# SPECIFICATIONS FOR A TRIPLE COMBINATION PUMPER

Sealed bids will be received by Somerset Fire Department for the furnishing of all necessary labor, equipment and material for the Fire Apparatus and other equipment as outlined in the following specifications.

## INTENT OF SPECIFICATIONS

It shall be the intent of these specifications to cover the furnishing and delivery of a complete fire apparatus. These detailed specifications cover the requirements as to the type of construction, finish, equipment and tests to which the fire apparatus shall conform. Minor details of construction and materials, which are not otherwise specified, are left to the discretion of the contractor.

Images and illustrative material in this specification are as accurate as known at the time of publication, but are subject to change without notice. Images and illustrative material is for reference only, and may include optional equipment and accessories and may not include all standard equipment.

## INSTRUCTIONS TO BIDDERS

The purchaser's standards for bidding automotive fire apparatus must be strictly adhered to, and all bid forms and questions must be complete and submitted with the bid. **Omissions and variations shall result in immediate rejection of the bid.**

Bids shall only be considered from companies that have an established reputation in the field of fire apparatus construction and have been in business for a minimum of 20 years. Furthermore, in order to insure fair, ethical, and legal competition, neither the original equipment manufacturer (O.E.M.) nor parent company of the O.E.M. shall have ever been fined or convicted of price fixing, bid rigging, or collusion in any domestic or international fire apparatus market (no exception).

If a bidder represents more than one fire apparatus company or brands of apparatus, they must only bid the top of the line that meets specification.

Each bidder shall furnish satisfactory evidence of their ability to construct the apparatus specified.

Any apparatus manufacturer or their parent company who has had a performance bond called in the last 10 years, shall not be eligible to bid. Any bids from these manufactures shall be immediately rejected (no exception).

Each bid shall be accompanied by a set of manufacturer's set of specifications consisting of a detailed description of the apparatus, construction methods, and equipment proposed to which the apparatus furnished under contract shall conform. These specifications shall indicate size, type, model and make of all components parts and equipment, providing proof of compliance with each and every item in the departments advertised specifications. A letter only, even though written on company letterhead, shall not be sufficient. **An exception to this requirement shall not be acceptable.**

In accordance with the current edition of NFPA 1901 standards, the proposal shall specify whether the fire department or apparatus dealership shall provide required loose equipment.

The purchaser will utilize this advertised specification to compare all submitted bid proposals. To facilitate comparison, all bid proposal specifications shall be submitted in the same sequence as the advertised specification. Any bidder who fails to submit a set of bid proposal specifications, or who photo copies and submits these specifications as their own construction details will be considered non responsive. This shall render such proposal ineligible for award.

The purchaser's specification shall, in all cases, govern the construction of the apparatus, unless a properly documented exception or deviation was approved. Any bid indicating that the manufacturer's proposal shall supersede the purchaser's specification will be considered a complete substitute and immediately rejected.

THE PURCHASER HAS THE RIGHT TO REJECT ANY BIDS WHICH DOES NOT MEET THESE SPECIFICATIONS AND IS THE SOLE DECIDER TO DEEM WHICH BID IS IN THE BEST INTEREST OF THE PURCHASER.

## EXCEPTIONS

These specifications are based upon design and performance criteria which have been developed by the fire department as a result of extensive research and careful analysis. Subsequently these specifications reflect the only type of fire apparatus that is acceptable at this time and all specifications herein contained are considered as minimum. Therefore exceptions to the specifications may not be accepted.

Bidders shall indicate in the "yes/no" column if their bid complies on each item (paragraph) specified.

If a product brand name is specified and is commercially available to all bidders, an exception to such items is not acceptable and such bid may be rejected.

Exceptions shall be allowed if they are equal to or superior to that specified and provided they are listed and fully explained on a separate page. All deviations, no matter how slight, shall be clearly explained on a separate sheet, in the bid sequence, citing the page and paragraph number(s) of the specifications, how the proposal deviation is different, how the deviation meets or exceeds the specifications and why it is necessary, and entitled "EXCEPTIONS TO SPECIFICATIONS". The buyer reserves the right to require a bidder to provide proof in each case that a substituted item is equal to that specified. The buyer shall be the sole judge in determination of acceptable substitutes.

Proposals that are found to have deviations without listing them or bids taking total exceptions to these advertised specifications will be rejected (no exception).

Bids not including all exceptions is a material breach and shall result in the bid being immediately rejected (no exception).

