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**Custom Sidemount Pumper**

**Panther Challenger WB**

**January 13, 2011**

**INTRODUCTION**

**PROPOSAL REQUIREMENTS**

**GENERAL INFORMATION**

 It is the intent of these specifications to secure apparatus constructed to withstand the severe and continuous use encountered during emergency fire fighting services. The apparatus must be of the latest type, carefully designed and constructed with due consideration to the nature and distribution of the load to be sustained.

 These specifications detail the requirements for general design criteria of cab and chassis components, aerial device, fire pump and related components, water tank, fire body, electrical components, painting, and equipment. In evaluating the bid proposals to determine which proposal is the most advantageous, these major items shall be considered.

 Apparatus and equipment must meet the specific requirements and intent of the requirements as specified herein. All items of these specifications shall conform to the character of the proposed apparatus and the purpose for which it is intended. Criteria as specified by the National Fire Protection Association Pamphlet No. 1901, latest edition, entitled "Suggested Specifications for Motor Fire Apparatus", as approved by the American Insurance Association and International Association of Fire Chiefs, are hereby adopted and made a part of these specifications the same as if they were written out in full, insofar as they apply and are not specifically modified in the following detailed specifications. Each bidder shall provide only that equipment as required in the following specifications.

 The fire apparatus and equipment to be furnished in meeting these specifications must be the products of an established, reputable fire apparatus and/or equipment manufacturer. Each bidder shall furnish satisfactory evidence of the manufacturer's ability to construct, supply service parts and technical assistance for the apparatus specified. Each bidder must state the location of the factory and location for post delivery service.

**FIRE APPARATUS DOCUMENTATION**

 The contractor shall supply, at the time of delivery, at least one (1) copy of the following documents:

 The manufacturer's record of apparatus construction details, including the following information:

* Owners name and address
* Apparatus manufacturer, model and serial number
* Chassis make, model and serial number
* Front tire size and total rated capacity in pounds
* Rear tire size and total rated capacity in pounds
* Chassis weight distribution in pounds with water and manufacturer mounted equipment, front and rear
* Engine make, model, serial number, rated horsepower, rated speed and governed speed
* Type of fuels and fuel tank capacity
* Electrical system voltage and alternator output in amps.
* Battery make, model and total capacity in cold crank amps (CCA)
* Transmission make, model and serial number. If so equipped chassis transmission PTO(s) make, model and gear ratio
* Pump make, model, rated capacity in gallons per minute (liters per minute where applicable) and serial number
* Pump transmission make, model, serial number and gear ratio
* Auxiliary pump make, model, rated capacity in gallons per minute (liters per minute where applicable) and serial number
* Water tank certified capacity in gallons or liters
* Paint manufacturer and paint number(s)
* Company name and signature of responsible company representative
* Certification of slip resistance of all stepping, standing and walking surfaces.

 If the apparatus has a fire pump or an industrial supply pump, the pump manufacturer's certification of suction capability.

 If the apparatus has a fire pump or an industrial supply pump, a copy of the apparatus manufacturer's approval for stationary pumping applications.

 If the apparatus has a fire pump or an industrial supply pump, the engine manufacturers certified brake horsepower curve for the engine furnished, showing the maximum governed speed.

 If the apparatus has a fire pump or an industrial supply pump, the pump manufacturers certification of hydrostatic test.

 If the apparatus has a fire pump or an industrial supply pump, the Underwriters Laboratory certification of inspection and test for the fire pump.

 If the apparatus has an aerial device the Underwriters Laboratory certification of inspection and test for the aerial device.

 If the apparatus has an aerial device, all the technical information required for inspections to comply with NFPA 1911, Standards for Testing Fire Department Aerial Devices.

 If the apparatus has a fixed line voltage power source, the certification of the test for the fixed power source.

 If the apparatus is equipped with an air system, test results of the air quality, the SCBA fill station, and the air system installation.

 Weight documents from certified scale - showing actual loading on the front axle, rear axle(s) and overall vehicle (with the water tank full but without personnel, equipment and hose) shall be supplied with the complete vehicle to determine compliance with NFPA-1901.

 Written load analysis and results of electrical performance tests.

 If the apparatus is equipped with a water tank, the certification of water tank capacity.

 The chassis shall be certified by the apparatus manufacturer as conforming to all applicable Federal Motor Vehicle Safety Standards in effect at the date of contract. This shall be attested to by the attachment of a FMVSS certification label on the vehicle by the contractor who shall be recognized as the responsible final manufacturer.

**PRODUCT LIABILITY INSURANCE**

 Each bidder shall supply proof of product liability and facility insurance equal to or exceeding $30,000,000.00. This shall be provided as part of the proposal. NO EXCEPTIONS

**SINGLE-LINE RESPONSIBILITY**

 Since the desires to eliminate divided responsibility on the part of the manufacturers, only manufacturers who build their own fire apparatus cab, chassis, body and aerial device shall be considered. The apparatus must be built and painted in a facility owned and operated by the bidder by a staff that is directly employed by the bidder. At least fifteen similar units must have been sold and delivered of the type described herein. The entire apparatus (to include cab, chassis, body, pump, water tank and aerial device) MUST be manufactured in the United States! NO EXCEPTION SHALL BE ALLOWED TO THIS REQUIREMENT!

**PROPRIETARY PARTS**

 It is the intention of the Purchaser for all bidder's to furnish the apparatus with major parts commonly used by the heavy-duty truck manufacturers and open market vendors where as replacement parts are more readily available and at reduced cost. The use of proprietary parts such as but not limited to axles, suspensions, engines, transmissions, frontal air bags, electronic controls, multiplexing systems, seats, pumps, gauges, foam systems, etc., may not be acceptable by the purchaser.

**APPROVAL DRAWING**

 A detailed drawing of the apparatus shall be provided to the purchaser for approval before construction begins. A copy of this drawing shall also be provided to the manufacturer's representative. Upon purchaser's approval, the finalized drawing shall become a part of the total contract.

 The drawing shall show, but is not limited to, such items as the chassis make and model, major components, location of lights, sirens, all compartment locations and dimensions, special suctions, discharges, etc. The drawing shall be a visual interpretation of the apparatus as it is to be supplied.

**INSTRUCTION MANUALS/DRAWINGS, SCHEMATIC**

 In accordance with standard commercial practices, applicable to each vehicle (including body and special equipment) furnished under the contract, the following listed manuals and schematics, in the quantity specified, shall be provided at time of delivery of each vehicle.

 The contractor shall supply at time of delivery, two (2) copies of a complete operation and service manual covering the complete apparatus as delivered and accepted.

 The manual shall contain the following:

* Descriptions, specifications, and ratings of chassis, pump (if applicable), and aerial device (if applicable).
* Wiring diagrams
* Lubrication charts
* Operating instructions for the chassis, any major components such as a pump and any auxiliary systems.
* Instructions regarding the frequency and procedures recommended for maintenance.Parts replacement information.

**VEHICLE FLUIDS PLATE**

 As required by NFPA-1901, the contractor shall affix a permanent plate in the driver's compartment specifying the quantity and type of the following fluids used in the vehicle:

 A permanent plate in the driving compartment shall specify the quantity and type of the following fluids used in the vehicle:

* Engine oil
* Engine coolant
* Chassis transmission fluid
* Pump transmission lubrication fluid
* Pump primer fluid
* Drive axle(s) lubrication fluid
* Air-conditioning refrigerant
* Air-conditioning lubrication oil
* Power steering fluid
* Cab tilt mechanism
* Transfer case fluid
* Equipment rack fluid
* Air compressor system lubricant
* Generator system lubricant
* Aerial systems

**PRINCIPLE APPARATUS DIMENSIONS & G.V.W.R.**

 The bidder shall include the principle dimensions, front G.A.W.R., rear G.A.W.R., and total G.V.W.R. of the proposed apparatus. Additionally, the bidder shall provide a weight distribution of the fully loaded, completed vehicle; this shall include a filled water tank, specified hose load, miscellaneous equipment allowance in accordance with NFPA-1901 requirements, and an equivalent personnel load of 250 lbs. per seating position.

**BIDDER TO SUPPLY AND FILL- IN PROPOSED DIMENSIONS:**

* OVERALL LENGTH: 367 " [30’-7”]
* OVERALL WIDTH: 100 "
* OVERALL HEIGHT: 113 "
* WHEELBASE: 180 "

 The axle and total weight ratings of the completed apparatus shall not be less than the following minimum acceptable weight ratings:

* MINIMUM FRONT G.A.W.R.: 18,000 lbs.
* MINIMUM REAR G.A.W.R.: 24,000 lbs.
* MINIMUM TOTAL G.V.W.R.: 42,000 lbs.

**PRIMARY PLANT CONSTRUCTION**

 In order to insure top quality construction, maximum assembly line and engineering communication and the highest level of manufacturing supervision the entire apparatus shall be built at the bidders primary (headquarters) manufacturing facility. Apparatus constructed at satellite plants will not be considered.

**U.S.A. MANUFACTURER**

The entire apparatus shall be assembled within the borders of the Continental United States to insure more readily available parts (without added costs and delays caused by tariffs and customs) and service.

**COOPERATIVE PURCHASING**

 The Manufacturer shall be pleased to allow other public agencies to use the purchase agreement resulting from this invitation to bid unless the bidder expressly notes on the proposal form that prices are not available for tag-on. The condition of such use by other agencies shall be that any such agency must make and pursue contact, purchase order/contract, and all contractual remedies with the successful bidder. Such tag-ons shall be done so that the original purchasing agency has no responsibility for performance by either the manufacturer or the agency using the contract.

**UNDERWRITERS LABORATORIES INC. (UL) EXAMINATION AND TEST PROPOSAL**

 If required by the specific chapters of NFPA-1901, the proposed unit shall be tested and certified by Underwriters Laboratories Inc. (UL) Underwriters Laboratories Inc. (UL) is recognized worldwide as a leading third party product safety certification organization for over 100 years. UL has served on National Fire Protection Association (NFPA) technical committees for over thirty years.

**INDEPENDENT TESTING ORGANIZATION QUALIFICATIONS**

* UL is a nationally recognized testing laboratory recognized by OSHA.
* UL complies with the American Society for Testing and Materials (ASTM) Standard ASTM E543 "Determining the Qualifications for Nondestructive Testing Agencies."
* UL has more than 40 years of automotive fire apparatus safety testing experience and 16 years of factory aerial device testing and Certification experience. UL has more than 100 years of experience developing and implementing product safety standards.
* UL does not represent, is not associated with, nor is in the manufacture or repair of automotive fire apparatus.
* All test work for fire pumps outlined in NFPA 1901, Edition shall be conducted.
* UL has included a list of all factory aerial device manufacturers for whom testing is currently being conducted on a regular basis.
* UL carries ten million dollars in excess liability insurance for bodily injury and properly
damage combined.

 UL provides the manufacturer a complete written examination and test report for each inspection performed at the manufacturer's facility. This report specifies the points of inspection and results of such examinations and tests.

**PERSONNEL**

 The UL inspectors performing the test work on the units are certified to Level II in the required NDT methods, under the requirements outlined in ASNT document CP-189.

 The actual person(s) performing the inspection shall present for review proof of Level II Certification in the required NDT methods.

 Prior to submittal to the automotive fire apparatus manufacturer, the final Report shall be reviewed by the Supervisor of Fire Equipment Services and a Registered Professional Engineer, both of whom are directly involved with the aerial device certification program at UL.

**GENERAL APPARATUS DESCRIPTION "PUMPER"**

 The unit shall be designed to conform fully to the "Pumper Fire Apparatus" requirements as stated in the NFPA 1901 Standard (2009 Revision), which shall include the following required chapters as stated in this revision:

* Chapter 1 Administration
* Chapter 2 Referenced Publications
* Chapter 3 Definitions
* Chapter 4 General Requirements
* Chapter 5 Pumper Fire Apparatus
* Chapter 12 Chassis and Vehicle Components
* Chapter 13 Low Voltage Electrical Systems and Warning Devices
* Chapter 14 Driving and Crew Areas
* Chapter 15 Body, Compartments and Equipment Mounting
* Chapter 16 Fire Pumps and Associated Equipment
* Chapter 18 Water Tanks
* Chapter 20 Foam Proportioning Systems

**CAB SAFETY SIGNS**

The following safety signs shall be provided in the cab:

* A label displaying the maximum number of personnel the vehicle is designed to carry shall be visible to the driver.
* “Occupants must be seated and belted when apparatus is in motion” signs shall be visible from each seat.
* “Do Not Move Apparatus When Light Is On” sign adjacent to the warning light indicating a hazard if the apparatus is moved (as described in subsequent section).
* A label displaying the height, length, and GVWR of the vehicle shall be visible to driver.
* This label shall indicate that the fire department must revise the dimension if vehicle height changes while vehicle is in service.

**CHASSIS DATA LABELS**

The following information shall be on labels affixed to the vehicle:

Fluid Data

* Engine Oil
* Engine Coolant
* Chassis Transmission Fluid
* Pump Transmission Lubrication Fluid
* Pump Primer Fluid (if applicable)
* Drive Axle(s) Lubrication Fluid
* Air Conditioning Refrigerant
* Air Conditioning Lubrication Oil
* Power Steering Fluid
* Cab Tilt Mechanism Fluid
* Transfer Case Fluid (if applicable)
* Equipment Rack Fluid (if applicable)
* Air Compressor System Lubricant
* Generator System Lubricant (if applicable)
* Front Tire Cold Pressure
* Rear Tire Cold Pressure
* Aerial Hydraulic Fluid (if applicable)
* Maximum Tire Speed Rating

Chassis Data

* Chassis Manufacturer
* Production Number
* Year Built
* Month Manufactured
* Vehicle Identification Number

Manufacturers weight certification:

* Gross Vehicle (or Combination) Weight Rating (GVWR or GCWR)
* Gross Axle Weight Rating, Front
* Gross Axle Weight Rating, Rear

**ROLLOVER STABILITY**

 The apparatus shall meet the criteria defined in 4.13.1 for rollover stability as defined in the 2009 NFPA Standard for Automotive Fire Apparatus.

**\*\*\*\* CAB AND CHASSIS \*\*\*\***

**"PREDATOR PANTHER" CAB TYPE**

* **FULL TILT**
* **CONTOUR WINDSHIELD**

 The cab shall be a custom tilt style, built specifically for fire service. The cab shall be a cab over engine design, with integral tilt mechanism and engine access from inside the cab.

 Cab shall be designed, fabricated, assembled in its entirety, and installed on the frame rails in the factory of the bidder. This requirement shall eliminate any split responsibility in warranty and service. NO EXCEPTIONS TO THIS REQUIREMENT.

**OPEN SPACE DESIGN**

 The cab interior shall be the "Open-Space" design with no wall or window between the front and rear crew area to allow direct communication, better visibility and air circulation in the cab.

**CAB MATERIAL**

 The cab shall be fabricated from 5052-H 32 aluminum alloy, utilizing the minimum material thickness as follows:

* Cab side panels 0.125 thick (1/8")
* Cab roof 0.125 thick (1/8")
* Forward cab front sheet 0.125 thick (1/8")
* Interior cab panels 0.125 thick (1/8")
* Other panels 0.125 thick (1/8")
* Cab doors 0.1875 thick (3/16")
* Engine enclosure side panels 0.250 thick (1/4")

**CAB - BASE CONSTRUCTION**

 Cab sub-frame shall be a welded assembly fabricated of 6063 structural aluminum alloy. This frame shall extend the full length and width of the cab and be secured to the chassis frame through two (2) rear urethane self centering load cushions, two (2) forward pivot brackets, and two (2) cab locks. The cab shall be of entirely welded construction.

 The front cab wall shall be of double wall type construction, featuring an inner and outer panel. (No Exceptions)

**CRASH TESTING CERTIFICATION**

 To ensure the safety of the cab occupants and cab integrity, proof of third party testing shall be provided. The cab shall be certified for SAEJ2422 side impact, SAEJ2420 with ECER29 cab front impact, and ECER29 cab roof strength. NO EXCEPTIONS

**DIMENSIONS - MEDIUM FOUR DOOR STYLE CAB**

Minimum Cab Dimensions:

* Overall width 96"
* Inside width across ceiling 88"
* Front area floor to ceiling 63"
* Top of front seat to ceiling 44" (depending upon seat type)
* Seat back to steering wheel 22" (depending upon seat type)
* Inside width (door to engine enclosure) 25" (driver's side, at floor)
* Inside width (door to engine enclosure) 22-1/2" (officer's side, at floor)
* Crew seat area width 88"
* Outer crew seat risers to rear wall 35-1/2"
* Centerline axle to rear wall 53-1/2"
* Rear of engine enclosure to rear cab wall 42.5"
* Centerline axle to front of cab 74"
* Floor to top of engine enclosure 31-1/2"

Glass Area Dimensions:

* Windshield (Contour) 2,900 sq. in.
* Front door window, retractable 743 sq. in. each
* Rear door window, retractable 875 sq. in. each
* Fixed side windows 620 sq. in. each

Cab Entry Door Dimensions

* Forward door opening 73" high x 37" wide
* Forward door recessed step 30" wide by 8-1/2" deep
* Rear door opening 85-3/4" high x 31" wide
* Rear door recessed step 20" wide x 8-1/2" deep

**CAB ROOF**

 The roof shall be of a split level design with radius edges for an aesthetic, streamline appearance. The roof shall be constructed of aluminum skin and shall be internally reinforced using extruded aluminum framing which shall span the entire width and length of the cab for maximum structural integrity. This shall allow the roof to support personnel and roof mounted equipment without the need for additional reinforcement.

 The cab roof over the rear crew area shall be raised twelve (12) inches higher than the front driver and officer area. The front face of the raised roof section shall be sloped at a 45 degree angle, creating a streamlined interface with the standard, lower, forward roof section. This design shall allow for additional interior height in the rear crew area.

 The rear crew area doors shall be "Vista-Style", extending full height to the radius edge of the raised roof.

Approximate dimensions:

* Crew area floor to ceiling 65-1/2"
* Top of crew seat to ceiling 47" (depending upon seat type)

**CAB ROOF DRIP RAIL**

 For enhanced protection from inclement weather, a drip rail shall be furnished on the sides of the cab. The drip rail shall be constructed of bright polished extruded aluminum, and be fastened to the sides of the cab rood edge. The drip rail shall extend the full length of the cab roof.

**CAB DOORS**

 Four (4) side-opening doors shall be provided. The cab doors shall be totally aluminum construction with an extruded aluminum frame and a 3/16" thick aluminum outer door skin. Doors shall be full height from the step to the cab roof rain gutter and enclose the step area when the doors are closed.

 The forward cab door opening shall be a minimum of 37" wide, and the rear cab door opening shall be a minimum of 31" wide. The rearward cab doors shall have a radius cutout allowing the door opening to protrude forward over the cab wheel well, while providing full access to the rear crew area.

 There shall be a heavy duty piano type stainless steel hinge on each door with a minimum pin diameter of 5/16". Hinges shall be slotted for ease of horizontal and vertical adjustment. There shall be a cab door seal and the doors shall close flush with the side of the cab, any overlap closure shall not be acceptable. A heavy-duty 6" wide belting material shall be utilized to prevent the cab doors from opening greater than 90 degrees.

**CAST OPEN GRATE STEPS**

 The front entrance steps shall be a minimum of 29" wide x 8-1/2" deep. Each step shall be a cast aluminum, open grate style step fabricated by Cast Products Inc. with a polished aluminum outer surface.

 The rear entrance steps shall be a minimum of 22 3/4" wide x 9" deep. Each step shall be a cast aluminum, open grate style step fabricated by Cast Products Inc. with a polished aluminum outer surface.

 Each step shall be fabricated as an integral part of the cab construction. The cab step risers shall be smooth material, painted to match the cab exterior color.

**DOOR LATCHES**

 Heavy-duty, bright finish cast paddle latches shall be provided on the interior and exterior of each cab door. Door latch mechanisms which utilize spring steel clamps shall not be considered due to their tendency to both rust and break. The interior door latch cables are to be designed to reduce adjustment or possible wear at the adjustment turnbuckles.

 Each exterior cab door shall be equipped with keyed locks. The cab doors shall be capable of being locked from the outside with a key and from the inside with a control in each door.

**DOOR WINDOWS**

 Each side cab door shall have a tinted retractable window operated by a hand crank mechanism. The window track shall be designed into the door frame extrusion, which shall be extruded with a track groove to house a window track and seal. The window shall be capable of being removed from an access slot designed in the bottom of the door frame.

 Each side cab door window shall be designed with a custom extruded trim plate, which shall conform to the perimeter of the window opening in each door. The trim plate shall extend from the edge of the door skin to the window and shall have a silver anodized finish.

**INNER DOOR PANELS**

 The cab door interior panels shall be covered with a one piece, full height, brushed aluminum panel for ease of maintenance. The panel shall be 1/8" aluminum with a brushed finish and shall be designed to allow easy access to the inner door.

**DOOR WARNING - CHEVRON**

 Four (4) Chevron reflective signs shall be installed on the lowest portion of the inner door panels, one (1) on each door. These chevrons shall cover at least 96 in².

**EXTERIOR CAB WALL OVERLAY**

 A bright finish aluminum tread plate overlay shall be provided on the exterior rear cab wall. The tread plate overlay shall be sealed with caulking around the edges to prevent moisture from getting between the cab and the overlay.

