The chassis battery system shall then be able to restart the chassis engine. The failure of the chassis battery system to restart the chassis engine shall be considered a failure of this test.

11.7 Documentation

11.7.1 The apparatus manufacturer shall provide the results of the low-voltage electrical system performance test, certified in writing, with the documentation provided to the purchaser at the time of delivery of the completed apparatus.

11.7.2 The test results shall consist of the following documents:

- Documentation of the electrical system performance tests.
- A written electrical load analysis, including the following:
- The nameplate rating of the alternator.
- The alternator rating under the conditions specified in NFPA 1900
- Each of the component loads specified that make up the minimum continuous electrical load.
- Additional electrical loads that, when added to the minimum continuous electrical load, determine the total continuous electrical load.
- Each individual intermittent electrical load.

12 — Apparatus Finish

12.1 Body Finish Procedure

12.1.1 All exposed steel surfaces shall be thoroughly cleaned and prepared for finish painting.

12.1.2 All removable items, such as brackets and compartment doors, shall be removed and painted separately to ensure finish paint behind them after they are reinstalled.

12.1.3 All roll up compartment doors shall be left unpainted, in a natural aluminum finish.

12.1.4 The apparatus body shall be masked as needed to prevent the painting of unwanted areas and overspray damage. Due to its modular design, the apparatus body shall be completely finish painted prior to its installation on the chassis.

12.1.5 All exterior surface scratches and blemishes shall be filled with body putty and sanded down, along with all primed surfaces.

12.1.6 The complete apparatus body shall be cleaned, blown free of dust; washed with thinner; and wiped with tack cloths. A non-sanding primer shall be applied and when dry, the apparatus body shall be sprayed with three coats of finish paint. All loose body components shall be treated in the same manner.

12.1.7 Any irregularity in any painted surface shall be repaired prior to the application of the finish paint coats.

12.1.8 The compartment interiors are to be sealed for leaks and the inside surface areas cleaned and prepped, then finish painted with Zolatone™ #20-11 (Apollo Gray).

12.2 Apparatus Body Color

12.2.1 The apparatus body shall be painted to match the color of the chassis cab exterior. The chassis cab shall not be repainted. The color of the chassis cab exterior and body shall be No. 14260 of Federal Standard No. 595 (Forest Service Green).

12.3 Chassis Finish

12.3.1 The chassis cab exterior paint finish shall be supplied by the chassis manufacturer.

12.4 Vehicle Marking

12.4.1 A 4-inch wide white reflective stripe shall be provided and installed horizontally on the chassis cab, water tank and body. The stripe shall be placed as high as possible on the vertical surfaces on the sides of the chassis tilt hood and shall run the full length of the apparatus; continuing around the rear of the apparatus body, ending at either side of the roll up door. A break shall be provided in the striping on either side of the water tank, approximately over rear wheel centerline. The ends of the horizontal stripe shall be sloped at approximately 45 degrees on either side of the break.

12.4.2 Block style lettering, fabricated from reflective material, shall be provided and installed on the apparatus as follows:

12.4.3 The word “FIRE,” in 4-inch tall white letters, shall be centered in the break in the horizontal 4-inch stripe on each side of the water tank, approximately over rear wheel centerline.

12.4.4 The unit designator and equipment designator (example: CA-BDF-WT256), in 8-inch tall white letters, shall be provided on each side of the apparatus body, on the lower sections of the compartment doors forward of the rear wheels.

12.4.5 The words “USDA,” “FOREST SERVICE” in 3-inch tall green letters, “FIRE” in 4-inch tall green letters; shall be provided at the rear of the apparatus body on the hose reel compartment roll up door. The lettering shall be arranged as follows:

12.4.6 The unit designator (example: CA-BDF), in 6-inch tall letters, shall be provided centered on the swept back portion of the front bumper on the passenger's side, and the equipment designator (example: WT256), in 6-inch tall letters, shall be provided centered on the swept back portion of the front bumper on the driver's side.

12.4.7 The unit designator and equipment designator (example: CA-BDF-WT256), in 6-inch tall letters, shall be provided on the rear bumper on the driver's side.

12.4.8 The Forest identifier of the unit designator (example: BDF), in tall black letters, shall be provided on the top/forward section of the water tank, aft of the lightbar, and the equipment designator (example: WT256), in tall black letters, shall be provided on the top/forward section of the water tank aft of the unit designator.