**WINDSHIELD/GLASS**

 A one piece, symmetrical, safety glass windshield shall be provided on the cab for the driver and officer providing a clear viewing area. The windshields shall be full width to the center of the front cab support for each side and provide the occupants with a panoramic view. To provide enhanced peripheral vision on each side of the cab, the windshield and cab structure shall be designed with radius corners, which provide a minimum of 8" of glass area, measured from the glass face to the side edge near the door post. The windshield shall consist of three (3) layers; the outer light, the middle safety laminate and the inner light. The thick outer light layer shall provide superior chip resistance, the middle safety laminate layer shall prevent the windshield glass pieces from detaching in the event of breakage and the inner light shall provide yet another chip resistant layer.

 The windshield will be a contour design with 2900 sq. in. of area for improved visibility and style. The windshield glass shall be designed so it can be used on either the driver or officer side. Windshields that utilize epoxy or that are bonded to the cab structure will not be acceptable.

**WINDSHIELD WIPERS AND WASHER**

 Dual, electric operated, pantographic type windshield wipers shall be provided. One (1 ) electric drive motor shall be provided for each wiper. Windshield wiper systems which utilize a single motor and a reciprocating actuator arm shall not be considered.

 Wipers shall have "HI/LO" and "INTERMITTENT" operating speeds. "HI/LO" speeds shall be controlled by a dash mounted rocker switch. "INTERMITTENT" operation shall be controlled by a dash mounted "paddle/lever" switch. The wipers shall be of the self-parking type.

 Windshield washers shall be electric operated wet-arm type with a 3/4 gallon washer fluid reservoir, mounted inside the engine enclosure and readily accessible through the engine hatch at the rear of the engine enclosure. The washer control shall be integral with the intermittent wiper control switch.

 There shall be individual removable panels on the front face of the cab for access to the wiper motor assemblies.

**CAB SIDE VIEWING WINDOWS**

 A fixed, tinted window with 620 sq. in of glass area shall be provided on each side of the cab behind the forward cab doors. This window shall be the same height as the window in the rear cab door for maximum visibility.

**DARK TINTED REAR WINDOW GLASS**

 The windshield and the forward cab door glass shall be provided with standard DOT green automotive tint. The side cab windows to the rear of the front doors, the rear cab door windows and any rear viewing windows shall be equipped with a dark automotive tint. The use of stick on material shall not be acceptable.

**GRAB HANDLES**

 Four (4) 1-1/4" diameter x 28" long, knurled, bright anodized aluminum handrails shall be provided, one (1) at each cab door entrance. Grab rail stanchions shall be chrome plated and offset when necessary to prevent "hand-pinching" when opening or closing the doors. Formed rubber gaskets shall be provided between each stanchion base and the cab surface.

**INTERIOR GRAB RAILS**

 Each front cab door shall be provided with one (1) horizontally mounted, 11" long, black cast "D" style aluminum handle in the upper center rear portion of the door panel for use in closing the door.

 Each rear cab door shall be provided with one (1) horizontally mounted, 11" long, black cast "D" style aluminum handle in the upper center rear portion of the door panel for use in closing the door.

 Four (4) vertically mounted, 12” black cast aluminum “D” style entry assist handles shall be furnished to assist in entry and exiting of the cab. These rails shall be mounted one (1) each side of cab interior on the “A” post and one (1) each side of the cab interior on the “C” post in the crew area.

**AIR INTAKE/OUTLET**

 There shall be a front air intake with a minimum size of 945 square inches of open area for maximum air flow to the charge air cooler and the radiator. A custom made 37-1/2" wide x 30" high bright finish stainless steel grille with 414 openings, 1-1/2" square, shall be installed over this intake.

 A single air cleaner inlet with 43.5 square inches of area shall be located at the driver's side of the cab horizontally above wheel well. This design shall permit proper ducting of air through the air cleaner system. This inlet shall be equipped with an ember separator for separating water and burning embers from the air intake system. This system shall be such that particles larger than .039 inches (1 mm) in diameter can not reach the air filter element.

 These air intakes shall be covered with perforated bright finish stainless steel grilles, secured with stainless steel fasteners.

**WHEEL WELL LINERS**

 The front cab wheel wells shall be equipped with fully removable, bolt-in, aluminum inner wheel well liners. The liners shall extend full depth into the truck frame. The completely washable wheel well liners shall be designed to protect the cab substructure, inner panels, and other miscellaneous installed components from road salts, debris, dirt accumulation and corrosion. Fender liners which are fixed partially removable or one piece liner/fenderette shall not be considered.

**FENDERETTES**

 The cab wheel well openings shall be trimmed with replaceable, bolt-in, polished aluminum fenderettes. The fenderettes shall be secured to the cab with stainless steel threaded fasteners along the internal perimeter of the wheel well. Rubber welting shall be installed between the fenderettes and the cab side panel.

**MUD FLAPS**

 Heavy duty, black rubber type mud flaps shall be provided behind the front wheels.

**CAB MIRRORS**

 Each forward cab door shall have a 16" x 8", motorized, stainless steel, West Coast type mirror mounted on a swing-away, bow type, stainless steel bracket. Each mirror shall be individually remote controlled from the driver's position. Two (2) 6" diameter, stainless steel, convex spot mirrors shall also be provided, one (1) on each main mirror bracket.

**EXTENDING CONVEX MIRROR**

 One (1) Velvac, 6" (minimum) convex mirror extending mirror shall be provided and installed right hand side of cab extending forward off of cab roof. Support brackets shall be made of stainless steel material.

**INTERIOR TRIM**

 The dash, and headliners shall be upholstered with gray Durawear material. The cab interior shall be constructed to create an ergonomically designed interior to be user friendly and functional for the driver and officer. The cab dash shall be a custom formed aluminum module.

 The forward overhead panel shall be a fabricated aluminum module painted to match the interior. This module shall contain the integrated windshield defroster/heater.

 All of the interior upholstery panels shall be gray in color. The upholstered cab overhead and side wall portions shall utilize gray Durawear upholstery with padding underneath to provide additional insulation.

 The interior metal surfaces of the cab shall be finish painted the same color as the main exterior color.

**INTERIOR REAR WALL**

 The interior rear wall of the cab shall be covered with gray Durawear for durability and shall match the other upholstered areas of the cab.

**BARYFOL FLOORING**

 The floor of the driver’s compartment and the floor of the crew area shall be lined with BARYFOL vinyl composite flooring to comply with NFPA noise and heat requirements.

 The material utilized for this application shall be certified to meet the NFPA 1901, 2009 revision for anti slip walking surfaces.

**ENGINE ENCLOSURE**

 The forward portion of the engine enclosure shall be covered with upholstered material. To allow maximum "elbow room" for the driver and officer, the forward portion of the engine enclosure shall feature a contour shape. The engine enclosure shall not significantly obstruct the driver's vision in any direction. The enclosure shall be an integral part of the cab structure, which shall be constructed from .250 5052-H32 aluminum, providing adequate strength to support radio, map boxes, etc. The engine enclosure shall be insulated to protect from heat and sound. The noise insulation shall keep the DBA level within the limits stated in the current NFPA series 1900 pamphlet.

 A hinged access door shall be provided in the top rearward portion of the engine enclosure. The door shall allow access to the engine oil, transmission fluid, power steering fluid level dipsticks and the windshield washer fluid reservoir. The access door shall be provided with two (2) latches and one (1) gas shock holder.

**SUN VISORS**

 To provide maximum protection for the driver and officer, two (2) dark smoked Lexan sun visors shall be recess mounted in the cab overhead on each side.

**\*\*\*\*\* CAB SEATING & ACCESSORIES \*\*\*\*\***

**DRIVER'S SEAT**

The driver's seat shall be a H. O. Bostrom Sierra EX 8, high back bucket ABTS seat. The seat shall have a tapered and padded seat cushion with lumbar support. The seat shall have an eight inch fore and aft adjustment, a 2 inch height adjustment, front of seat tilt, rear of seat tilt and a reclining seat back. All seat movements shall be electrically controlled from a control panel on the forward lower edge of the seat.

 The seat shall be equipped with a red integrated 3-point shoulder harness with lap belt and an automatic retractor built into the seat assembly.

**OFFICER'S SEAT**

 The officer's seat shall be a H. O. Bostrom Tanker 450 series fixed base high back bucket seat. The seat shall have a tapered padded seat cushion and a reclining seat back with lumbar support. The seat shallinclude a SCBA storage area with integral headrest.

 A red 3-point shoulder harness with lap belt shall be provided as standard equipment.

 The officer's seat shall include a H. O. BOSTROM Secure All™ SCBA Locking System. The bracket system shall be free of straps and clamps that may interfere with auxiliary equipment on SCBA units. The center guide fork shall keep the tank in-place for a safe and comfortable fit in seat cavity. Fire fighters shall simply push the SCBA unit against the pivot arm to engage the patented auto-locking system. Once the lock is engaged, the top clamp shall surround the top of the SCBA tank for a secure fit in all directions.

 The standard release handle shall be integrated into the seat cushion for quick and easy release and shall eliminate the need for straps or pull cords to interfere with other SCBA equipment.

**CREW AREA SEATING**

**DRIVER'S SIDE REAR FACING CREW SEAT**

The driver's side outboard rear facing crew seat shall be a H. O. Bostrom Tanker 450 ABTS series fixed base high back bucket seat. The seat shall have a tapered and padded seat cushion with lumbar support. The seat shall include a SCBA storage area with integral headrest.

 The seat shall be equipped with a red integrated 3-point shoulder harness with lap belt and an automatic retractor built into the seat assembly.

 The driver's side rear facing outboard seat shall include a H. O. BOSTROM Secure All™ SCBA Locking System. The bracket system shall be free of straps and clamps that may interfere with auxiliary equipment on SCBA units. The center guide fork shall keep the tank in-place for a safe and comfortable fit in seat cavity. Fire fighters shall simply push the SCBA unit against the pivot arm to engage the patented auto-locking system. Once the lock is engaged, the top clamp shall surround the top of the SCBA tank for a secure fit in all directions.

 The standard release handle shall be integrated into the seat cushion for quick and easy release and shall eliminate the need for straps or pull cords to interfere with other SCBA equipment.

**OFFICER'S SIDE REAR FACING CREW SEAT**

The officer's side outboard rear facing crew seat shall be a H. O. Bostrom Tanker 450 ABTS series fixed base high back bucket seat. The seat shall have a tapered and padded seat cushion with lumbar support. The seat shall include a SCBA storage area with integral headrest.

 The seat shall be equipped with a red integrated 3-point shoulder harness with lap belt and an automatic retractor built into the seat assembly.

 The officer's side rear facing outboard seat shall include a H. O. BOSTROM Secure All™ SCBA Locking System. The bracket system shall be free of straps and clamps that may interfere with auxiliary equipment on SCBA units. The center guide fork shall keep the tank in-place for a safe and comfortable fit in seat cavity. Fire fighters shall simply push the SCBA unit against the pivot arm to engage the patented auto-locking system. Once the lock is engaged, the top clamp shall surround the top of the SCBA tank for a secure fit in all directions.

 The standard release handle shall be integrated into the seat cushion for quick and easy release and shall eliminate the need for straps or pull cords to interfere with other SCBA equipment.

**CENTER FORWARD FACING CREW SEATS**

Two (2) center inboard forward facing crew seats shall be provided, each seat shall be an H. O. Bostrom Tanker 450 ABTS series fixed high back bucket seat. Each seat shall have a tapered and padded seat cushion with lumbar support. Each seat shall include an SCBA storage area with integral headrest.

 Each seat shall be equipped with a red integrated 3-point shoulder harness with lap belt and an automatic retractor built into the seat assembly.

 The two (2) center inboard forward facing crew seats shall have a flip-up style seat bases.

 The center forward facing seats shall include a H. O. BOSTROM Secure All™ SCBA Locking System. The bracket system shall be free of straps and clamps that may interfere with auxiliary equipment on SCBA units. The center guide fork shall keep the tank in-place for a safe and comfortable fit in seat cavity. Fire fighters shall simply push the SCBA unit against the pivot arm to engage the patented auto-locking system. Once the lock is engaged, the top clamp shall surround the top of the SCBA tank for a secure fit in all directions.

 The standard release handle shall be integrated into the seat cushion for quick and easy release and shall eliminate the need for straps or pull cords to interfere with other SCBA equipment.

**SEAT UPHOLSTERY MATERIAL**

 The seats shall be upholstered with heavy duty gray tweed Durawear material as provided by Bostrom.

**SEAT BELT CUSHION SENSORS AND BELT SENSORS**

 The apparatus shall be equipped with a IMMI seat belt warning system. The system shall consist of a Seat Belt module, dash mounted display and an audible alarm.

 Seat belt and seat cushion sensors shall be provided on the six (6) specified seating positions.

**VEHICLE DATA RECORDER**

 An IMMI Vehicle Data Recorder (VDR) system shall be provided. The system shall include an NFPA compliant "Black Box" with reporting software that shall be capable of data storage to coincide with the NFPA requirements.

 Data storage capabilities shall include interfaces with the following systems:

* Display module (Master Optical Warning Device)
* Seat belt monitoring (seat occupied with seat belt)
* Surface or panel mount
* VDR, date & time stamp
* Max Vehicle speed (MPH)
* Vehicle acceleration / deceleration (MPH/Sec.)
* Engine Speed (RPM)
* ABS event
* Data password protected
* Data sampled once per second, in 48-hour loop
* Data sampled min by min for 100 engine hours
* Throttle position (% of Throttle)
* Data software
* Data interface for data download
* PC / Mac Compatible
* Hours Driven
* Data summary reports
* Last Minute Log
* Idle Time
* Track inputs from RollTek (If Equipped)

**CAB DOGHOUSE STORAGE MODULE**

 A storage module shall be installed on the center doghouse area between the driver and officer. The module shall be constructed of 1/8" aluminum and shall be painted with a scuff resistant paint to match the cab interior. The module shall include two (2) cup holders, a pen tray, a flat open storage area for notebooks, six (6) divided storage area's for 3-ring binders, and four (4) slide in storage area's two (2) accessible from each side of the cab.

**ANTENNA INSTALLATION**

 One (1) antenna mounting base(s) model #MATM with 17' of coaxial cable shall be provided and installed on the lower cab roof, behind the light bar. The attached antenna wire(s) shall be run to the right side cab dash area.

 The Fire Department is responsible to have the correct antenna whip installed once the apparatus is delivered.

**\*\*\*\*\* CAB INSTRUMENTATION & CONTROLS \*\*\*\*\***

**DASH & CENTER CONSOLE**

 The dash shall be a custom formed aluminum housing to create an ergonomically designed interior to be user friendly and functional for the driver and officer.

 The instrument cluster shall be centered in front of the driver and all gauges shall be custom fit in the fabricated dash with a non-glare pewter panel.

 All warning lights and indicators shall be located in the gauge itself or in the lower center portion. Each gauge shall be equipped with an international symbol that is easily recognizable, denoting the system being monitored. Instrumentation shall be backlit for easy identification when activated.

 The transmission gear selector shall be located on the left side of the center dash assembly, toward the driver for easy access.

 **DRIVER'S DASHBOARD PANEL**

 The main instrument panel shall be centered in front of the driver and shall be hinged at the bottom with two ¼ turn latches at the top. The driver's dash panel shall be 1/8” aluminum with an anti-glare, pewter brushed surface. This panel shall contain the gauge panel and the instrument warning cluster.

 The main instrument panel shall contain ten (10) primary gauges. An ignition and engine start switch shall be located on a panel to the right upper portion of the driver's side dash panel.

 Each gauge shall have a raised glass lens with a black matte finish trim ring and be backlit by integral white LED's. Each gauge shall also possess an integral red warning light with a pre-programmed warning light set point. Each gauge warning indicator shall be capable of activating an audible alarm inside the dashboard.

The ten (10) primary gauges shall consist of:

* Vehicle speedometer (0-80 mph)
* Engine tachometer (0-3000 rpm)
* Engine oil pressure (0-100 psi); low oil pressure warning
* Engine coolant temperature (100-250 °F); high engine temp warning
* Transmission oil temperature (100-350 °F); high transmission fluid temp warning
* Vehicle battery voltage (9-18 VDC); low voltage warning
* Front air system gauge (0-150 psi); low air pressure warning at 65 psi
* Rear air system gauge (0-150 psi); low air pressure warning at 65 psi
* Fuel level (E - 1/2 - F); low fuel level warning
* Air cleaner restriction gauge (0-40), warning at 25"

 Additional auxiliary control switches and instruments (if applicable) shall be located within the dash panel and overhead panel located near the driver's position.

**INDICATOR CLUSTER**

 The driver's dashboard panel shall contain an Ametek instrument warning light cluster and gauges.

 The display contains the system control unit that collects data from the vehicle data bus (J 1939), analog sensors, and switches throughout the vehicle. This data shall be presented using gauges, telltales and the display. The display shall include 18 telltales, 2 buttons to navigate through the screen menus and a 2 x 20 dot matrix display.

 The LCD module shall be a 2 line by 20-character display with each character being 7 by 5 dot matrix configuration. FSTN technology shall be used on the display for wide viewing capability. The module shall be backlit with amber LED's. The unit shall also be supplied with a heater to ensure proper operation over the entire 40 to +85 deg. C range.

 The display contains a series of screens to provide information about the vehicle and to control the display of that information. The screens are divided into menus that can be displayed while the vehicle is in motion and menus that can only be accessed when the park brake is set.

On the Road displays include:

* Two (2) user configurable displays that can display any of the parameters the display collects. This includes odometer, trip information, fuel economy information; all gauge data, and virtually any other data available on the vehicle that the display has access to either through the data bus or via analog inputs.
* Two (2) trip displays for miles and hours that are capable of being reset.
* Two (2) fuel data screens: one for fuel remaining until empty and one for fuel economy. The fuel economy display is capable of being reset so that average economy over an operator determined period can be displayed.

The additional displays that can be accessed when the park brake is set are as follows:

* Engine hours as maintained by the engine ECU.
* Service Alarm screens that report miles to next service or miles service is overdue. These screens also allow the operator to choose the length of the service alarm and to reset it.
* Message screens provide access to the warning messages the display has collected during the current ignition cycle. These screens are divided into the configured warnings like “Low Air Pressure” and the data bus faults reported by ECU's on the vehicle. Both lists allow the operator to review the last 12 events that occurred on the vehicle for maintenance and troubleshooting purposes.
* Diagnostic screens provide a means to test the instrumentation system to verify it is working correctly.
* Setup screens provide a way to set the units the message center shall display its data in English or metric. They also allow the operator to choose the data that shall be displayed in the configurable on-the-road screens.

 The system can be configured with user defined warning messages for significant events on the vehicle such as Low Air Pressure or High Coolant Temperature. When these events occur the warning message shall come up on the screen and can be accompanied by a buzzer. The messages can be prioritized so the most important messages are always displayed and whether the message can be dismissed by pressing a button is also configurable. Messages that have been dismissed but still active are kept in the message screens for review until ignition is turned off. Listed below are the defined telltales and their indicators.

* "Right And Left Directional" arrows (green in color)
* "Ignition ON" Indicator (amber in color)
* "Hi Beam" indicator (blue in color)
* "Battery ON" indicator (green in color)
* "Parking Brake ON" indicator (red in color)
* "Check Transmission" indicator (amber in color)
* "Cab Not Latched" indicator (red in color)
* "Stop Engine" indicator (red in color)
* "Check Engine" indicator (amber in color)
* "ABS Warning" indicator (red in color)
* "Low Coolant Level" (red in color)
* "Fuel Restriction" indicator (amber in color)
* "Water In Fuel" indicator (amber in color)
* "Fasten Seat Belts" indicator (red in color)
* "Fast Idle" Indicator (amber in color)
* "Do Not Move Truck" indicator (red in color)
* "DPF Regeneration" (amber in color)
* "Exhaust High Temperature" (amber in color)
* "Engine Diagnostic Fault" (amber in color)
* "Retarder On" (green in color)

**LOWER RIGHT AUXILIARY SWITCH PANEL**

 The driver’s lower right panel shall be capable of housing five (5) guarded type rocker switches. Examples of the switches that shall be installed in this area are automatic chains, fan clutch over-ride, ATC, inter-axle diff lock, electric fuel pump, all wheel drive, etc.

**PUMP SHIFT CONTROL**

 The pump shift control and pump engaged indicator light shall be mounted in the driver's lower left panel. This control shall be equipped with a mechanical type lock to prevent inadvertent activation or de-activation. The lever positions and indicator light shall be clearly marked.

**CAB HEATER/DEFROSTER**

 A SGM heater/defroster, rated at 32,900 BTU/HR shall be provided, with a minimum 500 CFM total air flow. The unit shall supply heat to the cab and provide windshield defrosting through adjustable louvers. The heater/defroster shall be mounted in the center overhead console area, near the windshield. Control shall be located on the front of the heater/defroster unit.

**PANTHER OVERHEAD AIR CONDITIONING SYSTEM**

 A climate-control system shall be provided for total cab environmental comfort. This system shall be able to provide heat and cooling capabilities to various areas in the cab. The system shall consist of one (1) evaporator unit mounted in the center overhead of the cab and a roof mounted condenser. This system shall provide conditioned air for the front and rear area of the cab.

The ceiling mounted evaporator/heater unit shall include the following:

* Dual high output blower.
* High efficiency coil that includes "rifled" tubing and oversized header tubes for maximum refrigerant distribution.
* Six (6) adjustable 3” diameter louvers shall be furnished; three (3) louvers located in the forward area of the cover and three (3) louvers located in the rear for the crew area.
* An electric water valve in the heat mode controls temperature.
* Unit housing is fully insulated.
* Heating BTU: 50,000
* Air Conditioning BTU" 34,000
* CFM: 410 @ 13.8 volts

 The roof mounted condenser shall be strategically positioned on the cab roof so as not to interfere with any emergency lighting systems and shall include the following:

* High performance, long life fan assemblies. Fan motors are sealed around housing and shaft areas.
* Condenser and coil design includes rifled tubing for maximum efficiency. Coil is painted black.
* Condenser unit includes receiver drier with hi/lo pressure switch.
* Wire harness includes necessary wiring for clutch circuit as well as a separate power relay circuit.
* 14-gauge mounting brackets
* 16-gauge condenser frame and fan shroud
* 16-gauge aluminum cover, E-coated white

 Mounting design shall enable easy servicing of all components and unit replacement if necessary. The evaporator unit shall be covered with an ergonomically designed painted aluminum cover to provide maximum headroom and a pleasing appearance

**AIR CONDITIONING CONTROLS**

 The air conditioning control shall be mounted on the overhead panel above the driver. These controls shall consist of an ON/OFF switch, temperature control switch, heat/cold control switch and three speed fan switch. All switches shall be mounted in a removable panel and shall be clearly labeled and adequately backlit.

**AIR CONDITIONING**

 A SMG air conditioning system?? shall be provided to cool the rear of the cab. The unit shall be located in the rear cab overhead, next to the rear wall, which shall contain vents for proper cool air circulation. The cooling output of the unit?? shall be 31,200 BTU/HR. Controls shall be provided on the unit for activation and fan speed.

 All cooling measurements?? shall be in accordance with IMACA 200 standards. The only refrigerant utilized?? shall be R134A in accordance with EPA regulations.

**CAB TILT ASSEMBLY**

 The cab tilt mechanism shall be custom designed for ease of maintenance and shall consist of two (2) hydraulic cylinders with a maximum lift capacity of 19,625 pounds. Hydraulic lines shall be rated at 20,000 PSI burst pressure. Each cylinder shall have an attached hydraulic locking mechanism, in the event of a hydraulic failure. Hydraulic cylinders shall be detachable to allow removal of the engine for major service. A mechanical cylinder stay bar and release shall be provided to insure a positive lock in the tilted position.

 The two (2) rear outboard cab latches shall be of the hydraulic pressure release, automatic re-latching type, and provide an automatic positive lock when the cab is lowered. The latch must not disengage or experience any damage when subjected to a pull apart tensile load of 6,000 lbs. The hydraulic pressure required to unlock the latch shall not exceed 550 PSI. The latch shall withstand 5,000 PSI without leaks or damage and withstand 1,000 continuous cycles of operation under a load of 1,000 lbs at liftoff. The tilt pump shall be electric over hydraulic type, with a pressure rating of not less than 4,000 PSI. Additionally, the cab tilt device shall be both electrically and hydraulically interlocked to prevent inadvertent activation of the cab tilt system.

* A "CAB NOT LATCHED"indicator shall be provided in the cab dash-warning cluster.
* A dual switch control system shall be provided for the cab tilt, located on the passenger side pump panel. System shall consist of a three (3) position toggle switch along with a rubber covered push button switch.

**AUXILIARY MANUAL CAB LIFT**

 An auxiliary manual cab lift back up system shall be furnished inside the passenger side of the pump enclosure for use in the event of total electrical shutdown.

 The cab tilt control shall be equipped with an interlock that shall disable the cab tilt system , in the event the parking brake is not applied.

**CHASSIS FRAME ASSEMBLY**

The chassis frame shall be fabricated in its entirety in the factory of the apparatus manufacturer. This shall prevent any split responsibility in warranty or service.

The frame shall consist of two (2) channels fastened together by cross members. All structural fasteners used in the frame shall be Grade 8 hardware. Hardened steel washers shall be used under all bolt heads and nuts to avoid stress concentrations. Top flange shall be free of bolt heads. All spring hangers shall be machined steel castings. Weldment type chassis and the use of Huck bolts shall not be acceptable.

 Each main frame rail shall be 10-1/4" x 4" x 3/8", fabricated from 110,000 PSI minimum yield steel, with a minimum section modulus of 17.97 in 4 and a resisting bending moment (RBM) of 1,976,700 inch pounds.

 Formed frame rails or a fish plated frame shall not be acceptable.

 The cross members, axles and steering gear(s), shall be finish painted before installation of any electrical wiring, fuel system components, or air system components. All components or brackets fastened to the frame rails shall be cleaned, primed and painted prior to being attached to the frame rails.

**\*\*\* FRONT BUMPER, EXTENSION & ACCESSORIES \*\*\***

**PAINTED STEEL FRONT BUMPER**

 A 12" high, 101" wide, painted steel front bumper shall be provided. The bumper shall be constructed from a minimum of .135 gauge steel, which shall be designed with 45-degree welded corners and a 2" flange on the top and bottom. The ends of the bumper shall be supported by horizontal channels, which shall extend from the frame rails to the sides of the bumper. The color of the bumper shall match the cab and body base color.

 The bumper shall be extended 20" with a polished aluminum tread plate gravel shield enclosing the top and ends.

**STORAGE WELL - CENTER**

 One (1) storage well constructed of 1/8" aluminum shall be installed in the gravel shield. This storage well shall be center mounted between the chassis frame rails. The bottom of the storage well shall have a minimum of four (4) drain holes.

 The center front bumper hose well shall be furnished with Velcro straps to secure the hose stored in the well. The straps shall be attached to each side of the hose well with stainless steel footman loops.

**TOW HOOKS**

 Two (2) front painted tow hooks shall be fastened directly to the frame, below the front bumper. The tow hooks shall be fastened with grade 8 bolts and nuts.

**FRONT AXLE**

 Front axle shall be a Meritor MFS-18-133 A-N, includes low friction "Easy Steer" bushing technology for maximum steering ease and longer life.

 The front axle shall be rated at 18,000 lbs. (Minimum)

**FRONT DISC BRAKES**

 Meritor EX-225 H, 17" disc brakes shall be provided for the front axle. The front brakes will be full air actuated with automatic slack adjustment.

**FRONT SUSPENSION**

 Front suspension shall be progressive rate front leaf springs. The spring shall be permanently pinned at the front and have a shackle double pinned mounting at the rear. Suspensions allowing the spring to float freely at the ends without a permanent pin shall not be acceptable.

 The front leaf springs shall have a minimum of 9 leaves, a minimum length of 51", and a minimum width of 3-1/2". The capacity at ground shall be 18,000 lbs. or exceed the capacity of the axle, unless specified to the contrary in this specification. All springs shall be of center bolt design. Cup center springs shall not be acceptable. All spring pins shall be positively restrained from rotating in brackets and shackles.

**FRONT SHOCK ABSORBERS**

 The front suspension system shall be equipped with Monroe, model "Magnum - 70", double acting hydraulic shock absorbers. Shock absorbers to have a minimum bore of 1.38" and an outside diameter of approximately 3-1/4".

**REAR AXLE**

 Rear axle shall be a single, Meritor RS-24-160 with a capacity of 24,000 lbs. (Minimum). Axle shall be a single reduction type and have a gear ratio as required. Oil seals shall be provided as standard equipment.

**REAR BRAKES**

 Brakes shall be "S" Cam, 16-1/2" x 7" size and shall be full air actuated with automatic slack adjusters.

**REAR AXLE TOP SPEED**

 The rear axle/s shall be geared for a vehicle top speed in accordance with NFPA sections 4.15.2 and 4.15.3.

 Units with GVWR over 26,000 pounds shall be limited to 68 mph. If the combined tank capacity is over 1250 gallons of foam and water or the GVWR is over 50,000 pounds, the vehicle top speed shall be limited to 60 mph or the fire service rating of the tires, whichever is lower.

**REAR SUSPENSION**

 Rear suspension shall be leaf type, positively pinned at front. Main pack shall be 59-1/4" long x 3" wide x 3/8" thick with 11 leaves and a rubber block helper mounted above the leaf springs, rated at 4,500 lbs. Two (2) fully wrapped leaves shall transmit driving and braking torque. Rating shall be designed to match or exceed the rear axle weight rating. Designs allowing main pack to float are not acceptable.

**REAR SHOCK ABSORBERS**

 The rear suspension system shall be equipped with Monroe, model "Magnum" model #74001, double acting hydraulic shock absorbers. Shock absorbers to have a minimum bore of 1.38" and an outside diameter of approximately 3-1/4".

**\*\*\*\*\* AIR & BRAKE SYSTEM \*\*\*\*\***

**BRAKE SYSTEM**

 A dual circuit, air operated braking system, meeting the design and performance requirements of FMVSS -121 and the operating test requirements of NFPA 1901 current edition shall be installed. It shall be direct air type with dual air treadle in the cab. The system shall be powered by an engine mounted, gear driven air compressor protected by a heated air dryer.

 The air system shall be plumbed with reinforced, air brake tubing/hose in conformance to SAE J 844-94, Type B and U.S.D.O.T. standards. The compressor discharge shall be plumbed with stainless steel braided hose lines with a Teflon lining. Eaton Synflex Eclipse Air Brake tubing shall be run along the inside frame rails and connected with Eaton Q-CAB 217 series fittings that meet or exceed all industry standards. All Synflex shall be secured with non-conductive, corrosion resistant strapping mounted with standoff fasteners. Cord reinforced rubber hose lines with brass fittings shall be installed from the frame rails to axle mounted air connections.

 The air system shall provide a rapid air build-up feature and low-pressure protection valve with light and buzzer, designed to meet the requirements of NFPA 1901, current

**ABS SYSTEM**

 An Anti-Skid Braking System (ABS) shall be provided to improve braking control and reduce stopping distance. This braking system shall be fitted to all of the axles. All electrical connections shall be environmentally sealed, water, weatherproof, and vibration resistant.

 The system shall constantly monitor wheel behavior during braking. Sensors on each wheel shall transmit wheel speed data to an electronic processor which shall sense approaching wheel lock causing instant brake pressure modulation up to 5 times per second in order to prevent wheel lockup. Each wheel shall be individually controlled.

 To improve service trouble shooting, provisions in the system for an optional diagnostic tester shall be provided. The system shall test itself each time the vehicle is started. A dash-mounted light shall go out once the vehicle has attained 4 mph after successful ABS start-up To improve field performance, the system shall be equipped with a dual circuit design. The system circuits shall be configured in a diagonal pattern. Should a malfunction occur, the defective circuit shall revert to normal braking action. A warning light shall signal malfunction to the operator. The system shall consist of a wheel mounted toothed ring, sensor, sensor clip, electronic control unit and solenoid control valve.

 The sensor clip shall hold the sensor in close proximity to the toothed ring. An inductive sensor consisting of a permanent magnet with a round pole pin and coil shall produce an alternating current with a frequency proportional to wheel speed. The unit shall be sealed, corrosion resistant and protected from electromagnetic interference. The electronic control unit shall monitor the speed of each wheel. A deviation shall be corrected by cyclical brake application and release. If a malfunction occurs, the defective circuit shall signal the operator and the malfunctioning portion of the system shall shut down. The system shall be installed in a diagonal pattern for side-to-side control. The system shall insure that each wheel is braking to optimum efficiency up to 5 times a second.

 The system shall also control application of the auxiliary engine exhaust or drive line brakes to prevent wheel lock.

 This system shall have a three (3) year or 300,000 mile parts and labor warranty as provided by Meritor Wabco Vehicle Control Systems.

**BRAKE AIR RESERVOIRS**

 There shall be a minimum of three (3) air reservoirs installed in conformance with best automotive practices. Reservoir capacity total shall be a minimum of 4400 cubic inches.

 The air reservoirs shall be color coded to match the air lines for easy identification, ease of maintenance and troubleshooting. The reservoirs shall be painted the following colors:

* Wet Tank Black
* Primary Tank Green
* Secondary Tank Blue
* Auxiliary Tank(s) Yellow

 For ease of daily maintenance, each air system reservoir shall be equipped with a brass 1/4 turn drain valve.

 A Rockwell/Wabco System Saver 1200 heated air dryer shall be furnished. An automatic moisture ejector on the primary or wet tank shall also be furnished.

**AIR LINES**

 The entire chassis air system shall be plumbed utilizing reinforced, Synflex air lines. All of the airlines shall be color coded to correspond with an air system schematic and shall be adequately protected from heat and chafing.

**AIR COMPRESSOR**

 Air compressor shall be a Bendix model, with a minimum of 15.9 cu. ft. per minute capacity. Air brake system shall be the quick build up type. The air compressor discharge line shall be stainless steel braid reinforced Teflon hose.

 A pressure protection valve shall be installed to prevent the use of air horns or other air operated devices should the air system pressure drop below 80 psi (552 kPa). Air compressor shall cutout at 130 psi and cut in no lower than 105 psi.

 The chassis air system shall meet NFPA 1901, latest edition for rapid air pressure build-up within sixty (60) seconds from a completely discharged air system. This system shall provide sufficient air pressure so that the apparatus has no brake drag and is able to stop under the intended operating conditions following the sixty (60) seconds build-up time.

**BRAKE TREADLE VALVE**

 A Bendix dual brake treadle valve shall be mounted on the floor in front of the driver. The brake control shall be positioned to provide unobstructed access and comfort for the driver.

**PARKING BRAKE**

 Parking brake shall be of the spring-actuated type, mounted on the rear axle brake chambers. The parking brake control shall be mounted on the cab center instrument panel, offset toward the driver. A red indicator light shall be provided in the driver dash panel that shall illuminate when the parking brake is applied.

**FRONT WHEELS & TIRES**

 The front wheels shall be 22.5" x 9" ten stud, hub piloted polished aluminum disc type.

 The aluminum disc front wheels shall be provided with bright nut covers and hub caps.

 The front tires shall be Michelin 315/80R22.5 "20 Ply" tubeless radial XZA1 highway tread. The tires shall be fire service rated up to 20,000 lbs and shall have a top speed of 75 mph when inflated to 130 psi.

 Fire Service Rating means operations not to exceed one hour loaded travel at maximum speed, with at least a one hour cool down prior to another loaded run.

 Industry load and inflation standards are in a constant state of change. Printed material may not reflect the latest load and inflation standards.

NOTE : NEVER EXCEED THE MAXIMUM AIR PRESSURE LIMITATION

**REAR WHEELS & TIRES**

 The single rear axle wheels shall be 22.5" x 9" ten stud, hub piloted disc type. The inner wheels shall be painted steel, the outer wheels shall be polished aluminum.

 The single rear axle aluminum disc wheels shall be provided with bright nut covers and hub caps.

 The rear wheels shall be equipped with wheel spacers that shall protect against dissimilar metals coming in contact with one another.

 The rear tires shall be Michelin 11R22.5 "16 Ply" tubeless radial XDN2 traction tread. The tires shall be fire service rated up to 24,820 lbs and shall have a top speed of 75 mph when inflated to 120 psi.

 Fire Service Rating means operations not to exceed one hour loaded travel at maximum speed, with at least a one hour cool down prior to another loaded run.

 Industry load and inflation standards are in a constant state of change. Printed material may not reflect the latest load and inflation standards.

NOTE : NEVER EXCEED THE MAXIMUM AIR PRESSURE LIMITATION

**TIRE PRESSURE MONITORING DEVICES**

 Each tire shall be equipped with an air pressure indicator cap on the valve stem. Each cap shall have a visual indicator to show if the tire is correctly inflated.

**VALVE EXTENSION STABILIZERS**

 The rear tire and wheel assemblies shall be equipped with valve extensions and stabilizers.

 **\*\*\*\*\* ENGINE, TRANSMISSION & ACCESSORIES \*\*\*\*\***

**ENGINE**

 The engine shall be a Maxxforce, 10 Liter, diesel, dual turbo-charged, electronically controlled, per the following specifications.

* Max. Horsepower 350 HP @ 2200 RPM
* Governed Speed 2200 RPM
* Peak Torque 1150 lb. ft. @ 1200 RPM
* Cylinders Six (6)
* Operating Cycles Four (4)
* Bore & Stroke 4.59 x 5.75 in.
* Displacement 570 cu. in.
* Compression Ratio 17.2:1
* Drive line Size 1710
* Fan Drive Thermal Clutch

 Engine oil filters shall be engine manufacturers branded or approved equal. Engine oil filters shall be accessible for ease of service and replacement.

 A fuel/water separator shall be provided.

 Engine shall be installed in accordance with engine manufacturer's instructions, and the chassis manufacturer shall be able to furnish proof of engine installation approval by the engine manufacturer.

**ENGINE WARRANTY**

 The MaxxForce 10 engine shall be warranted for a period of five (5) years or 100,000 miles, whichever occurs first.

**COOLING/RADIATOR**

 Radiator shall be brass with bolted steel top and bottom tanks. The cooling system shall be designed for a maximum of fifteen (15) PSI operation. There shall be a sight glass in the radiator to check the coolant level without removing the radiator cap. The core construction shall be tube and fin with three (3) tube rows, 273 total core tubes, and fourteen (14) fins per inch.

 Extended life engine coolant shall provide anti-freeze protection to -30° F. The mixture shall be per the engine manufacture's specifications.

 A transmission oil to liquid cooler shall be furnished.

 Core area shall be a minimum of 1375 square inches (39 H x 35.25W).

**RADIATOR SKID PLATE**

 The radiator installation shall include a heavy-duty radiator skid plate to protect the radiator from debris or obstructions under the chassis. The skid plate shall be designed so the angle of approach is not affected.

**CHARGE AIR COOLER**

 The charge air cooler shall be constructed of aluminum with cast aluminum side tanks. The cooler shall have a frontal core size of 957 square inches, seven (7) fins per inch, and forty eight (48) core tubes.

 The charge air cooler shall be mounted directly ahead of the radiator and to the radiator headers. Rubber isolators shall be used at the mounting points to reduce transmission of vibrations.

 The piping between the charge air cooler and engine shall use heavy duty hoses with stainless steel bands. Bands are used to maintain the shape of the hose during changing turbo boost pressures. The hoses shall be attached with stainless steel constant torque hose clamps.

**COOLING SYSTEM FAN**

 The engine cooling system shall incorporate a heavy duty fan, installed on the engine and include a shroud.

 Recirculation shields shall be installed to ensure that air which has passed through the radiator is not drawn through it again.

 Heavy duty rubber heater and coolant hoses shall be furnished for the heater and coolant system. All coolant hoses shall be equipped with constant torque type hose clamps. All integral hoses supplied with the engine shall be as supplied by the engine manufacturer.

**SECONDARY BRAKING**

 The engine shall be equipped with an engine compression brake for increased braking capabilities. Automatic control shall be as provided by the engine manufacturer and shall be activated by releasing the throttle pedal to the idle position.

 The engine compression brake shall have dash mounted control switch to turn the brake on or off.

 The engine brake shall be interlocked with the pump shift and shall automatically disengage any time the apparatus is shifted from road gear to pump gear.

**ENGINE FAST IDLE**

 A fast idle for the electronic controlled engine shall be provided. The fast idle shall be controlled by an ON/OFF switch on the dash.

 An electronic interlock system shall prevent the fast idle from operating unless the transmission is in "Neutral" (or "Park" if so equipped) and the parking brake is fully engaged. If the fast idle control is used in conjunction with a specified engine/transmission driven component or accessory, the fast idle control shall be properly interlocked with the engagement of the specified component or accessory.

**AIR CLEANER**

 An engine air cleaner shall be provided. Air cleaner shall include a dry type element. Air cleaner shall be installed in accordance with the engine manufacturer's recommendations. The air cleaner shall be located to the rear of the engine, with streamline air pipes and hump hose connections from the inlet to the air cleaner and from the air cleaner to the turbo. The air cleaner shall be easily accessible when the cab is tilted.

 Air cleaners mounted on the side or near the bottom of the cab shall not be acceptable. [NO EXCEPTIONS]

**SPARK ARRESTOR**

 A spark arrestor shall be installed in the chassis air intake system. This arrestor shall be mounted behind the intake grille to filter out airborne embers. The spark arrestor housing must be easily accessible when the cab is tilted.

**ACCELERATOR CONTROL**

 A floor mount accelerator pedal shall be installed on the floor in front of the driver. The pedal shall be positioned for comfort with ample space for fire boots and adequate clearance from the brake pedal control.

**TRANSMISSION**

 An Allison World Transmission, Model 3000 EVS electronically controlled, automatic transmission shall be provided. Transmission specifications shall be as follows:

* Max. Gross Input Power 425 HP
* Max. Gross Input Torque 1250 lb. ft.
* Input Speed (Range) 2000- 2800 RPM
* Shift Calibrations 5 Speed
* Direct Gear (Pumping) 4th (Lock-up)
* Direct Gear Ratio 1.00:1
* Overdrive Ratio 0.75:1

 Transmission installation shall be in accordance with the transmission manufacturer's specification. The transmission shall be readily and easily removable for repairs or replacement.