12.5 Door Decal (Shield and Vehicle Numbers)

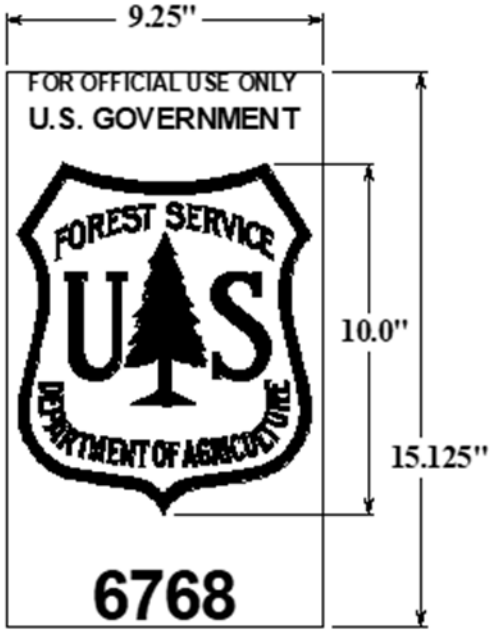
12.5.1 The apparatus manufacturer shall provide and install door decals (shield and vehicle numbers) on the front cab doors, below the reflective striping.

12.5.2 First line: FOR OFFICIAL USE ONLY. All letters must be Engineering Grade reflective (3M series 3279 or equivalent), ½ inch high, Highway Gothic Wide (52 pt.), capitalized, die cut, pre-spaced, and brown.

12.5.3 Second line: U.S. GOVERNMENT. All letters must be Engineering Grade reflective (3M series 3279 or equivalent), 5/8-inch-high, Highway Gothic Wide (64 pt.), capitalized, die cut, pre-spaced, and brown.

12.5.4 The shield decal must have a base layer of brown Engineer Grade reflective (3M series 3279 or equivalent) vinyl die-cut to the FS Shield shape with a second layer of white Engineer Grade reflective (3M series 680-10 or equivalent) vinyl die-cut at a reduced size to create the border of the shield with all the text and graphics die-cut and removed, and in approved Forest Service font.

12.5.5 Fourth line: Four Digit Equipment Number. All letters must be Engineering Grade reflective (3M series 3279 or equivalent), 1 ½ inch high, Highway Gothic Condensed (154 pt), capitalized, die cut, pre-spaced, and brown. Center the equipment number on the door approximately 1-¼ to 2 inches below the shield.



12.6 Truck Identification Plate

12.6.1 A durable truck identification plate, fabricated from corrosion resistant metal, shall be provided and installed on the pump operator's panel. The plate shall state the name and address of the apparatus manufacturer, the serial number of the unit and the pump performance test results.

13 — Equipment

13.1 NFPA and OSHA Compliance

13.1.1 The following equipment shall be provided with the completed apparatus. The equipment shall be new and unused, and shall meet all current NFPA, OSHA and other applicable safety regulations

13.2 Manuals and Drawings

13.2.1 The following specified materials shall be provided with the completed apparatus:

- One complete set of standard chassis operation, parts and service manuals.
- One apparatus manufacturer’s operation and service manual, to include:
- Manufacturer’s Record of Construction
- Warranty Registration and Information
- Operator Safety Information
- Pump Operation and Troubleshooting Instructions
- Foam System Operation Instructions
- Vehicle Exterior Maintenance Instructions

- Maintenance and Lubrication Information & Charts
- Complete Electrical Diagrams
- Component Literature (i.e.: siren, PTO, hose reel, etc.)
- Pump Test Certificate
- Weight Certificate
- Service Parts Replacement List

13.3 Road Kit

13.3.1 The completed apparatus shall be equipped with a road kit containing the following items:

- One 2½ pound Class B/C fire extinguisher with vehicle mounting bracket, shipped loose
- One set of warning triangle reflectors, containing three folding reflectors in a plastic storage case
- One 12-ton hydraulic jack with handle

13.4 Wheel Chocks

13.4.1 Two Worden™ brand, Model #HWC-7 wheel chocks shall be provided with the completed apparatus.

14 — Warranty Provisions

14.1 Fifteen Year Apparatus Warranty

14.1.1 All materials and workmanship herein specified, including all equipment furnished, shall be guaranteed for a period of fifteen years after the acceptance date of the apparatus, unless otherwise noted, with the exception of any normal maintenance services or adjustments which shall be required.

14.1.2 Under this warranty, the apparatus manufacturer shall be responsible for the costs of repairs to the apparatus that have been caused by defective workmanship or materials during this period.

14.1.3 This warranty shall not apply to the following:

14.1.3.1 Any component parts or trade accessories such as chassis, engines, tires, pumps, valves, signaling devices, batteries, electric lights, bulbs, alternators, and all other installed equipment and accessories, in as much as they are usually warranted separately by their respective manufacturers, or are subject to normal wear and tear.

14.1.3.2 Failures resulting from the apparatus being operated in a manner or for a purpose not recommended by the apparatus manufacturer.

14.1.3.3 Loss of time or use of the apparatus, inconvenience or other incidental expenses.

14.1.3.4 Any apparatus which has been repaired or altered outside of the apparatus manufacturer's factory in any way that affects its stability, or which has been subject to misuse, negligence, or accident.