 An illuminated, touch-pad type shift control shall be mounted in the cab, convenient to the driver. Shift control shall be approved by the transmission manufacturer.

**TRANSMISSION OIL LEVEL SENSOR**

 The transmission shall be equipped with the oil level sensor (OLS); this sensor shall allow the operator to obtain an indication of the fluid level from the shift selector. The sensor display shall provide the following checks, correct fluid level, low fluid level and high fluid level.

**PARK TO NEUTRAL**

 The transmission, upon application of the parking brake, shall automatically shift into neutral.

**TRANSMISSION FLUID**

 TES- 389 transmission fluid shall be utilized to fill the 3000 EVS transmission.

**DRIVE LINES**

 Drive lines shall be Dana (Spicer) 1710 heavy duty series or equal, with "glide coat" splines on all slip shafts. The chassis manufacturer shall utilize an electronic type balancing machine to statically and dynamically balance all drive shafts. The chassis manufacturer shall be able to provide proof of compliance with all drive shaft manufacturer's standards and specifications. (No Exceptions)

**EXHAUST SYSTEM**

 The exhaust system shall be installed in accordance with the engine manufacturer's requirements and meet all Environmental Protection Agency and State noise level requirements. Exhaust system components shall be securely mounted and easily removable.

 The diesel particulate filter/muffler shall be fabricated from stainless steel and of a size compatible with the engine exhaust discharge.

 Exhaust tubing shall be a minimum of 16 gauge stainless steel from the turbocharger on the engine to the inlet of the diesel particulate filter. Any flexible exhaust tubing shall be HDT stainless steel type. To minimize heat build-up, exhaust tubing within the engine compartment shall be wrapped with an insulating material. Exhaust shall be wrapped from the turbocharger to the entrance of the muffler. Material shall be held in place with worm gear type clamps.

 An exhaust diffuser shall be provided to reduce the temperature of the exhaust as it exits the tailpipe.

 The computer controlling the engine shall be programmed in such a manner that it shall not allow the engine to go into regen mode while the fire pump is engaged. Separate "regeneration" enable and prohibit switches shall be provided under the dash board on the driver's side. Each switch shall be provided with a spring loaded protective cover and shall be clearly marked as to function.

 The exhaust tailpipe extending from the muffler (DPF) to the side of the vehicle shall be constructed from 16-gauge aluminized steel tubing. The exhaust discharge shall be on the officer side of the apparatus forward of the rear axle.

**\*\*\*\* FUEL SYSTEM \*\*\*\***

**FUEL TANK**

 Fuel tank shall be a minimum of fifty (50) gallon capacity. It shall have a minimum fuel filler neck of 2" ID. A 1/2" minimum diameter drain plug shall be provided. The tank shall be fabricated from hot rolled, pickled and oiled steel. Provisions for an additional feed line and fuel level float shall be provided for apparatus manufacturer's use.

 The fuel tank shall be installed behind the rear wheels between the frame rails.

 The fuel tank shall meet all FHWA 393.67 requirements including a fill capacity of 95% of tank volume.

 The fuel lines shall be ParaFlex HTFL fuel hose. The lines shall be carefully routed and secured along the inside of the frame rails.

**FUEL POCKET**

 A fuel fill shall be provided in the left side rear wheel well area. A Cast Products heavy duty cast aluminum spring loaded hinged fill door shall be provided.

 A label indicating "Ultra Low Sulfur Diesel Fuel Only" shall be provided adjacent to the fuel fill.

**STEERING SYSTEM**

 A power steering system shall be provided utilizing a Sheppard model #M110 main steering gear on the driver side of the chassis. The steering system shall be designed to maximize the turning capabilities of the front axle no matter the rating and tire size.

 The system shall be designed utilizing an engine driven hydraulic pump, with a maximum operating pressure of 2000 PSI. Steering design shall permit a maximum of 5.6 turns from stop to stop. Steering system components shall be mounted in accordance with the manufacturer's instructions.

**STEERING WHEEL & COLUMN**

 The steering wheel shall be vinyl padded, minimum 18" diameter, with a center hub mounted horn button. There shall be a self-canceling, directional signal lever and a traffic hazard switch on the steering column. The high beam activator shall be controlled by pulling the directional signal lever toward the driver.

 The steering column shall have a separate lever control for tilting and telescoping capability.

**ROAD SAFETY KIT**

A road safety kit shall be furnished with the following equipment:

* 2 1/2 lb. B-C fire extinguisher
* Triangle safety reflectors

 **\*\*\*\*\* CHASSIS/BODY ELECTRICAL & ACCESSORIES \*\*\*\*\***

**CHASSIS ELECTRICAL SYSTEM**

 All electrical wiring in the chassis shall be SXL cross link insulated type. Wiring is to be color coded and include function codes every three (3) inches on both sides. Wiring harnesses shall be routed in protective, heat resistant loom, securely and neatly installed. Two (2) power distribution centers shall be provided in central locations for greater accessibility. The power distribution centers shall contain automatic thermal self resetting breakers, power control relays, flashers, diode modules, daytime driving light module, and engine and transmission data links. All breakers and relays shall have a capacity substantially greater than the expected load on the related circuit, thus ensuring long component life. Power distribution centers shall be composed of a system of interlocking plastic modules for ease in custom construction.

 The power distribution centers are function oriented. The first is to control major truck function. The second shall control center to overhead switching and interior operations. Each module is single function coded and labeled to aid in troubleshooting. The centers also have accessory breakers and relays for future installations. All harnesses and power distribution centers shall be electrically tested prior to installation to ensure the highest system reliability.

 All external harness interfaces shall be of a triple seal type connection to ensure a proper connection. The cab/chassis and the chassis/body connection points shall be mounted in accessible locations. Complete chassis wiring schematics shall be supplied with the apparatus.

**WIRING HARNESS DESCRIPTION**

 The wiring harness contained on the chassis shall be designed to utilize wires of stranded copper or copper alloy of a gauge rated to carry 125% of maximum current for which the circuit is protected without exceeding 10% voltage drop across the circuit. Wiring shall be uniquely identified by color code or circuit function code, labeled at a minimum of every three (3) inches. The identification of the wiring shall be referenced on a wiring diagram. All wires conform to SAEJ1127 (Battery Cable), SAEJ1128 (Low Tension Primary Cable), SAEJ1560 (Low Tension Thin Wall Primary Cable).

 The covering of harnesses shall be moisture resistant loom with a minimum rating of 289° Fahrenheit and a flammability rating of VW-1 as defined in UL62. The covering of jacketed cable shall have a minimum rating of 289° Fahrenheit.

 All circuits shall conform to SAEJ1292. All circuits must be provided with low voltage over current protective devices.

 All exposed electrical connections will be coated with “Z-Guard” to prevent corrosion.

**DIRECT GROUNDING STRAPS**

 Direct grounding straps shall be mounted to the following areas; frame to cab, frame to body and frame to pump enclosure.

 All exposed electrical connections shall be coated with "Z-Guard 8000" to prevent corrosion.

**EMI/RFI PROTECTION**

 The apparatus shall incorporate the latest designs in the electrical system with state of the art components to insure that radiated and conducted electromagnetic interference (EMI) and radio frequency interference (RFI) emissions are suppressed at the source

 The apparatus proposed shall have the ability to operate in the environment typically found in fire ground operations with no adverse effects from EMI/RFI.

 EMI/RFI susceptibility is controlled by utilizing components that are fully protected and wiring that utilizes shielding and loop back grounds where required. The apparatus shall be bonded through wire braided ground straps. Relays and solenoids that are suspect to generating spurious electromagnetic radiation are diode protected to prevent transient voltage spikes

 In order to fully prevent the radio frequency interference the purchaser may be requested to provide a listing of the type, power output, and frequencies of all radio and bio medical equipment that is proposed to be used on the apparatus.

**12 VOLT ELECTRICAL SYSTEM TESTING**

 The apparatus low voltage electrical system shall be tested and certified by the apparatus manufacture. The certification shall be provided with the apparatus. All tests shall be performed with air temperature between 0°F and 100°F.

 The following three (3) tests shall be performed in order. Before each test, the batteries shall be fully charged.

**TEST #1-RESERVE CAPACITY TEST**

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

**TEST #2-ALTERNATOR PERFORMANCE TEST AT IDLE**

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

**TEST #3-ALTERNATOR PERFORMANCE TEST AT FULL LOAD**

 The total continuous electrical load shall be activated with the engine running up to the engine manufacturers governed speed. The test duration shall be a minimum of 2 hours. Activation of the load management system shall be permitted during this test. However, an alarm sounded due to excessive battery discharge, as detected by the system, or a system voltage of less than 11.7 volts DC for a 12 volt system, for more than 120 seconds, shall be considered a test failure.

**LOW VOLTAGE ALARM TEST**

 Following completion of the preceding tests, the engine shall be shut off. The total continuous electrical load shall be activated and shall continue to be applied until the excessive battery discharge alarm is activated.

 The battery voltage shall be measured at the battery terminals. With the load still applied, a reading of less than 11.7 volts shall be considered a test failure. The battery system shall then be able to restart the engine.

At time of delivery, documentation shall be provided with the following information:

* Documentation of the electrical system performance test
* A written load analysis of the following;
* Nameplate rating of the alternator
* Alternator rating at idle while meeting the minimum continuous electrical load
* Each component load comprising the minimum continuous electrical load.
* Additional loads that, when added to the minimum continuous load, determine the total connected load.
* Each individual intermittent load.

**LOAD MANAGEMENT SYSTEM**

 A load management system shall be provided for performing electrical load management. The load manager shall have 16 programmable outputs to supply warning and load switching requirements. The load management system shall be capable of offering load sequencing, load shedding, fast idle control, low voltage warning, scene mode operation and response mode operation

 Outputs 1 thru 12 shall be independently programmable to activate during the scene mode, the response mode or both. These outputs can also be programmed to activate with the ignition or master warning switch, or to sequence and shed along with the priority. Output 13 shall be designated to activate a fast idle system. Output 14 shall provide a low voltage warning for an isolated battery. Output 15 is a user configurable output and shall be programmable for activating between 10.5 and 15 volts. Output 16 shall provide a low voltage alarm that activates at the NFPA required 11.8 volts.

 The load management shall have a digital display to indicate system voltage in normal operation mode and also indicate the output configuration during programming mode.

 The load management shall also be protected against reverse polarity and shorted outputs, and be enclosed in a metal enclosure to enhance EMI/RFI protection.

**DIAGNOSTICS**

 Diagnostic ports shall be accessible while standing on the ground and located inside the drivers side door left of the steering column. The diagnostic panel shall allow diagnostic tools such as computers to connect to various vehicle systems for improved troubleshooting providing a lower cost of ownership. Diagnostic switches shall allow engine and ABS systems to provide blink codes should a problem exist.

 The diagnostic system shall include the following:

* Engine diagnostic port
* Transmission and ABS diagnostic port
* Roll sensor diagnostic port (if applicable)

Additional diagnostic locations under the officers side of the dash.

* Engine diagnostic switch (blink codes)
* ABS diagnostic switch (blink codes)

**VOLTAGE MONITOR SYSTEM**

 A voltage monitoring system shall be provided to indicate the status of the battery system connected to the vehicle's electrical load. The system shall provide visual and audible warning when the system voltage is below or above optimum levels.

 The alarm shall activate if the system falls below 11.8 volts DC for more than two (2) minutes.

**INDICATOR LIGHT AND ALARM PROVE-OUT SYSTEM**

 A system shall be provided which automatically tests basic indicator lights and alarms located on the cab instrument panel.

**SEQUENCER**

 A sequencer shall be provided that automatically activates and deactivates vehicle loads in a preset sequence thereby protecting the alternator from power surges. This sequencer operation shall allow a gradual increase or decrease in alternator output, rather than loading or dumping the entire 12 volt load to prolong the life of the alternator.

 Emergency light sequencing shall operate in conjunction with the emergency master light switch. When the emergency master switch is activated, the emergency lights shall be activated one by one at half second intervals. Sequenced emergency light switch indicators shall flash while waiting for activation.

 When the emergency master switch is deactivated, the sequencer shall deactivate the warning light loads in the reverse order.

 Rear of cab Air-Conditioning and Heat shall be load managed.

**ELECTRICAL HARNESS REQUIREMENT**

 To ensure dependability, all 12-volt wiring harnesses installed by the apparatus manufacturer shall conform to the following specifications:

* SAE J 1128 - Low tension primary cable
* SAE J 1292 - Automobile, truck, truck-tractor, trailer and motor coach wiring
* SAE J 163 - Low tension wiring and cable terminals and splice clips
* SAE J 2202 - Heavy duty wiring systems for on-highway trucks
* NFPA 1901 - Standard for automotive fire apparatus
* FMVSS 302 - Flammability of interior materials for passenger cars, multipurpose passenger vehicles, trucks and buses
* SAE J 1939 - Serial communications protocol
* SAE J 2030 - Heavy-duty electrical connector performance standard
* SAE J 2223 - Connections for on board vehicle electrical wiring harnesses
* NEC - National Electrical Code
* SAE J 561 - Electrical terminals - Eyelet and spade type
* SAE J 928 - Electrical terminals - Pin and receptacle type A

 For increased reliability and harness integrity, harnesses shall be routed throughout the cab and chassis in a manner which allows the harnessing to be laid into it's mounting location. Routing of harnessing which requires pulling of wires through tubes shall not be allowed.

 Wiring shall be run in loom or conduit where exposed, and have grommets or other edge protection where wires pass through metal. Wire colors shall be integral to each wire insulator and run the entire length of each wire. Harnessing containing multiple wires and uses a single wire color for all wires shall not be allowed. Function and number codes shall be continuously imprinted on all wiring harness conductors at 3.00" intervals. All wiring installed between the cab and into doors shall be protected by a wire conduit to protect the wiring. Exterior exposed wire connectors shall be positive locking, and environmentally sealed to withstand elements such as temperature extremes, moisture and automotive fluids. Electrical wiring and equipment shall be installed utilizing the following guidelines:

* All holes made in the roof shall be caulked with silicon (no exception). Large fender washers, liberally caulked, shall be used when fastening equipment to the underside of the cab roof.
* Any electrical component that is installed in an exposed area shall be mounted in a manner that shall not allow moisture to accumulate in it. Exposed area shall be defined as any location outside of the cab or body.
* For low cost of ownership, electrical components designed to be removed for maintenance shall be quickly accessible. For ease of use, a coil of wire shall be provided behind the appliance to allow them to be pulled away from the mounting area for inspection and service work.
* Corrosion preventative compound shall be applied to non-waterproof electrical connectors located outside of the cab or body. All non-waterproof connections shall re-quire this compound in the plug to prevent corrosion and for easy separation of the plug.
* Any lights containing non-waterproof sockets in a weather-exposed area shall have corrosion preventative compound added to the socket terminal area.
* All electrical terminals in exposed areas shall have protective coating applied completely over the metal portion of the terminal.
* Rubber coated metal clamps shall be used to support wire harnessing and battery cables routed along the chassis frame rails.
* Heat shields shall be used to protect harnessing in areas where high temperatures exist. Harnessing passing near the engine exhaust shall be protected by a heat shield.
* Cab and crew cab harnessing shall not be routed through enclosed metal tubing. Dedicated wire routing channels shall be used to protect harnessing therefore improving the overall integrity of the vehicle electrical system. The design of the cab shall allow for easy routing of additional wiring and easy access to existing wiring.
* All standard wiring entering or exiting the cab shall be routed through sealed bulkhead connectors to protect against water intrusion into the cab.

**BATTERY CABLE INSTALLATION**

 All 12-volt battery cables and battery cable harnessing installed by the apparatus manufacturer shall conform to the following requirements:

* SAE J 1127 - Battery Cable
* SAE J 561 - Electrical terminals, eyelets and spade type
* SAE J 562 - Nonmetallic loom
* SAE J 836 A - Automotive metallurgical joining
* SAE J 1292 - Automotive truck, truck-tractor, trailer and motor coach wiring
* NFPA 1901 - Standard for automotive fire apparatus

 Battery cables and battery cable harnessing shall be installed utilizing the following guidelines:

* Splices shall not be allowed on battery cables or battery cable harnesses.
* For ease of identification and simplified use, battery cables shall be color coded. All positive battery cables shall be marked red in color. All negative battery cables shall be black in color.
* For ease of identification, all positive battery cable isolated studs throughout the cab and chassis shall be red in color.
* For increased reliability and reduced maintenance, all electrical buss bars located on the exterior of the apparatus shall be coated to prevent corrosion.

 An operational test shall be conducted to ensure that any equipment that is permanently attached to the electrical system is properly connected and in working order.

**ALTERNATOR**

 The alternator shall be Leece Neville Model 4890JB, 320 amp, serpentine belt driven unit. The installation shall include an integral self-diagnostic regulator and rectifier for compact installation.

 The alternator installation shall be designed to provide maximum output at engine idle speed to meet the minimum continuous electrical load of the apparatus as required.

**BATTERY SYSTEM**

 Three (3) Exide #HP-31D, maintenance free batteries shall be provided. These batteries shall be wired in parallel to the master disconnect switch. Each battery shall be rated at 925 CCA at 0° F and shall have a reserve capacity of 180 minutes.

 Wiring for the batteries shall be 4/0 welding type dual path starting cables per SAEJ541.

**BATTERY STORAGE**

 Batteries shall be securely mounted in a fixed 3/16” GR50 steeltray, located on the driver's side of the chassis frame. Complete access shall be provided when the cab is fully tilted. Batteries shall be mounted on non-corrosive matting material.

**BATTERY DISCONNECT SWITCH**

 The chassis batteries shall be wired in parallel to a single 12 volt electrical system, controlled through a heavy duty, rotary type, master disconnect switch. The master disconnect switch shall be located within easy access of the driver upon entering or exiting the cab.

**BATTERY JUMPER STUDS**

 A set of Cole Hersee battery jumper studs, model #46210-02 (red) and #46210-03 (black) shall be provided to allow the battery system to be jump started or charged from an external source. The studs shall be located on the bottom of the battery box on the driver's side of the chassis. Each stud shall be equipped with both a rubber protector cap and a 2” square non-conductive plate to prevent accidental shorting.

**120 VOLT SHORELINE CONNECTION - "SUPER" AUTO EJECT**

 One (1) Kussmaul "Super" Auto Eject model 091-55-20-120, automatic, 120 volt, 20 amp shoreline disconnect shall be provided for the on board, 110 volt battery charging systems.

 The disconnect shall be equipped with a NEMA 5-20 P male receptacle, which shall automatically eject the shoreline when the vehicle starter is energized. A label shall be provided indicating voltage and amperage ratings.

**SHORELINE POWER INLET PLATE**

 A shoreline power receptacle information plate shall be permanently affixed at or near the power inlet. The plate shall indicate the following;

* Type of Line Voltage
* Current Rating in Amps Power Inlet Type (DC or AC)

 The Kussmaul auto-eject connection shall be equipped with a Red weatherproof cover.

 The shoreline receptacle shall be located in the area directly adjacent to the driver's side cab door.

**BATTERY CHARGER SYSTEM**

 A Kussmaul model #091-53-12-REMOTE, "Auto Charge 1200" high output, fully automatic battery charger shall be provided for maintaining the vehicle battery system. Unique electronic sensing circuits sense the true battery voltage while eliminating the need for external sense wires. Output current shall be 40 amperes @ 12 volt DC.

 A LED bar graph display shall be located near the shoreline connection to monitor the battery status.

**EMERGENCY SWITCHES**

 A switch control console shall be provided in the center dash panel between the driver's and officer's position. This console shall separate the emergency / auxiliary electrical functions from the regular chassis functions. A minimum of ten (10) rocker type switches with integral indicator lights shall be provided, in addition to the Load Manager indicator.

 A master switch with integral red indicator light shall be provided, which shall allow pre-setting of emergency light switch and shall have a red integral indicator light. A primary emergency lighting switch shall be provided, next to the master switch. Then a total of seven (7) load manageable emergency switches shall be provided. The last remaining switch shall be a ground light switch. All switches, (other than the master switch), shall have switch function labeling and an amber integral indicator light.

**LIGHTING - CAB INTERIOR**

 Four (4) combination red/white halogen dome lights shall be furnished in the cab, two (2) in the forward section and two (2) in the rear section. The lights shall be Weldon model #8086-6978-68 with euro style switch. Each dome light shall have an integral selector switch. Each dome light shall also activate when the respective, adjacent cab door is opened.

 A shielded light shall be provided in each side opening, cab door step well. These lights shall activate with the respective door jamb switch.

**"DO NOT MOVE APPARATUS" WARNING LIGHT**

 A 3/4" red flashing warning light with an integral audible alarm shall be functionally located in the cab to signal when an unsafe condition is present; such as an open cab or body compartment door, an extended ladder rack, a deployed stabilizer, an extended light tower or any other device that may be opened, extended or deployed and might cause damage to the apparatus if it is moved.

 This light shall be activated through the parking brake switch to signal when the parking brake is released. This light shall be labeled "DO NOT MOVE TRUCK"..

**CIGARETTE LIGHTER PORT**

 Two (2) 12 volt cigarette lighter style accessory outlet(s) shall be installed in the cab of the truck for the fire departments accessory devices. The lighter(s) shall be located as directed near the officer's seating position for devices such as cellular phones.

**ASA VOYAGER REAR CAMERA SYSTEM**

 An ASA Voyager rear vision camera system shall be provided to allow the driver to visually see the rear of the apparatus while in the cab. The system shall include an ASA model #AOM711 flat panel LCD color monitor mounted adjacent to the driver. An ASA model #VCCS130 color camera that shall be mounted at the rear of the vehicle.

 The rear vision camera system shall be wired to automatically activate when the chassis transmission is placed in reverse.

 The monitor for the rear vision system shall be mounted ceiling of the cab in easy view of the driver.

**HEADLIGHTS CLUSTER**

 Two (2) dual, rectangular, halogen headlight modules in bright finish bezels shall be furnished on the front of the cab. Each side head light module shall incorporate an individual low beam and a high beam headlight. High beam actuation shall be controlled on the turn signal lever.

**DAYTIME RUNNING LIGHTS**

 The chassis head lights shall have integrated circuitry to actuate the low beam headlights at a maximum of 80 percent of capacity whenever the chassis engine is running.

 The daytime running lights shall be interlocked with the parking brake.

**SECONDARY DUAL LIGHT MODULE**

 Two (2) Code 3 65STA arrow shaped, amber LED turn signals shall be provided, one (1) in each side of the dual light module above the headlights.

 The NFPA required, Zone "A" lower warning lights shall be incorporated into each side dual light module noted above.

**DOT MARKER LIGHTS AND REFLECTORS**

 Five (5) DOT approved Whelen (or equal) Light Emitting Diode (LED) cab marker lamps shall mounted on the top front edge of the cab roof.

 Amber LED marker lights with integral reflectors shall be provided on the side of the cab above the front wheel well, one (1) each side.

 Truck-Lite Model #18 red LED marker lights with integral reflectors shall be provided at the lower side rear, one (1) each side.

 Truck-Lite #60115Y yellow LED side marker and turn lights shall be provided on the apparatus lower side, forward of rear axle, one (1) each side.

 Truck-Lite Model #19 red LED clearance lights shall be provided on the apparatus rear upper, one (1) each side at the outermost practical location.

 Truck-Lite Model #33740R LED 3-lamp identification bar will be provided on the apparatus rear center. The lights shall be red in color.

 Truck-Lite #98034Y yellow reflectors shall be provided on the apparatus body lower side, as far forward and low as practical, one (1) each side if the apparatus is 30' long or longer.

 Truck-Lite #98034R red reflectors shall be provided on the apparatus rear, one (1) each side at the outermost practical location.

**LICENSE PLATE LIGHT - REAR**

 One (1) license plate light shall be provided above the mounting position of the license plate. The light shall be clear in color.

**TAIL, STOP, TURN AND BACK-UP LIGHTS**

 Two (2) Code 3, 45STBZ 3" x 7", red LED combination tail and stop lights, shall be mounted one each side at the rear of the body with a chrome mounting flange.

 Two (2) Code 3, 45TABZ 3" x 7", amber LED arrow turn signal lights, shall be mounted one each side, on a vertical plane with the tail/stop lights with a chrome mounting flange.

 Two (2) Code 3, 41RVBZ 3" x 7", white halogen backup lights, shall be mounted with a chrome mounting flange, one each side on a vertical plane with the turn/tail/stop signals. These lights shall activate when the transmission is placed in reverse gear.

**CAB STEP LIGHTS**

 Chrome plated Whelen model #0AC0EDCR, shielded LED chassis step lights shall be provided and controlled with marker light actuation. Step lights shall be located to properly illuminate all chassis access steps and walkway areas.

**BODY STEP LIGHTS**

 Chrome plated Whelen model #0AC0EDCR, shielded LED body step lights shall be provided and controlled with marker light actuation. Step lights shall be located to properly illuminate all chassis access steps and walkway areas.

**DUNNAGE AREA LIGHTING**

 Two (2) chrome plated Whelen model #0AC0EDCR, shielded LED lights shall be provided in the dunnage area to provide adequate illumination of this area.

**SCENE LIGHTS - REAR OF BODY**

 Two (2) Whelen 810 series Opti-Scene halogen scene lights, with internal optics, shall be provided, one on each side of the rear body panel. The scene lights shall be controlled by a rocker switch in the master warning light switch console. All scene lights shall be wired through the load management system.

**GROUND LIGHTS - CAB**

 One (1) Amdor Luma Bar H2O LED 20" ground light shall be provided under each side cab door entrance step, four (4) total. The ground lights shall turn on automatically with each respective door jamb switch and also by a master ground light switch in the warning light switch console.

 Each light shall illuminate an area at a minimum 30" outward from the edge of the vehicle.

**GROUND LIGHTS - FRONT BODY**

 One (1) Amdor Luma Bar H2O LED 20" ground light shall be provided under each front body corner, two (2) total. The ground lights shall be activated by a master ground light switch in the cab and shall be wired through the load management system.

**GROUND LIGHTS - REAR**

 One (1) Amdor Luma Bar H2O LED 20" ground light shall be provided under each rear body corner, two (2) total. The ground lights shall be activated by a master ground light switch in the cab and shall be wired through the load management system.

**ROOF MOUNT 150W LED BROW LIGHT - ABOVE WINDSHIELD**

 Fire Research Focus model FCA800-Q13 contour roof mount light shall be installed. The mounting brackets shall attach to the bottom of the lamp head and be machined to conform to the roof radius. Wiring shall extend from a weatherproof strain relief at the rear of the lamp head.

 The lamp head shall have eight (8) high output LED’s and shall draw 13 amps and generate 13,300 lumens. The lamp head shall direct 50 percent of the light onto the action area while providing 50 percent to illuminate the working area. The lamp head shall incorporate external heat-dissipating fins and be no more than 5" deep by 3 5/16" high by 11 1/2” wide. Lamp head and brackets shall be powder coated white. The floodlight shall be UL listed as scene lights for fire service use.

 The Focus brow mounted flood light shall be located above the windshield in the center of the cab.

**TELESCOPING LIGHTS - REAR OF CAB**

 Two (2) Fire Research Focus model FCA530-Q13 side mount push up telescopic lights shall be mounted one (1) each side on the rear of the cab. The light poles shall be anodized aluminum and have a knurled twist lock mechanism to secure the extension pole in position. The extension poles shall rotate 360 degrees. The outer pole shall be a grooved aluminum extrusion and qualify as an NFPA compliant handrail. The pole mounting brackets shall have a 3 1/2" offset. Wiring shall extend from the pole bottom with a 4' retractile cord.

 Each lamp head shall have eight (8) high output LED’s and shall draw 13 amps and generate 13,300 lumens. Each lamp head shall direct 50 percent of the light onto the action area while providing 50 percent to illuminate the working area. The lamp heads angle of elevation shall be adjustable at a pivot in the mounting arm and the position locked with a round knurled locking knob. The lamp heads shall incorporate heat-dissipating fins and be no more than 5" deep by 3 5/16" high by 11 1/2" wide. Each Lamp head and mounting arms shall be powder coated white. The floodlights shall be UL listed as a scene lights for fire service use.

**REAR OF CAB LIGHTS MASTER POWER SWITCH**

 A master power switch shall be provided on the pump panel to turn the rear of cab lights on and off when the light mounted switch is left in the ON position.

**LIGHTS ABOVE WINDSHIELD MASTER POWER SWITCH**

 A master power switch shall be provided in the cab warning light switch console to turn the lights above windshield on and off.

**\*\*\*\* BODY ELECTRICAL SYSTEM \*\*\*\***

**12 VOLT BODY ELECTRICAL SYSTEM**

 All electrical lines in the body shall be protected by automatic circuit breakers, conveniently located to permit ease of service. Flashers, heavy solenoids and other major electrical controls shall be located in a central area near the circuit breakers.

 All lines shall be color and function coded every 3", easy to identify, oversized for the intended loads and installed in accordance with a detailed diagram. A complete wiring diagram shall be supplied with the apparatus.

 Wiring shall be carefully protected from weather elements and snagging. Heavy duty loom shall be used for the entire length. Grommets shall be utilized where wiring passes through panels.

 In order to minimize the risk of heat damage, wires run in the engine compartment area shall be carefully installed and suitably protected by the installation of heat resistant shielded loom.

 All electrical equipment shall be installed to conform to the latest federal standards as outlined in NFPA 1901.

**PUMP ENCLOSURE WORK LIGHTS**

 Work lighting shall be provided inside the pump enclosure providing a minimum of 20 candlepower illumination.

**ENGINE COMPARTMENT WORK LIGHTS**

 Work lighting shall be provided inside the engine enclosure that will provide a minimum of 20 candlepower illumination.

**AMDOR LUMA BAR TRACK MOUNTED COMPARTMENT LIGHTS - LED**

Each individual, equipment storage compartment shall be equipped with the AMDOR Luma Bar LED light fixture mounted one each side of the forward (and rear) vertical door frame.

**NFPA LIGHTING PACKAGE**

 The following warning light package shall include all of the minimum warning light and actuation requirements for the current revision of the NFPA 1901 Fire Apparatus Standard. The lighting as specified shall meet the requirements for both "Clearing Right of Way" and "Blocking Right of Way" as noted.

**LIGHT PACKAGE ACTUATION CONTROLS**

 The entire warning light package shall be actuated with a single warning light switch located on the cab switch panel. The wiring for the warning light package shall engage all of the lights required for "Clearing Right of Way" mode when the vehicle parking brake is not engaged. An automatic control system shall be provided to switch the warning lights to the "Blocking Right of Way" mode when the vehicle parking brake is engaged.

**UPPER LEVEL LIGHTING - CODE 3**

**NFPA ZONE A, UPPER**

 A Code 3 #2780NFPA1 "RX 2700 Prizm Series", 80" LED cab roof warning light bar shall be furnished and rigidly mounted on top of the cab roof. The lightbar shall be equipped with the following:

* Eight Forward Facing Red - Eight LED Reflector Prizm Modules
* Four Corners Red - Twelve LED Reflector Prizm Modules

 The forward facing clear lights shall be disabled automatically for the "Blocking Right of Way" mode.

**NFPA ZONE C, UPPER**

 Two (2) Code 3 468RBZ-75, PriZm II surface mounted flashing LED lights, shall be furnished and mounted one (1)each side at the rear, upper portion of the apparatus. Each light shall be furnished with a chrome-plated flange. A red lens shall be provided on each light.

**NFPA ZONES B & D REAR, UPPER**

 Two (2) surface mounted Code 3 468RBZ-75 PriZm II LED light heads shall be furnished and shall be mounted one (1) each side on the upper side face, towards the rear of the body, facing to each side of the unit. Each upper rear LED light head shall be equipped with a red lens and chrome plated flange.

**NFPA ZONES B & D FRONT, UPPER**

 Two (2) surface mounted Code 3 468RBZ-75 PriZm II LED light heads shall be furnished and mounted one (1) each side on the upper side face, towards the front of the body, facing to each side of the unit. Each upper front LED light head shall be equipped with a red lens and chrome plated flange.

**LOWER LEVEL LIGHTING - CODE 3**

**NFPA ZONE A, LOWER**

 Two (2) Code 3 #468RBZ-75 PriZm II LED light heads shall be provided and installed one (1) each side. Each light shall be equipped with a red lens and chrome plated mounting flange.

 The lower zone A warning lights shall be mounted in the custom chassis headlight bezels.

**NFPA ZONE C, LOWER**

 Two (2) Code 3 #378RBZ-75 PriZm II flashing LED light heads shall be provided and installed one (1) each side directly below the DOT stop, tail, turn and backup lights. Each light shall be equipped with a red lens and chrome plated mounting flange.

**NFPA ZONES B & D FRONT, LOWER**

 Two (2) Code 3 #378RBZ-75 PriZm II flashing LED light heads shall be provided and installed one (1) each side. Each light shall be equipped with a red lens and chrome plated mounting flange.

 The lower zone B & D warning lights shall be mounted on the sides of the custom chassis front bumper.

**NFPA ZONES B & D MIDSHIP, LOWER**

 Two (2) Code 3 #378RBZ-75 PriZm II flashing LED light heads shall be provided and installed one (1) each side. Each light shall be equipped with a red lens and chrome plated mounting flange.

**NFPA ZONES B & D REAR, LOWER**

 Two (2) Code 3 #378RBZ-75 PriZm II flashing LED light heads shall be provided and installed one (1) each side. Each light shall be equipped with a red lens and chrome plated mounting flange.

**WARNING LIGHT SYSTEM CERTIFICATION**

 The warning light system(s) specified above shall not exceed a combined total amperage draw of 45 AMPS with all lights activated in either the "Clearing Right of Way" or the "Blocking Right of Way" mode.

 The warning light system(s) shall be certified by the light system manufacturer(s), to meet all of the requirements in the current revision of the NFPA 1901 Fire Apparatus Standard as noted in the General Requirements section of these specifications. The NFPA required "Certificate of Compliance" shall be provided with the completed apparatus.

**ELECTRIC HORN**

 A single electric horn activated by the steering wheel horn button shall be furnished.

**BACK-UP ALARM**

 A Code 3, model #D450C, 87dBA back-up alarm, shall be provided and installed at the rear of the apparatus under the tailboard. The back-up alarm shall activate automatically when the transmission is placed in reverse gear and the ignition is "on".

**AIR HORNS**

 Two (2) chrome plated air horns shall be at the front of the vehicle. The air horns shall be mounted in full compliance with NFPA-1901. The supply lines shall be dual 1/4" lines with equal distance from each horn.

 Both air horns shall be recessed in the front bumper.

 The air horn(s) shall be controlled by a foot switch on the officer's side and the steering horn button on driver's side. An air horn/electric DOT horn selector switch shall be furnished on the dash for the drivers steering horn button.

**ELECTRONIC**

 One (1) Code 3 Model #3692 V-Con electronic siren shall be provided featuring: electronic air horn, wail, yelp and hi-lo siren tones along with public address and radio rebroadcast. A hardwired microphone shall provided for the public address feature.

 The electronic siren and speaker shall meet the NFPA required SAE certification to ensure compatibility between the siren and speaker.

 One (1) Code 3, model #FM100C chrome plated siren speaker shall be provided, recessed in the front bumper and wired to the electronic siren.

**\*\*\*\* PUMP AND PLUMBING \*\*\*\***

**PUMP**

* **WATEROUS CSU-C20**
* **1500 G.P.M.**
* **SINGLE-STAGE**

 The pump shall be of single-stage construction and shall comply with all applicable requirements of the latest standards for automotive fire apparatus of the National Fire Protection Association, NFPA-1901 and shall have a rated capacity of 1500 gpm.

The pump must deliver the percentage of rated capacity at the pressure listed below:

* 100% of rated capacity at 150 P.S.I. net pump pressure
* 100% of rated capacity at 165 P.S.I. net pump pressure
* 70% of rated capacity at 200 P.S.I. net pump pressure
* 50% of rated capacity at 250 P.S.I. net pump pressure

 When dry, the pump shall be capable of taking suction and discharge water with a lift of 10 feet in not more than 30 seconds through 20 feet of appropriate size suction hose.

 The pump shall be free from objectionable pulsation and vibration under all normal operating conditions.

**PUMP CONSTRUCTION**

 The pump body shall be close-grained gray iron and must be horizontally split in two sections for easy removal of the impeller shaft assembly, and designed for complete servicing from the bottom of the truck without disturbing setting of the pump in the chassis or apparatus piping which is connected to the pump. Pump body halves shall be bolted together on a single horizontal face to minimize chance of leakage and facilitate reassemble.

 Discharge manifold shall be cast as an integral part of the pump body assembly and shall provide at least three full 3-1/2 inch openings for ultimate flexibility in providing various discharge outlets for maximum efficiency, and shall be located as follows: one outlet on the right side of the pump body, one outlet on the left side of the pump body, and one outlet on top of the pump discharge manifold.

**IMPELLER SHAFT**

 The impeller shaft shall be stainless steel, accurately ground to size, and supported at each end by oil or grease lubricated, anti-friction bearings for rigid and precise support. Bearings shall be protected from water and sediment by suitable stuffing boxes, flinger rings and oil seals. The impeller shaft shall be of two-piece construction separable between the pump and pump transmission to allow true separation of the transmission from the pump without disassembly of either component. No sleeve type bearings shall be used.

**PUMP PACKING**

 Stuffing boxes shall be equipped with two-piece glands to permit adjustment or replacement of packing without disturbing the pump. Lantern rings shall be located at the inner end of the stuffing boxes the all ring can be removed without removal of the lantern rings. Water shall be fed into the stuffing box lantern rings for proper lubrication and cooling when the pump is operating.

**PUMP IMPELLER**

 The impeller shall be bronze, accurately balanced (mechanically and hydraulically), of mixed flow design with reverse flow labyrinth-type wear rings that resist water bypass and loss of efficiency due to wear.

 Wear rings shall be bronze, and shall be easily replaceable to restore original pump efficiency and eliminate the need for replacing the entire pump casing due to wear.

**PUMP TRANSMISSION**

 The pump transmission shall be an all aluminum **"C20"** model, rigidly attached to the pump body assembly and be of latest design incorporating a high strength involute tooth-form Hy-Vo chain drive. The driven sprockets shall be capable of operating at high speeds to provide smooth, quiet transfer of power. The shift engagement shall be accomplished by a free-sliding collar and shall incorporate an internal locking mechanism to insure that the collar shall be maintained in ROAD or PUMP position.

**PUMP RATIO**

 The pump ratio shall be selected by the apparatus manufacturer to give maximum performance with the engine and transmission selected.

 The manufacturer shall supply at time of delivery copies of the pump manufacturer's certification of hydrostatic testing, the engine manufacturer's current certified brake horsepower curve.

**PUMP SHIFT**

 The pump shift shall be pneumatically operated and shall incorporate a standard automotive air valve shifting mechanism for ease of maintenance and parts availability. The pump shift valve shall be mounted in the cab and identified as **PUMP SHIFT**, and include shift instructions permanently inscribed on the pump shift switch plate. The in cab control valve shall include a detent lock to prevent accidental shifting.

**PUMP SHIFT INDICATORS LIGHT**

 The pump shift assembly shall incorporate an indicating light system which shall warn the operator if the shift to PUMP has not been completed and indicate when it has been completed. The switch that activates the lights must be mounted on the pump transmission and positioned so that the pump shift arm activates the switch only when the shift arm has completed its full travel into PUMP position.

**TRANSMISSION LOCK**

 The automatic transmission furnished in the chassis shall have a lock-up assembly which brings the transmission to direct drive and prevents the transmission from shifting gears while in the pumping mode.

**BRAKING SYSTEM**

 A positive braking system shall be provided to prevent vehicle movement during pumping operations. The air brakes furnished must satisfy this requirement.

**MAIN PUMP MOUNTS**

 Extra heavy duty pump mounting brackets shall be furnished. These shall be bolted to the frame rails in such a position to perfectly align the pump so that the angular velocity of the drive line joints shall be the same on each end of the drive shaft. This shall assure full capacity performance with a minimum of vibration. Mounting hardware shall utilize Grade 8 bolts.

 Pumps which are not mounted directly to the frame will not be considered. Under no circumstance shall the pump function as a frame cross member.

**\*\*\*\*\* PRESSURE CONTROL & ACCESSORIES \*\*\*\*\***

**CLASS ONE "TPG+" PRESSURE GOVERNOR**

 The apparatus shall be equipped with a Class1 “Total Pressure Governor Plus” (TPG+) that is connected to the Engine Control Module (ECM) mounted on the engine. The “TPG+” shall operate as a pressure sensor (regulating) governor (PSG) utilizing the engines J1939 data for optimal resolution and response when supported by the engine manufacturer. If J-1939 engine control is not supported, then analog remote throttle control shall be provided by the “TPG+”. The “TPG+” shall function as a Master Pump Discharge and Intake Gauge.

 The TPG+ shall utilize control algorithms that minimize pressure spikes during low or erratic water supply situations. The “TPG+” shall be backwards compatible to any engine that supplies J1939 RPM, Temperature and Oil Pressure information providing the ability to maintain a consistent fleet fire-fighting capability and reduce operator cross training and confusion.

 The “TPG+” shall have the ability to use either a 300 PSI or a 600 PSI discharge pressure transducer and a 300 PSI intake pressure transducer. PSG system diagnostics shall be built in and accessible by technicians. Programmable presets for RPM and Pressure settings shall be easily configurable. The straightforward menu structure shall allow the “TPG+” configuration to match existing apparatus operation as closely as possible.

 The “TPG+” shall also include indication of engine RPM, system voltage, engine oil pressure and engine /transmission temperature with audible alarm output for all. The “TPG+” uses the J1939 data bus for engine information, requiring no additional sensors to be installed. The TPG+ shall monitor and display pump and engine hours. The “TPG +” shall use J1939 broadcast warnings for the alarm as a standard and allow the “user” to select warning values if “SOPs” dictate.

 The pressure governor, monitoring and master pressure display shall be programmed to interface with a specific engine.

**AKRON INTAKE RELIEF VALVE**

 An Akron Model 59 intake relief valve system shall be plumbed on the suction side of the pump to comply fully with NFPA-1901 requirements. Excess pressures shall be plumbed to discharge water under the pump enclosure away from the pump operator.

**PUMP CERTIFICATION**

 The pump shall be third party performance tested to meet the requirements of NFPA-1901. To ensure top quality and integrity, the test company shall be Underwriter's Laboratories (UL). NO EXCEPTIONS!

**PRIMING PUMP**

 The priming pump will be a Trident air primer system. A push in primer handle will open the priming valve and prime the pump.

**MASTER DRAIN**

 The Waterous manifold drain assembly shall consist of a stainless steel plunger in a bronze body with multiple ports. The valve shall be designed so that pump discharge pressure prevents it from opening accidentally. The drain valve control shall be panel mounted, cable or rod operated and identified PUMP DRAIN.

**INDIVIDUAL BLEEDERS AND DRAINS**

 All lines shall drain through the master drain valve or shall be equipped with individual drain valves, easily accessible and labeled.

 One (1) individual "TRIDENT" quarter turn drain valve shall be furnished for each 1-1/2" or larger discharge port and each 2-1/2" gated auxiliary suction.

 Drain/bleeder valves shall be located at the bottom of the side pump module panels.

 All drains and bleeders shall discharge below the running boards.

**SYNFLEX SUCTION, DISCHARGE, PRESSURE AND CONTROL LINES**

Small lines within the pump enclosure shall be constructed from Synflex hose. Uses include, but are not limited to such lines as priming control, gauge lines, drain lines, air control valves, pump shift, supplemental cooling, foam flush and air bleeder valves.

**ANODE BLOCKS**

 Two (2) Waterous zinc anode blocks shall be provided and located on the suction side of the pump to protect the pump from corrosion.

 The Anodes shall be painted Safety Yellow for identification purposes.

**PUMP OVERHEAT INDICATOR SYSTEM**

 A Waterous Overheat Protection Manager (OPM) shall be provided to serve as a safety device by releasing hot water from the discharge area of the pump to the ground or back to a water tank. The OPM consists of a valve that opens when the water in the pump reaches 140 F (60 C) and a warning light that is triggered by a thermal switch when the water in the pump reaches 180 F (82 C). The warning light acts as an additional protection device if the temperature inside the pump keeps rising although the valve is open. The OPM valve and switch are both mounted on two 1/2” tapped holes located near the center discharge area of the pump.

**PUMP MODULE**

 The pump module shall be a self-supported structure mounted independently from the body and chassis cab. The design must allow normal frame deflection without imposing stress on the pump module structure or side running boards. The pump module shall be securely mounted to the chassis frame rails.

 The pump module shall be a welded frame work utilizing structural steel components properly braced to withstand the rigors of chassis frame flex.

**DUNNAGE AREA**

 A dunnage area shall be provided above the pump enclosure for equipment mounting and storage. This area shall be furnished with a removable 3/16" aluminum tread plate floor and shall be enclosed on the sides.

NOTE: The size of this storage area may vary when top mounted crosslays, booster reel(s), etc., are specified and located in this area.

 **\*\*\*\*\* PUMP SUCTIONS & AUXILIARY INLETS \*\*\*\*\***

**SUCTION INLETS**

 Two (2) 6" N.S.T. suction inlets shall be provided, one on the driver side pump panel and one on the officer side pump panel. A removable strainer shall be installed on each inlet.

**PUMP SUCTION ENDS**

 The main pump suction inlets shall be furnished with a short suction end, terminating with only the suction threads protruding through the side panel to minimize the distance an exterior appliance protrudes beyond the pump panel.

 One (1) 6" NST chrome plated long handle pressure vented cap shall be installed on each.

**FRONT SUCTION**

 A 6" N.S.T. front suction inlet shall be provided at the front of the vehicle, plumbed from the pump.

 The front inlet shall be located above the right hand side of the front bumper extension and shall terminate with a chromed brass, chicksan style swivel to allow a minimum of 180 degree rotation of the inlet for suction hose attachment.

 The front suction pipe shall be equipped with a chrome 6" NSTM thread adapter.

 The front inlet shall be plumbed utilizing 5", schedule 40 black iron piping, 45 degree weld elbows and a limited number of 90 degree sweep elbows in a welded assembly from the pump to the front of the cab.

 A minimum of two (2) grooved pipe couplings shall be furnished in this assembly to allow for flex and serviceability.

 The front suction inlet shall be gated with a 5" Bray in-line, full flow butterfly valve, located in the pump compartment.

 An Akron model 59 inlet relief valve shall be provided as part of the front suction plumbing, situated outboard of the rear suction gate valve.

 The front suction valve shall be air operated with a control switch located on the operator's panel with function plate.

 One (1) 6" NST chrome plated long handle vented cap(s) shall be installed on front suction.

**AUXILIARY SIDE SUCTION(S)**

 One (1) 2-1/2" auxiliary suction shall be provided at the driver side pump panel, to the rear of the main inlet. The 2-1/2" auxiliary suction shall terminate with a removable strainer, chrome plated 2-1/2" NST female swivel with a chrome plated plug and retaining chain.

 A 2 1/2" Akron #8800 series full flow, stainless steel ball valve shall be provided for the driver side rear auxiliary suction.

 A 1/4 turn swing control handle shall be provide on the driver side rear auxiliary suction valve

 All side gated inlet valves shall be recess mounted behind the side pump panels or body panels. (No Exceptions)

**TANK TO PUMP**

 One (1) 3" tank to pump line shall be piped through the front bulkhead of the tank with a 90 degree elbow down into the tank sump. This line shall be plumbed directly into the rear of the pump suction manifold for maximum efficiency.

 A check valve shall be provided to prevent accidental pressurization of the water tank through the pump connection. Connection from the valve to the tank shall be made by using a non-collapsible flexible rubber hose.

 A 3" Akron #8800 series full flow, stainless steel ball valve shall be provided between the pump suction manifold and the water tank.

 A push/pull control handle shall be located on the operator's panel with function plate.

**TANK FILL**

 One (1) 2" gated full flow pump to tank refill line controlled at the pump panel shall be provided. A deflector shield inside the tank shall be furnished. Tank fill plumbing shall utilize 2" high pressure hose for tank connection to accommodate flexing between components. (NO EXCEPTIONS)

 A 2" Akron, #8800 series, full flow, stainless steel ball valve shall be provided between the pump discharge manifold and the water tank.

 A push/pull control handle shall be located on the operator's panel with function plate.

**\*\*\*\*\* DISCHARGES & ACCESSORIES -SIDE MOUNT \*\*\*\*\***

**DRIVER'S SIDE MAIN DISCHARGE #1**

 A discharge shall be provided and located at the driver's side pump panel. The driver's side discharges #1 shall terminate with NST threads, through the left panel above the main pump intake.

 The main pump discharge shall be plumbed directly from the pump discharge manifold utilizing direct connect discharge valve flanges.

 A 2 1/2" Akron, #8800 series, full flow, stainless steel ball valve shall be provided for the driver's side #1 discharge. The valve shall be equipped with the Akron "Tork-Lok" feature.

 The discharge valve shall be equipped with integral 2 1/2" NST, 30 degree, chrome plated elbow.

 A 2 1/2 " NST chrome plated pressure vented cap shall be installed on driver's side #1 discharge.

 The driver's side #1 discharge valve shall be controlled by a rack and sector with push/pull handle located on the operator's panel.

 The driver's side #1 discharge shall be equipped with a 2 ½ “ diameter Noshok pressure gauge. The gauge shall have a rugged corrosion free stainless steel case and clear scratch resistant molded crystals with captive O-ring seals to ensure distortion free viewing and seal the gauge. The gauge shall be filled with a synthetic mixture to dampen shock and vibration, lubricate the internal mechanisms, prevent lens condensation and ensure proper operation from –40°F to +160°F.

 The gauge shall exceed ANSI B40.1 Grade A requirements with an accuracy of +/- 1.5% full scale and include a size appropriate phosphorous bronze bourdon tube with a reinforced lap joint and large tube base to increase the tube life and gauge accuracy.

 A polished chrome-plated stainless steel bezel shall be provided to prevent corrosion and protect the lens and gauge case. The gauge shall have black graphics on a white background.

**OFFICER'S SIDE MAIN DISCHARGE #1**

 A discharge shall be provided and located at the officer's side pump panel. The officer's side discharges #1 shall terminate with NST threads, through the officer's side panel above the main pump intake.

 The main pump discharge shall be plumbed directly from the pump discharge manifold utilizing direct connect discharge valve flanges.

 A 2 1/2" Akron, #8800 series, full flow, stainless steel ball valve shall be provided for the officer's side #1 discharge. The valve shall be equipped with the Akron "Tork-Lok" feature.

 The discharge valve shall be equipped with a straight 2 1/2" NST adapter that shall be equipped with a 2 1/2" NST, 30-degree, chrome plated elbow.

 A 2 1/2" NST chrome plated pressure vented cap shall be installed on officer's side #1 discharge.

 The officer side #1 discharge valve shall be controlled by a push/pull handle located on the operator's panel.

 The officer's side #1 discharge shall be equipped with a 2 ½ “ diameter Noshok pressure gauge. The gauge shall have a rugged corrosion free stainless steel case and clear scratch resistant molded crystals with captive O-ring seals to ensure distortion free viewing and seal the gauge. The gauge shall be filled with a synthetic mixture to dampen shock and vibration, lubricate the internal mechanisms, prevent lens condensation and ensure proper operation from –40°F to +160°F.

 The gauge shall exceed ANSI B40.1 Grade A requirements with an accuracy of +/- 1.5% full scale and include a size appropriate phosphorous bronze bourdon tube with a reinforced lap joint and large tube base to increase the tube life and gauge accuracy.

 A polished chrome-plated stainless steel bezel shall be provided to prevent corrosion and protect the lens and gauge case. The gauge shall have black graphics on a white background.

**OFFICER'S SIDE MAIN DISCHARGE #2**

 A discharge shall be provided and located at the officer's side pump panel. The officer's side discharges #2 shall terminate with NST threads, through the officer's side panel above the main pump intake.

 The main pump discharge shall be plumbed directly from the pump discharge manifold utilizing direct connect discharge valve flanges.

 A 3" Akron, #8800 series, full flow, stainless steel ball valve shall be provided for the officer's side #2 discharge. The valve shall be equipped with the Akron "Tork-Lok" feature.

 The discharge valve shall be equipped with a straight 3" NST adapter that shall be equipped with a 3" NST, 30-degree, chrome plated elbow.

 The officer's side #2 discharge cap provided as standard equipment shall be deleted.

 A 3" NSTF X 5" Storz Kochek S37S straight adapter w/cap shall be provided on the officer's side #2 discharge.

 The driver side rear discharge valve shall be controlled by a push/pull handle located on the operator's panel.

 The officer's side #2 discharge shall be equipped with a 2 ½ “ diameter Noshok pressure gauge. The gauge shall have a rugged corrosion free stainless steel case and clear scratch resistant molded crystals with captive O-ring seals to ensure distortion free viewing and seal the gauge. The gauge shall be filled with a synthetic mixture to dampen shock and vibration, lubricate the internal mechanisms, prevent lens condensation and ensure proper operation from –40°F to +160°F.

 The gauge shall exceed ANSI B40.1 Grade A requirements with an accuracy of +/- 1.5% full scale and include a size appropriate phosphorous bronze bourdon tube with a reinforced lap joint and large tube base to increase the tube life and gauge accuracy.

 A polished chrome-plated stainless steel bezel shall be provided to prevent corrosion and protect the lens and gauge case. The gauge shall have black graphics on a white background.

**DRIVER SIDE HOSE BED DISCHARGE**

 A 2 1/2" NST rear hose bed discharge shall be plumbed to the upper front body panel, extending into the front of the hose bed.

 The rear hose bed discharge shall terminate just above the hosebed floor, in the driver side front of the hose bed.

 The driver side hose bed discharge pipe shall be equipped with a chrome 2 1/2" NSTM thread adapter.

 The driver side hose bed discharge shall be plumbed utilizing 2 1/2" schedule 10, stainless steel piping, 45 degree threaded elbows and a limited number of 90 degree sweep elbows in an assembly from the pump to the rear of the vehicle.

 A minimum of one (1) grooved pipe coupling shall be furnished in this assembly to allow for flex and serviceability.

 A 2 1/2" Akron, #8800 series, full flow, stainless steel ball valve shall be provided for the driver side hose bed side rear discharge. The valve shall be equipped with the Akron "Tork-Lok" feature.

 The driver side hose bed discharge valve shall be controlled by a push/pull handle located on the operator's panel.

 One (1) 2 1/2" NST chrome plated pressure vented cap(s) shall be installed the driver's side hose bed discharge.

 The driver's side hose bed discharge shall be equipped with a 2 ½ “ diameter Noshok pressure gauge. The gauge shall have a rugged corrosion free stainless steel case and clear scratch resistant molded crystals with captive O-ring seals to ensure distortion free viewing and seal the gauge. The gauge shall be filled with a synthetic mixture to dampen shock and vibration, lubricate the internal mechanisms, prevent lens condensation and ensure proper operation from –40°F to +160°F.

 The gauge shall exceed ANSI B40.1 Grade A requirements with an accuracy of +/- 1.5% full scale and include a size appropriate phosphorous bronze bourdon tube with a reinforced lap joint and large tube base to increase the tube life and gauge accuracy.

 A polished chrome-plated stainless steel bezel shall be provided to prevent corrosion and protect the lens and gauge case. The gauge shall have black graphics on a white background.

**DECK GUN DISCHARGE**

 A deck gun discharge shall be plumbed from the pump to an area on top of the vehicle. The deck gun piping shall be firmly supported and braced.

 The deck gun discharge shall be located in the dunnage area above the pump module on the officer's side of the vehicle. A pedestal type, 1/4" steel plate support assembly shall be provided to stabilize deck gun plumbing below deck gun mount flange.

 The deck gun discharge pipe shall terminate with 3" NPT threads.

 The deck gun piping shall be designed so the overall height of the deck gun in the mounted/stowed position does not exceed the tallest point on the cab/body.

 The deck gun discharge shall be plumbed utilizing 3" schedule 10, stainless steel piping, 45 degree threaded elbows and a limited number of 90 degree sweep elbows in an assembly from the pump to the deck gun location.

 A minimum of one (1) grooved pipe coupling shall be furnished in this assembly to allow for flex and serviceability.

 A 3" Akron, #8800 series, full flow, stainless steel ball valve shall be provided for the deck gun discharge. The valve shall be equipped with the Akron "Tork-Lok" feature.

 The deck gun discharge valve shall be controlled by a push/pull handle located on the operator's panel.

 The deck gun discharge shall be equipped with a 2 ½" diameter Noshok pressure gauge. The gauge shall have a rugged corrosion free stainless steel case and clear scratch resistant molded crystals with captive O-ring seals to ensure distortion free viewing and seal the gauge. The gauge shall be filled with a synthetic mixture to dampen shock and vibration, lubricate the internal mechanisms, prevent lens condensation and ensure proper operation from –40°F to +160°F.

 The gauge shall exceed ANSI B40.1 Grade A requirements with an accuracy of +/- 1.5% full scale and include a size appropriate phosphorous bronze bourdon tube with a reinforced lap joint and large tube base to increase the tube life and gauge accuracy.

 A polished chrome-plated stainless steel bezel shall be provided to prevent corrosion and protect the lens and gauge case. The gauge shall have black graphics on a white background.

**FRONT DISCHARGE**

 A 1 1/2" front #1 discharge shall be plumbed to the front bumper of the vehicle.

 The front #1 discharge shall terminate on the top center of the front bumper extension gravel shield with a chrome 1 1/2" NSTM chicksan swivel adapter.

 The front #1 discharge shall be plumbed utilizing 2" schedule 10, stainless steel piping, 45 degree threaded elbows and a limited number of 90 degree sweep elbows in an assembly from the pump to the front of the vehicle.

 A minimum of one (1) grooved pipe coupling shall be furnished in this assembly to allow for flex and serviceability. Automatic discharge drains shall be provided at all low points in the plumbing.

 A 2" Akron, #8800 series, full flow, stainless steel ball valve shall be provided for the front #1 discharge. The valve shall be equipped with the Akron "Tork-Lok" feature.

 The front #1 discharge valve shall be controlled by a push/pull handle located on the operator's panel.

 A 1 1/2" NST chrome plated pressure vented cap shall be installed the front #1 discharge.

 The front #1 discharge shall be equipped with a 2 ½ “ diameter Noshok pressure gauge. The gauge shall have a rugged corrosion free stainless steel case and clear scratch resistant molded crystals with captive O-ring seals to ensure distortion free viewing and seal the gauge. The gauge shall be filled with a synthetic mixture to dampen shock and vibration, lubricate the internal mechanisms, prevent lens condensation and ensure proper operation from –40°F to +160°F.

 The gauge shall exceed ANSI B40.1 Grade A requirements with an accuracy of +/- 1.5% full scale and include a size appropriate phosphorous bronze bourdon tube with a reinforced lap joint and large tube base to increase the tube life and gauge accuracy.

 A polished chrome-plated stainless steel bezel shall be provided to prevent corrosion and protect the lens and gauge case. The gauge shall have black graphics on a white background.

**HORIZONTAL CROSSLAY #1**

 A crosslay hose bed shall be provided and plumbed from the pump in a transverse design, located above the pump enclosure for quick attack deployment. The crosslay hose bed flooring shall be designed to be removable, constructed from brushed finish, perforated aluminum material.

 Crosslay #1 shall be designed to have a minimum total capacity of 3.5 cubic feet as required by NFPA -1901 to accommodate a minimum of 200 feet of 1-3/4" fire hose.

 Crosslay #1 hosebed shall be designed to accommodate the fire hose in a single stack configuration.

 The crosslay discharge shall terminate below the hosebed floor with a 1 1/2" NSTM chicksan swivel adapter. The crosslay hose bed floor shall be slotted to allow the swivel to extend up through the floor, allowing the pre-connected hose to be pulled off either side of the apparatus without kinking the hose at the coupling connection.

 The crosslay #1 discharge shall be plumbed utilizing 2" schedule 10, stainless steel piping and/or flexible hose, 45 degree threaded elbows and a limited number of 90 degree sweep elbows in an assembly from the pump to crosslay hosebed.

 A minimum of one (1) grooved pipe coupling shall be furnished in this assembly to allow for flex and serviceability.

 A 2" Akron, #8800 series, full flow, stainless steel ball valve shall be provided for the crosslay #1 discharge. The valve shall be equipped with the Akron "Tork-Lok" feature.

 The crosslay #1 discharge valve shall be controlled by a push/pull handle located on the operator's panel.

 The crosslay #1 discharge shall be equipped with a 2 ½ “ diameter Noshok pressure gauge. The gauge shall have a rugged corrosion free stainless steel case and clear scratch resistant molded crystals with captive O-ring seals to ensure distortion free viewing and seal the gauge. The gauge shall be filled with a synthetic mixture to dampen shock and vibration, lubricate the internal mechanisms, prevent lens condensation and ensure proper operation from –40°F to +160°F.

 The gauge shall exceed ANSI B40.1 Grade A requirements with an accuracy of +/- 1.5% full scale and include a size appropriate phosphorous bronze bourdon tube with a reinforced lap joint and large tube base to increase the tube life and gauge accuracy.

 A polished chrome-plated stainless steel bezel shall be provided to prevent corrosion and protect the lens and gauge case. The gauge shall have black graphics on a white background.

**HORIZONTAL CROSSLAY #2**

 A crosslay hose bed shall be provided and plumbed from the pump in a transverse design, located above the pump enclosure for quick attack deployment. The crosslay hose bed flooring shall be designed to be removable, constructed from brushed finish, perforated aluminum material.

 Crosslay #2 shall be designed to have a minimum total capacity of 3.5 cubic feet as required by NFPA -1901 to accommodate a minimum of 200 feet of 1-3/4" fire hose.

 Crosslay #2 hosebed shall be designed to accommodate the fire hose in a single stack configuration.

 The crosslay discharge shall terminate below the hosebed floor with a 1 1/2" NSTM chicksan swivel adapter. The crosslay hose bed floor shall be slotted to allow the swivel to extend up through the floor, allowing the pre-connected hose to be pulled off either side of the apparatus without kinking the hose at the coupling connection.

 The crosslay #2 discharge shall be plumbed utilizing 2" schedule 10, stainless steel piping and/or flexible hose, 45 degree threaded elbows and a limited number of 90 degree sweep elbows in an assembly from the pump to crosslay hosebed.

 A minimum of one (1) grooved pipe coupling shall be furnished in this assembly to allow for flex and serviceability.

 A 2" Akron, #8800 series, full flow, stainless steel ball valve shall be provided for the crosslay #2 discharge. The valve shall be equipped with the Akron "Tork-Lok" feature.

 The crosslay #2 discharge valve shall be controlled by a push/pull handle located on the operator's panel.

 The crosslay #2 discharge shall be equipped with a 2 ½ “ diameter Noshok pressure gauge. The gauge shall have a rugged corrosion free stainless steel case and clear scratch resistant molded crystals with captive O-ring seals to ensure distortion free viewing and seal the gauge. The gauge shall be filled with a synthetic mixture to dampen shock and vibration, lubricate the internal mechanisms, prevent lens condensation and ensure proper operation from –40°F to +160°F.

 The gauge shall exceed ANSI B40.1 Grade A requirements with an accuracy of +/- 1.5% full scale and include a size appropriate phosphorous bronze bourdon tube with a reinforced lap joint and large tube base to increase the tube life and gauge accuracy.

 A polished chrome-plated stainless steel bezel shall be provided to prevent corrosion and protect the lens and gauge case. The gauge shall have black graphics on a white background.

**PUMP ENCLOSURE HOSEBED HOSE RETENTION**

 A vinyl cross lay cover shall be provided. It shall be securely fastened at the front with snaps and Velcro at the rear, with straps to secure each end flap.

 The crosslay cover shall be red in color.

**\*\*\*\*\*\* CONCENTRATE PIPING & FOAM SYSTEM \*\*\*\*\*\***

**FOAM PIPING**

All foam concentrate plumbing from the tank or auxiliary foam inlet to the foam system components shall be stainless steel.

 The foam system piping shall incorporate a check valve to prevent water from entering the foam tank; the discharge piping shall also include a check valve to prevent foam solution from back feeding into the discharge side of the pump. Individual discharge piping shall be as specified for each discharge.

 The complete foam system shall be tested in accordance with Chapter 17 of NFPA-1901.

 **WATEROUS AQUIS 2.5**

The apparatus shall be equipped with an automatic microprocessor controlled, conductivity based, direct injection, discharge side foam proportioning system. The installed system shall be capable of accurately proportioning all commercially available Class A foam concentrates. The system shall be accurate over the specified operation range when installed according to the instructions contained in the factory supplied installation manual.

**MICROPROCESSOR CONTROLLER**

 A 16-bit mixed signal microcontroller with 60 kB flash memory, 2 kB RAM and 12-bit analog to digital converter shall be utilized to receive input from the incoming water conductivity probe, flowmeter and foam solution conductivity probe, compare values and control the foam pump motor, providing accurate injection into the foam process manifold per the operator selected mix ratio. The controller and related electronics shall be located inside a sealed aluminum housing which is mounted to the motor/pump mounting base plate. All electrical components of the foam system shall be sealed to NEMA 4 X standards or equivalent, suitable for mounting inside the apparatus pump compartment.

 **OPERATOR INTERFACE TERMINAL**

 The system shall be equipped with an operator interface terminal (OIT) which shall be mounted on the pump operators’ panel. The OIT shall enable the pump operator to perform the following functions for the foam system:

* Provide rotary dial control of foam proportioning rates from 0.1% to 1%, in infinite increments
* Calibrate flow rate
* Perform setup and calibrate functions for the microcontroller
* Flashes then displays a steady “low concentrate” warning when the foam concentrate tank runs low - system shuts off after two (2) minutes.
* Flash a "no concentrate" warning when the foam concentrate tank is empty
* Flash an “error” warning with associated code in the event of an electronic malfunction
* Provide a manual back-up mode, controlled by the operator
* Means shall be provided for pre-selection of measurement units: U.S. Gallons, Imperial Gallons or Liters

**REMOTE ACTIVATION**

 The system can be activated from an external 12 or 24-volt electrical source, such as a pump-in-gear circuit or engine ignition on, which can eliminate one step in the operation sequence. An optional remote start/stop control and cable is available.

**FLOWMETER**

 A paddlewheel-type flowmeter shall be installed in the process manifold upstream of the foam injection point and shall be connected to the microcontroller. A 316 stainless steel paddlewheel with a carbide axle shall be utilized for improved accuracy and long life.

 The flowmeter shall be a Standard - 2" ID 400GPM / 1500 L/min with an Optional - 2.5" ID 750 GPM / 2800 L/min 2.5 inch ID available.

**FOAM PUMP**

 A 12 or 24 - volt electric motor driven positive displacement triplex plunger foam pump is equipped with an aluminum crankcase, ball bearings, forged brass pump body and manifold, solid ceramic plungers, stainless steel check valves and position guides, Buna packing and preset thermal and pressure relief valves. Rated at 2.5 GPM (9.46 L/min) at 150 psi (10 BAR) and with operating pressures up to 450 psi (32 BAR), shall be installed in a suitable, serviceable location. The system shall draw a maximum electrical load of 40 amps @ 12 VDC or 21 amps @ 24 VDC. A pump motor electronic driver, located inside the controller housing shall receive signals from the microcontroller and power the 1/2 hp (.4 Kw) electric motor in a variable speed duty cycle to ensure that the correct amount of foam concentrate as set by the pump operator is injected into the water stream.

**CONTROL CABLES AND CONNECTORS**

 The cables for interconnection of the control unit, OIT, temperature sensors and flowmeter shall be electrically shielded to prevent radio frequency or electro-mechanical interference.

**LOW TANK LEVEL SWITCH (Optional)**

 A low tank level float switch shall be installed in each foam concentrate tank and connected to the control unit to alert the operator to low foam supply conditions.

**FOAM INJECT CHECK VALVE**

 A brass and stainless steel check valve shall be provided in the foam concentrate line at the foam injection point to prevent water backflow into the foam supply reservoir.

**SYSTEM COMPONENTS**

Components of the complete foam system supplied by Waterous shall include:

* Operator interface terminal (OIT)
* Pump module with electric motor/motor driver and microcontroller unit
* Foam concentrate strainer
* Shielded electrical cables for connection of all electronic components
* Foam inject check valve (Waterway check valve optional)
* WYE Strainer
* Low level tank switch
* Flowmeter and Tee - 2" ID ( 2.5" optional)
* System diagram and rating placards (per NFPA 1901) for pump panel mounting (optional)
* Installation, operation and service manuals

 An installation and operation manual shall be provided for the unit along with a copy of the warranty policy. The system must be installed and serviced by an authorized Waterous OEM or service center.

 Note: Multiple discharges plumbed to this system may affect performance if the flow rates are exceeded by any one discharge or the totality of multiple discharges at one time!

 The discharge piping shall be equipped with a properly sized flowmeter sensor, based on the systems capabilities.

 The foam system shall be plumbed to the following discharge/s through the discharge piping or manifold system:

Crosslay #1 discharge

Crosslay #2 discharge

Front discharge

**FOAM CONCENTRATE**

 The foam system shall be capable of injecting the following foam concentrates:

* **No Class A foam selected**
* **No Class B foam selected or Class B foam system present**

**\*\*\*\* PUMP PANEL & ACCESSORIES \*\*\*\*\***

**PUMP PANEL - SIDE MOUNT**

 The pump operator's control panel shall be located on the driver side of the apparatus. The pump enclosure side panels shall be completely removable and designed for easy access and servicing.

**PUMP PANEL MATERIAL**

 The left side operator's panel, gauge panel, right side pump panel and right side access door shall be fabricated from 14-gauge 304L stainless steel with a #4, (150/180 grit), standard brushed finish.

**HINGED GAUGE PANEL**

 A full width, vertically hinged gauge access panel shall be provided at the operator's position. Chrome plated positive locks shall be provided along with chain holders to prevent the front of the gauge panel from coming in contact with other panels when open.

**VERTICALLY HINGED PUMP PANEL OFFICER SIDE**

 The officer's side pump panel shall be vertically hinged to provide complete access to the pump and plumbing on the right side of the pump enclosure. The panel shall be equipped with a stainless steel hinge and secured with push type locks to hold the panel closed. The drains located on the officer's side panel shall be fastened to the lower 6" of the panel, which shall be stationary.

**PANEL FASTENERS**

 Stainless steel machine screws and lock washers shall be used to hold these panels in position. The panels shall be easily removable to provide complete access to the pump for major service.

**CAPS AND ADAPTERS SAFETY TETHER**

 All applicable discharge and suction caps, plugs and adapters shall be equipped with chrome plated ball chain or double looped coil chain and secured to the vehicle.

**PUMP PANEL TRIM PLATES**

 A high polish stainless steel trim plate shall be provided around each discharge port and suction inlet opening to allow accessibility to the respective valve for service and repairs.

**DISCHARGE GAUGE TRIM BEZELS**

 Each individual discharge gauge shall be installed into a decorative chrome-plated mounting bezel that incorporates valve-identifying verbiage and color labels.

**COLOR CODED IDENTIFICATION TAGS**

 Color coded identification tags shall be provided for all gauges, controls, connections, switches, inlets and outlets.

**PUMP OPERATOR'S PANEL LIGHT SHIELD AND STEP**

 The pump operators panel shall be equipped with a light shield/step that shall be full width of the control panel, and shall be positioned to cover the lights and prevent glare. The light shield shall be fabricated from aluminum tread plate, which shall also serve as a step. The step shall be a minimum of 8" deep X the width of the pump panel.

 The light shield shall be equipped with the following lights:

Amdor Luma Bar H2O super bright led strip lights

**OFFICER SIDE PUMP PANEL LIGHT SHIELD AND STEP**

 The officer side pump panel shall be equipped with a light shield/step that shall be full width of the panel, and shall be positioned to cover the lights and prevent glare. The light shield shall be fabricated from aluminum tread plate, which shall also serve as a step. The step shall be a minimum of 8" deep X the width of the pump panel.

 The light shield shall be equipped with the following lights:

* Amdor Luma Bar H2O super bright led strip lights

 The lights shall be switched with the operator panel lights.

**PUMP OPERATOR'S PANEL**

 Particular attention is to be given to functional arrangement of all controls. The pump operator's panel shall accommodate the following:

* Hinged gauge panel
* Water tank fill valve
* Auxiliary suction valve control
* All discharge valve controls
* Auxiliary engine cooler controls
* Water tank suction control valve
* Pump primer valve
* Engine throttle control
* Master compound vacuum gauge
* Master pressure gauge
* Individual discharge gauges
* Pump shift engaged indicator light
* Water tank water level indicator
* Engine tachometer
* Engine oil pressure gauge with audible alarm
* Engine water temperature gauge with audible alarm
* Low voltage light and audible alarm
* Pump panel light switch
* Speed counter (Underwriters)
* Pump performance plate (Underwriters)
* Pump serial No. plate
* Master pump drain valve
* Individual drains
* Voltmeter
* Air inlet/outlet at lower driver side panel
* Pump panel air horn actuation button
* 3/8" Pump cooler (Bypass Line)
* Class One "TPG+" pressure governor control

**PUMP TEST PORTS**

 The pump panel shall be equipped with Vacuum & Pressure test plugs to allow for test equipment to monitor pump pressure and vacuum levels. Chrome plugs and labels shall be provided for the test ports.

**MASTER PUMP GAUGES**

 The master pump intake pressure and vacuum, and the main pump discharge pressure shall be indicated on the pressure governor display.

**PRESSURE & COMPOUND GAUGE RANGES**

 All applicable pressure gauges shall have a range of 0 - 400 P.S.I., and the compound gauge shall have a range of -30" - 0 - 400 P.S.I.

**ENGINE COOLER**

 An auxiliary cooler or heat exchanger shall be installed in the engine compartment between the engine and the chassis radiator. The cooler shall permit the use of water from the pump for cooling system. The cooling shall be done without mixing engine and pump water.

**TANK LEVEL GAUGE**

 An Innovative Controls model #3030358, Ultra-Bright LED water level monitor shall be provided on the pump operator's panel. The level gauge shall contain ten (10) high intensity LED's on the display in a vertical pattern allowing the full, 3/4, 1/2, 1/4 and refill levels to be easily distinguished at a glance. The display shall use a two-dimensional, two-element lens to refract the light from the LED's to provide full 180° visibility for the level indications.

 The gauge shall use a pressure transducer installed near the bottom of the water tank to determine the correct volume in the tank.

**FOAM TANK LEVEL GAUGE - FOAM TANK "A"**

 An Innovative Controls model #3030393-01, Ultra-Bright LED foam level monitor shall be provided on the pump operator's panel. The level gauge shall contain ten (10) high intensity LED's on the display in a vertical pattern allowing the full, 3/4, 1/2, 1/4 and refill levels to be easily distinguished at a glance. The display shall use a two-dimensional, two-element lens to refract the light from the LED's to provide full 180° visibility for the level indications.

 The gauge shall use a pressure transducer installed near the bottom of the foam tank to determine the correct volume in the tank.

**WATER TANK**

 The water tank shall have a capacity of 980 gallons, constructed from Poly material.

**FOAM TANK "A"**

 In addition to the water capacity of the tank, a 20 gallon integral foam storage area shall be built into the water tank. The foam tank shall have a latched fill tower, properly labeled as the foam fill point. A valved drain shall be provided.

**TANK CONSTRUCTION**

 The Poly water tank shall be constructed from 1/2" thick polypropylene sheet stock. This material shall be a non corrosive stress relieved thermo-plastic, natural in color, and U.V. stabilized for maximum protection.

 The water and foam tanks shall be of a specific configuration and shall also designed to be completely independent of the body and compartments. All joints and seams shall be nitrogen welded and tested for maximum strength and integrity. The top of the booster tank shall be fitted with removable lifting eyes designed with a 3 to 1 safety factor to facilitate easy removal. The transverse swash partitions shall be manufactured of 3/8" polypropylene (natural in color) and extend from approximately 4" off the floor to just under the cover. The longitudinal swash partitions shall be constructed of 3/8" polypropylene (natural in color) and extend from the floor of the tank through the cover to allow for positive welding and maximum integrity. All partitions shall be equipped with vent and air holes to permit movement of air and water between compartments. The partitions shall be designed to provide maximum water flow. All swash partitions interlock with one another and are welded to each other as well as to the walls of the tank.

**TANK LID**

 The tank cover shall be constructed of 1/2" thick polypropylene, natural in color, and U.V. stabilized, to incorporate a multi three-piece design, which allows for individual removal and inspection if necessary. The tank cover shall be recessed 3/8" from the top of the tank and shall be welded to both sides and longitudinal partitions for maximum integrity. Each one of the covers shall have hold downs consisting of 2" polypropylene dowels spaced a maximum of 30" apart. These dowels shall extend through the covers and become welded to the transverse partitions. This shall assist in keeping the cover rigid under fast filling conditions. A minimum of two lifting dowels shall be drilled and tapped 1/2" X 13" to accommodate the lifting eyes.

**TANK FILL TOWER**

 The tank shall have a combination vent and manual fill tower. The fill tower shall be constructed of 1/2" polypropylene and shall be 12" W x 12" L outer perimeter. The tower shall have a 1/4" thick removable polypropylene screen and a polypropylene hinged type cover. The fill tower cover shall be marked as a water tank fill point.

**OVERFLOW AND VENT PIPE**

 The fill tower shall be fitted with an integral 4" I.D. schedule 40 P.V.C. combination overflow/vent pipe running from the fill tower through the tank to a 4" coupling flush mounted into the bottom of the tank to allow water to overflow behind the chassis rear axle.

**TANK SUMP**

 The tank sump shall be a minimum of 10" wide x 10" long x 3" deep. An anti-swirl plate shall be mounted inside the sump, approximately 1" above the bottom of the sump.

**TANK SUMP CONNECTION**

 The front bulkhead of the water tank shall be fitted with one (1) tank sump.

 A 3" drain plug shall be provided.

**OUTLETS**

 There shall be two (2) standard tank outlets; one for tank-to-pump suction line which shall be a minimum of 4" coupling and one for a tank fill line which shall be a minimum of a 2" N.P.T. coupling. All tank fill couplings shall be backed with flow deflectors to break up the stream of water entering the tank.

**TANK MOUNTING**

 The tank shall rest on the body cross members spaced a maximum of 22" apart, and shall be insulated from these cross members with a minimum of 3/8" nylon webbing or 1/2" rubber, 2-1/2" wide. The tank shall sit cradle-mounted using four (4) corner angles of 6 x 6 x 4 x 0.250 welded directly to the body cross members. The angles shall keep the tank from shifting left to right or front to rear. The tank is designed on the free-floating suspension principle and shall not require the use of hold downs. The tank shall be completely removable without disturbing or dismantling the apparatus body structure. The body or hose bed cross braces shall act as water tank retainers.

**APPARATUS BODY DESIGN CONSTRUCTION**

 The body side and compartment assemblies shall be designed and assembled to provide maximum strength and durability under all operating conditions.

 Special attention shall be taken to minimize corrosion on all fabricated parts and structural members of the body. All bolt-on components shall be provided with a dissimilar metals isolation barrier to prevent electric corrosion. The body design shall also incorporate removable panels to access rear body mounts and fuel tank sending units.

 The body shall be completely isolated from the cab and pump module structure.

**BODY AND COMPARTMENT FABRICATION - 3/16" ALUMINUM**

 All compartment panels and body side sheets shall be entirely 3/16" aluminum (5052-H32). Each side compartment assembly shall be both plug welded and stitch welded to ensure proper weld penetration on all panels while avoiding the possible warping caused by a full seam weld. The side compartments shall be welded on a fixture to ensure true body dimensions of all door openings. The side compartments and body side panels are then set into a body squaring fixture where the super structure is installed and the entire body is aligned to be completely symmetrical. The super structure is then welded to the compartment side panels and reinforcement plates are inserted which allows the compartment panels to become an integral component of the body support structure. A full seam weld shall not be used due to the applied heat which shall distort sheet metal and remove the protective coating from the perimeter of the welded area. All seams shall be caulked prior to finish paint to ensure proper compartment seal.

**SUPER STRUCTURE - ALUMINUM**

 The body super structure shall be an all welded configuration utilizing a combination of 3” x 1-1/2” 6061-T6 thick walled structural tubing and 6061 structural channel.

 This structure shall be designed to totally support the full length and width of the body and shall be welded to the body side compartments by use of reinforcement plates to incorporate the compartments into an integral part of the body weldment.

 The super structure shall be bolted to the sides of the chassis frame at four (4) points.

**STEPPING, STANDING, & WALKING SURFACES**

 All stepping, standing, and walking surfaces on the body shall meet NFPA #1901 anti-slip standards. Aluminum tread plate utilized for stepping, standing, and walking surfaces shall be Alcoa No Slip type. This material shall be certified to meet the NFPA #1901 standard. Upon request by the Purchaser, manufacturer shall supply proof of compliance with this requirement. (There shall be No Exceptions allowed for this paragraph)

**DRIVER'S SIDE COMPARTMENTATION**

 One (1) full height/full depth compartment, with a rollup door, shall be provided forward of the rear wheels. Compartment dimensions 68" high x 49" wide x 29" deep, with a door opening of 64" high x 46" wide.

 One (1) high side compartment, with a rollup door, shall be provided above the rear wheels. Compartment dimensions 36" high x 64" wide by 29" deep, with a door opening of 33-1/2" high by 58" wide.

 One (1) full height/full depth compartment, with a rollup door, shall be provided behind the rear wheels. Compartment dimensions 68" high x 49" wide x 29" deep, with a door opening of 64" high x 46" wide.

**OFFICER'S SIDE COMPARTMENTATION**

 One (1) full height/split depth compartment, with a rollup door, shall be provided forward of the rear wheels. Compartment dimensions 68" high x 49" wide x 29" deep in the lower 30" high area, 14" deep in the upper 38" high area, with a door opening of 64" high x 46" wide.

 One (1) high side compartment, with a rollup door, shall be provided above the rear wheels. Compartment dimensions 36" high x 64" wide by 14" deep, with a door opening of 33-1/2" high by 58" wide.

 One (1) full height/split depth compartment, with a rollup door, shall be provided behind the rear wheels. Compartment dimensions 68" high x 49" wide x 29" deep in the lower 30" high area, 14" deep in the upper 38" high area, with a door opening of 64" high x 46" wide.

**ROLL-UP DOORS**

 Roll-up doors shall be provided on all compartments. The roll-up doors shall be constructed from aluminum extruded slats which shall have a flexible seal between each slat for proper sealing of the door.

 A synthetic rubber seal shall be provided at each side, top and bottom edge of the door to prevent entry of dirt into the compartment.

 The door shall be equipped with a lift bar style latch mechanism which shall latch at the bottom of the door mounting extrusion.

 The roll-up door assembly shall be furnished with a spring-loaded, counter balance assembly to assist in door actuation.

 All running board and high side compartments shall be equipped with roll-up doors.

**AMDOR ROLL-UP DOORS**

 The roll-up doors shall be Amdor brand roll-up doors, equipped with a satin finish, with a dual durometer slat seal. The slats shall be made from 1” double-wall aluminum with a continuous ball and socket hinge joint. The interior of the door shall use a smooth interior door curtain to prevent equipment hang-ups. The bottom panel flange shall have a stainless steel lift bar latching system with cut-outs for ease of access with gloved hands.

**SWEEP-OUT COMPARTMENT FLOORS**

 Compartment floors shall be welded to the compartment walls and have a sweep out design for easy cleaning.

 Compartments with hinged doors shall have the door opening flanges bend down to produce the sweep-out design.

 Compartments with roll-up style doors shall have the external floor flange stepped down, 1/2" high x 2" deep, to produce a sealing surface for the roll-up doors below the compartment floor. The sweep out design shall also permit easy cleaning.

 Compartments set on running boards, which could cause additional corrosion potential, are not acceptable.

**COATED FASTENERS - (NO EXCEPTIONS)**

 All exterior fasteners shall be coated stainless steel screws. Screw threads shall be coated with reusable, self-locking, sealing material to provide vibration resistance. Screw heads shall be coated with a sealing element to prevent galvanic corrosion between dissimilar metals. Non-coated screws shall only be provided as part of vendor supplied component installations.

**COMPARTMENT LOUVERS**

 Ventilation between compartments to atmosphere shall be provided and located to avoid water entry into compartments.

**ACCESS PANELS**

 Removable access panels shall be provided to access fuel tank sender, electrical junction compartment and rear body mounts.

 Protective panels shall be located in the rear compartments providing access to the lights and associated wiring. The covers shall also serve as protective covers to prevent inadvertent damage to lights or wiring from tools or equipment located in the compartment.

**BODY PROTECTION PANELS**

 The front face of the side compartments, next to the driver and officer side pump panels shall be overlaid with aluminum tread plate full height protection.

**REAR BODY PANEL**

 The rear body panel shall extend the full width between the side compartments. This panel shall be full height from the rear step compartment to the hose bed floor. The panel shall be bolted on and removable, with no part of the rear panel attached to the booster tank. The rear body panel material shall be aluminum treadplate as standard, if Chevron striping is specified for the rear of the body then smooth aluminum shall be utilized.

**BODY RUB RAILS**

 Sacrificial C-Channel style rub rails shall be mounted at the base of the body, extend outward from the body. The rub rails shall extend the full length of the main body. Rub rails shall be designed to bolt to the body from the bottom side of the compartment area, so as not to damage the body side panels on initial impact and to provide for ease of replacement.

**RUNNING BOARD STEPS**

 The driver and officer running board steps shall be fabricated of 3/16" polished aluminum tread plate. The outside edge on each step shall be fabricated with a double break, return flange. The steps shall be rigidly reinforced with a heavy duty support structure. The running boards shall not form any part of the compartment design, and shall be bolted into place with a minimum 1/2" clearance gap between any panel to facilitate water runoff.

**OFFICER SIDE RUNNING BOARD STORAGE WELL**

 A storage well, constructed of 1/8" aluminum, shall be recessed into the officer’s side running board. The storage well shall measure 9" deep x 9" wide x as long as possible between the running board support members. Drain holes shall be located in the bottom corners to allow water to drain from the storage well.

 The officer's side running board hose well shall be furnished with Velcro straps to secure the hose stored in the well. The straps shall be attached to each side of the hose well with stainless steel footman loops.

**DRIVER SIDE RUNNING BOARD STORAGE WELL**

 A storage well, constructed of 1/8" aluminum, shall be recessed into the driver’s side running board. The storage well shall measure 9" deep x 9" wide x as long as possible between the running board support members. Drain holes shall be located in the bottom corners to allow water to drain from the storage well.

 The driver's side running board hose well shall be furnished with Velcro straps to secure the hose stored in the well. The straps shall be attached to each side of the hose well with stainless steel footman loops.

**REAR STEP**

 The rear step shall be fabricated from 3/16" polished aluminum tread plate, and shall be rigidly reinforced. The rear step shall extend 12" past the rear edge of the body, and shall be 100" wide, with square corners.

 The rear edge of the step shall be designed to accommodate the rear clearance lights, recessed for protection in the step reinforcement channel. The step treadplate overlay shall be bolted to the step frame for ease of replacement.

**REAR STEP COMPARTMENT**

 One (1) rear step compartment 51" high x 42" wide x 29" deep in the lower portion and 12" deep in the upper portion shall be provided with a door opening of 49" high x 42" wide.

 The rear step compartment door shall be a roll-up door. The roll-up door shall be equipped with a brushed aluminum finish.

**GRAB RAILS**

 All hand rails shall be 1-1/4" outer diameter, knurled bright anodized aluminum extrusion, designed to meet NFPA 1901 requirements.

 Molded gaskets shall be installed between the handrail stanchion castings and body surfaces to prevent electrolytic reaction between dissimilar metals and to protect paint.

**GRAB RAIL LOCATIONS:**

Two (2) vertical rails shall be mounted on the rear edge of the beavertails, one (1) each side.

 One (1) horizontal, full width handrail shall be installed on the rear, below the level of the hose bed.

 Two (2) vertical handrails shall be mounted above each pump panel, (1) each side, to assist access from the running board steps to the top of the body.

**FOLDING STEPS-FRONT OF BODY**

 Four (4) Austin Hardware model FS-200 CHR large folding steps, made of high strength die cast aluminum, with a textured chrome plate finish, minimum of 42 in² surface, conforming to NFPA-1901 requirements, shall be provided on the front face of the running board compartments, above running board steps, two (2) each side. The steps shall be mounted to accommodate access to the body hosebed area with a maximum of 18" height between each step.

 **FOLDING STEPS - REAR OF BODY**

 Four (4) Austin Hardware model FS-200 CHR large folding steps, made of high strength die cast aluminum, with a textured chrome plate finish, minimum of 42 in² surface, conforming to NFPA-1901 requirements, shall be provided on the rear of the body, two (2) each side. The steps shall be mounted to accommodate access to the body hosebed area with a maximum of 18" height between each step.

**SAFETY SIGN(S) AT REAR STEP AND CROSS WALKWAY(S)**

 Safety sign(s) shall be located on the vehicle at the rear step, and at any cross walkway(s), to warn personnel that riding in or on these areas while the vehicle is in motion is prohibited.

**REAR WHEEL WELL LINERS**

 Fully removable, one piece, bolt-in, stainless steel rear wheel well liner and fenderette will be provided. The wheel well liners will be natural metal finish and will protect the front and rear compartments and main body supports from damage. Wheel well liners and fenderettes which are welded in place or are only partially removable shall not be considered. (No Exceptions)

**\*\*\* BODY FENDER STORAGE OPTIONS \*\*\***

**OFFICER FRONT FENDER STORAGE**

 A storage compartment shall be inserted into the front officer side body fender. The compartment shall be sized large enough to store three (3) SCBA cylinders or fire extinguishers, with a maximum length of 26". The compartment shall have a non-abrasive floor area for the three (3) devices. The compartment shall be enclosed by a door painted to match the primary body color, with a single point latch and hinge. This compartment shall be tied into the compartment door ajar/do not move apparatus warning system.

**OFFICER REAR FENDER STORAGE**

 A storage compartment shall be inserted into the rear officer side body fender. The compartment shall be sized large enough to store three (3) SCBA cylinders or fire extinguishers, with a maximum length of 26". The compartment shall have a non-abrasive floor area for the three (3) devices. The compartment shall be enclosed by a door painted to match the primary body color, with a single point latch and hinge. This compartment shall be tied into the compartment door ajar/do not move apparatus warning system.

**DRIVER REAR FENDER STORAGE**

 A storage compartment shall be inserted into the rear driver side body fender. The compartment shall be sized large enough to store two (2) SCBA cylinders or fire extinguishers, with a maximum length of 26". The compartment shall have a non-abrasive floor area for the two (2) devices. The compartment shall be enclosed by a door painted to match the primary body color, with a single point latch and hinge. This compartment shall be tied into the compartment door ajar/do not move apparatus warning system.

**DRIVER FRONT FENDER STORAGE**

 A slide out absorbent storage bin shall be installed in the front driver side body fender. The storage bin shall be constructed of smooth aluminum and shall be sized to store a minimum of 50 lbs. of absorbent material. The bin shall be installed on sliding tracks that allow the bin to extend out of the body fender for dumping/filling. There shall be a hinged lid on top of the storage bin to add material to the bin, and a spring loaded valve at the bottom to dispense material out of the bin. The compartment shall be enclosed by a door painted to match the primary body color, with a single point latch and hinge. This compartment shall be tied into the compartment door ajar/do not move apparatus warning system.

**MUD FLAPS**

 Heavy duty mud flaps shall be provided behind the rear wheels.

**REAR TOW EYES**

 Two (2) painted tow eyes shall be furnished on the rear of the vehicle. The tow eyes shall be made from plate steel and shall be bolted directly to the chassis frame rails with grade 8 bolts and shall extend below the body. The tow eyes shall be smooth and free from sharp edges, and have a minimum eyelet hole of 2-1/2". The tow eyes shall be painted.

**HOSE BED**

 The hose bed shall be located directly above the booster tank and shall be free from all sharp objects such as bolts, nuts, etc., to avoid damage to fire hose.

 The hose bed will provide approximately 141 cubic feet of hose storage area for 2 ½” or larger fire hose, exceeding NFPA 1901 minimum pumper hose storage requirements. The hose bed depth shall be 16".

 The apparatus weight analysis will be based on 800' of 2 ½” hose unless otherwise specified. If the hose load to be carried exceeds this minimum, the purchaser must advise the manufacturer prior to contract so adequate chassis carrying capacity can be provided.

 For added strength and rigidity, the hose bed side walls shall be (3) inches thick. The top edge of the front wall shall be flanged inward two (2) inches and downward one (1) inch.

**HOSE BED FLOORING**

 Flooring to be constructed from extruded aluminum and be properly spaced for ventilation. The flooring shall be smooth and free from sharp edges to avoid hose damage. The hose bed floor shall be removable to provide access to inner body framework.

**HOSE BED PARTITIONS**

 Two (2) fully adjustable 3/16", brushed finish, aluminum hose bed partitions shall be provided. Partitions shall be easily adjustable by means of Unistrut channels located at the front and rear of the hose bed. Partitions shall be removable for access to the booster tank.

**VINYL HOSE BED COVER - 1/4 TURN FASTENERS**

 A hose bed cover shall be provided and installed. The cover shall be made from 22 ounce; heavy-duty vinyl coated polyester fabric (TXN 226). The cover shall be sewn with ultraviolet resistant thread and shall have 2" wide nylon webbing sewn around the perimeter to provide additional strength.

 The cover shall be secured to the top front body flange with quarter-turn fasteners. The cover shall be secured to the side body flanges with quarter-turn fasteners. A weighted flap shall be furnished on the rear of the cover with two (2) bungee cords.

 The Hypalon material shall be red in color.

**LADDER STORAGE**

 The ground ladders shall be stored vertically next to the water tank, behind the side body compartments, on the officer side of the apparatus.

**LADDERS**

 The following Alco-Lite ground ladder compliment shall be provided:

One (1) Alco-Lite model PEL-24; 24', aluminum, two (2) section extension ladder shall be provided.

One (1) Alco-Lite model PRL-14; 14', aluminum, straight roof ladder with folding hooks shall be provided.

One (1) Alco-Lite model FL-10; 10', folding, aluminum, attic ladder shall be provided.

**\*\*\*\* PIKE POLES AND HOLDERS \*\*\*\***

**PIKE POLE STORAGE**

 Two (2) pike pole tube(s) shall be provided. Each holder shall be equipped with a spring type holder and shall be accessible from the rear of the apparatus. Each pike pole holder shall be labeled to indicate the pike pole length.

 The pike pole tube(s) shall be mounted in the ladder storage compartment.

**SUCTION HOSE STORAGE**

 The suction hoses shall be located beneath the hose bed, one (1) on the driver side and one (1) on the officer side. The hose storage area shall be accessed from the rear of the apparatus. The storage area shall be enclosed with a hinged door on the rear of the body.

 Note: On bodies with rollup style doors this storage area shall be behind the roll of the door and will not affect usable compartment space. On bodies with hinged style doors this storage area shall be in the top corner of the compartment.

**SUCTION HOSE**

 Two (2) 13 foot sections of six (6) inch PVC lightweight suction hose shall be furnished (Kochek or Firequip Maxi-Flex). Suction hose shall be for suction only and not to be used on pressurized hydrants or for relay pumping. Couplings shall include a long handle, female swivel on one end and a rocker lug male on the other end. All threads shall be six (6) inch N.S.T.

 NOTE: All PVC suction hoses are strictly drafting hoses and must not be used on hydrants or in pressure applications, as serious personal injury or death may occur.

**STRAINER**

 One (1) 6" NST barrel type strainer(s) shall be provided to attach to the suction hose. A compartment mounting bracket shall also be provided to store the strainer(s) when not in use.

**EQUIPMENT CLARIFICATION**

 The NFPA-1901 recommended double female hydrant adapter shall not be provided by the apparatus manufacturer.

**ADDITIONAL ITEMS SUPPLIED WITH THE VEHICLE**

* 1 - Pint of touch up paint for each color
* 1 -Bag of assorted stainless steel nuts and bolts

**LOOSE EQUIPMENT**

 The following items shall be provided and shipped loose with the completed apparatus at the time of delivery:

**WHEEL CHOCKS**

 Two (2) ZICO #SAC-44 wheel chocks shall be mounted forward of the rear wheels on the driver side below the side running board compartments.

**\*\*\*\* PAINT SECTION \*\*\*\***

**PAINT, PREPARATION AND FINISH**

 The PPG Delta, Low V.O.C., polyurethane finishing system, or equal, shall be utilized. A "Clear Coat" paint finish shall be supplied to provide greater protection to the quality of the exterior paint finish.

 All removable items, such as brackets, compartment doors, etc. shall be painted separately to insure finish paint behind mounted items. All compartment unwelded seams exposed to high moisture environments shall be sealed using permanent pliable caulking prior to finish paint.

**BODY PRIMER & PREPARATION**

 All exposed welds shall be ground smooth for final finishing of areas to be painted. The compartments and doors are totally degreased and phosphatized. After final body work is completed, grinding (36 and 80 grit), and finish sanding shall be used in preparation for priming.

**BODY FINISH PAINT**

 The body shall be finish sanded and prepared for final paint. Upon completion of final preparation, the body shall be painted utilizing the highest quality, state of the art, low V.O.C., polyurethane base paint. Finish paint shall be applied in multiple coats to ensure proper paint coverage with a high gloss finish.

 The entire body shall be buffed and detailed.

**BODY PAINT**

 The inside and underside areas of the complete body assembly shall be painted black, prior to the installation of the body on the chassis or torque box.

**COMPARTMENT PAINT**

 The interior of the compartments shall be finish painted with Zolatone #20-63 Marble Stone scuff resistant paint to provide a protective application over all of the compartment interior surfaces.

**BODY PAINT**

 The body paint finish shall be PPG Delta System in a single color, to match customer furnished paint codes and requirements.

**PUMP / PIPING PAINT**

 The pump enclosure and pump/plumbing within the pump enclosure shall be painted black.

**CAB PRIMER & PREPARATION**

 The cab primer shall be a two (2) stage process. First stage shall be a coating with a two part component, self etching, corrosion resistant primer to chemically bond the surface of the metal for increased adhesion. Second stage shall be multiple coats of a catalyzed, two component polyurethane, primer applied for leveling of small imperfections and top coat sealing.

**CAB FINISH PAINT**

 The entire cab shall be finish sanded and prepared for final paint. Upon completion of final preparation, the cab shall be painted utilizing the highest quality, state of the art, low V.O.C., polyurethane base paint. Finish paint shall be applied in multiple coats to ensure proper paint coverage with a high gloss finish.

 The cab exterior shall be finish painted with PPG Delta system, single color, to match purchaser's furnished paint code.

 The entire exterior finish of the cab shall be buffed and detailed.

**CAB INTERIOR PAINT**

 The interior metal surfaces of the cab shall be finish painted the same color as the main exterior color.

**CHASSIS PAINT**

 The chassis frame rails, suspension and axles shall be painted black with a Polyurethane base paint prior to installation of any air lines or electric systems to ensure proper serviceability.

**WHEEL PAINT**

 The chassis wheels and hubs shall be provided as painted by the original wheel and axle manufacturers

**PAINT CODE/S**

 The paint shall match customer furnished paint code and layout. The paint code shall be as indicated below:

* **PRIMARY PAINT COLOR**

 *Single Color: Red Paint Code# 71528*

**TOUCH-UP PAINT**

 One (1) pint of each exterior color paint for touch-up purposes shall be supplied when the apparatus is delivered to the end user.

**FINALIZATION & DETAILING**

 Prior to delivery the vehicle, the interior and exterior be cleaned and detailed. The finalization process detailing shall include installation of NFPA required labels, checking fluid levels, sealing and caulking required areas of the cab and body, rust proofing, paint touch-up, etc.

**RUST PROOFING**

 The entire unit shall be thoroughly rust proofed utilizing rustproof and sound deadening materials applied in manufacturer recommended application procedures. Rust proofing shall be applied during the assembly process and upon completion to insure proper coverage in all critical areas.

**\*\*\*\* LETTERING AND STRIPING \*\*\*\***

**LETTERING**

 Lettering shall not be provided any where on the apparatus.

**\*\*\*\* NFPA REQUIRED SCOTCH-LITE STRIPING \*\*\*\***

**SCOTCH-LITE STRIPE**

 A six (6) inch high "Scotch-Lite" stripe shall be provided. The stripe shall be applied on a minimum of 60 percent of each side of the unit, 60 percent on the rear of the unit and 40 percent on the front of the unit. The Scotch-Lite stripe layout shall be determined by the Fire Department.

 The Scotch-Lite shall be white in color.

 A six (6) inch simple "Z" effect shall be incorporated into the Scotch-Lite scheme on the body. Final layout of this configuration shall be determined by the Fire Department.

**SCOTCH-LITE ACCENT STRIPES**

 A 1" high Scotch-Lite material accent stripe shall be incorporated into the Scotch-Lite scheme to border the primary Scotch-Lite stripe on the top and bottom edges. Final layout of this configuration shall be determined by the Fire Department.

**REAR CHEVRON STRIPING**

 At least 50% of the rear facing vertical surface shall be covered with alternating strips of reflective striping.

 The striping shall be 6" Diamond Grade Scotch-Lite.

 The Diamond Grade Scotch-Lite shall be Red and Yellow in color.

**\*\*\*\*\* WARRANTIES & REQUIRED INFORMATION \*\*\*\*\***

**VEHICLE WARRANTY**

 The proposed vehicle includes a one (1) year new vehicle warranty, upon delivery and acceptance of the vehicle. The warranty will ensure that the vehicle has been manufactured to the proposed contract specifications and will be free from defects in material and workmanship that may appear under normal use and service within the warranty period. The warranty may be subject to different time and mileage limitations for specific components and parts. This warranty is issued to the original purchaser of the vehicle.

 The warranty will not apply to tires, batteries, or other parts or components that are warranted directly by their manufacturers. The warranty will not apply to routine maintenance requirements as described in the service and operators manual. No warranty whether express, implied, statutory or otherwise including, but not limited to any warranty of merchantability or fitness for purpose will be imposed.

**OVERALL UNIT AND CUSTOM CHASSIS**

 All components and parts of the vehicle are warranted for a period of one (1) year from acceptance of the vehicle, unless excluded elsewhere in this warranty or described as having longer time limitations.

**ENGINE WARRANTY**

 The unit will be equipped with a Fire Service rated engine, which will come furnished with a five (5) year Engine Manufacturer's warranty. A copy of the manufacturer's warranty will be supplied to define additional details of the warranty provisions.

**TRANSMISSION WARRANTY**

 The required Allison transmission shall be provided with a five (5) year warranty. A copy of the Allison transmission warranty shall be supplied to the purchaser to define additional details of the warranty provisions.

**CUSTOM CHASSIS FRAME RAILS**

 The proposed KME custom chassis frame and cross members will be warranted for an unlimited time period. A copy of KME's frame rail warranty will be supplied to define additional details of the warranty provisions.

**CROSSMEMBERS WARRANTY**

 A lifetime warranty will be provided on all chassis frame cross members.

**MERITOR AXLE WARRANTY**

 The Meritor axle/s will be provided with a two (2) year parts and labor warranty. The wheel seals, gaskets and wheel bearings will have a one (1) year warranty. A copy of Meritor's warranty will be supplied to define additional details of the warranty provisions.

**CAB STRUCTURE WARRANTY**

 The proposed cab will be warranted against structural defects for a period of ten (10) years from the date of acceptance of the unit. Details of warranty coverage, limitations and exclusions are included in the specific warranty document.

**BODY STRUCTURE WARRANTY**

 The proposed body will be warranted against structural defects for a period of ten (10) years from the date of acceptance of the unit. Details of warranty coverage, limitations and exclusions are included in the specific warranty document.

**CORROSION WARRANTY**

 The proposed cab and body will be warranted against rust-through or perforation, due to corrosion from within, for a period of ten (10) years. Perforation is defined as a condition in which an actual hole occurs in a sheet metal panel due to rust or corrosion from within. Surface rust or corrosion caused by chips or scratches in the paint is not covered by this warranty.

**PAINT FINISH WARRANTY**

 The proposed paint finish will be warranted for a period of seven (7) years from the date of acceptance of the unit. Details of warranty coverage, limitations and exclusions are included in the specific warranty document.

**STAINLESS STEEL PLUMBING WARRANTY**

 The proposed stainless steel plumbing will be warranted for a period of ten (10) years from the date of acceptance of the unit. Details of warranty coverage, limitations and exclusions are included in the specific warranty document.

**WATER TANK (LIFETIME)**

 The proposed water tank will be warranted by the water tank manufacturer for the "Lifetime" of the unit. A copy of the manufacturer's warranty will be supplied to define additional details of the warranty provisions.

**WATEROUS FIRE PUMP (FIVE YEAR LIMITED)**

 Waterous warrants, to the original Buyer only, that products manufactured by Waterous will be free from defects in material and workmanship under normal use and service for a period of five (5) years from the date the product is first placed in service or five and one-half (5 1/2) years from the date of shipment by Waterous, whichever period shall be the first to expire; provided the buyer notifies Waterous, in writing, of the defect in said product within the warranty period, and said product is found by Waterous to be nonconforming with the aforesaid warranty.