## GENERAL DESIGN AND CONSTRUCTION

The cab, chassis, pump module, and body are to be entirely designed, assembled and painted by the prime vehicle manufacturer, which minimizes third party involvement on engineering, design, service and warranty issues.

All bidders shall provide a list of the company, manufacturing location, and engineering source for each individual major component, including but not limited to the welded cab assembly, the pumphouse module assembly, the chassis assembly, body and electrical system. Apparatus using any subcontracted cab, chassis, pump module, electrical system or body will not be acceptable.

The apparatus shall be designed with due consideration to distribution of load between the front and rear axles. Weight balance and distribution shall be in accordance with the recommendations of the National Fire Protection Association.

The bidder shall make accurate statements as to the apparatus weight and dimensions.

## QUALITY AND WORKMANSHIP

All steel welding shall follow American welding Society D1.1-2004 recommendations for structural steel welding. All aluminum welding shall follow American welding Society and ANSI D1.2-2003 requirements for structural welding of aluminum. All sheet metal welding shall follow American Welding Society B2.1-2000 requirements for structural welding of sheet metal. Flux core arc welding to use alloy rods, type 7000, American welding Society standards A5.20-E70T1. Employees classified as welders are tested and certified to meet the American Welding Society codes upon hire and every three (3) years thereafter. The manufacturer shall be required to have an American welding Society certified welding inspector in plant during working hours to monitor weld quality.

The manufacturer shall also be certified to operate a Quality Management System under the requirements of ISO 9001. These standards sponsored by the International organization for Standardization (ISO) specify the quality systems that shall be established by the manufacturer for design, manufacture, installation and service. A copy of the certificate of compliance shall be included with the bid.

To demonstrate the quality of the product and service, each bidder shall provide a list of at least ten (10) fire departments/municipalities in the region that have bought a second time from the representing dealer. **An exception to this requirement shall not be acceptable.**

## DELIVERY

Apparatus, to insure proper break in of all components while still under warranty, **shall be delivered under its own power** - rail or truck freight shall not be acceptable. A qualified delivery representative shall deliver the apparatus and remain for a sufficient length of time to instruct personnel in proper operation, care and maintenance of the equipment delivered.

## MANUALS AND SERVICE INFORMATION

The manufacturer shall supply at time of delivery, complete operation and maintenance manuals covering the complete apparatus as delivered. A permanent plate shall be mounted in the drivers compartment which specifies the quantity and type of fluid required including engine oil, engine coolant, transmission, pump transmission lubrication, pump primer and drive axle.

## SAFETY VIDEO

Since video is much more effective than written documentation and can be replayed for new personnel and as a refresher for existing personnel, an apparatus safety video, in DVD format shall be provided at time of delivery. This video shall address key safety considerations for personnel to follow when they are driving, operating, and maintaining the apparatus. Safety procedures for the following shall be included on the video: vehicle pre trip inspection, chassis operation, pump operation and maintenance.

## PERFORMANCE TESTS AND REQUIREMENTS

A road test shall be conducted with the apparatus fully loaded and a continuous run of ten (10) miles or more shall be made under all driving conditions, during which time the apparatus shall show no loss of power or overheating. The transmission drive shaft or shafts, and rear axle shall run quietly and be free from abnormal vibration or noise throughout the operating range of the apparatus. Vehicle shall adhere to the following parameters:

A) The apparatus, when fully equipped and loaded, shall have not less than 25 percent nor more than 50 percent of the weight on the front axle, and not less than 50 percent nor more than 75 percent on the rear axle.

B) The apparatus shall be capable of accelerating to 35 mph from a standing start within 25 seconds on a level concrete highway without exceeding the maximum governed rpm of the engine.

C) The service brakes shall be capable of stopping a fully loaded vehicle in 35 feet at 20 mph on a level concrete highway. The air brake system shall conform to Federal Motor vehicle Safety Standards (FMVSS) 121.

D) The apparatus, fully loaded, shall be capable of obtaining a speed of 50 mph on a level concrete highway with the engine not exceeding the governed rpm (full load).

## FAILURE TO MEET TEST

In the event the apparatus fails to meet the test requirements of these specifications on the first trial, second trials may be made at the option of the bidder within 30 days of the date of the first trial. Such trials shall be final and conclusive and failure to comply with these requirements shall be cause for rejection. failure to comply with changes to conform to any clause of the specifications, within 30 days after notice is given to the bidder of such changes, shall also be cause for rejection of the apparatus. Permission to keep or store the apparatus in any building owned or occupied by the purchaser or its use by the purchaser during the above-specified period with the permission of the bidder shall not constitute acceptance.

## SERVICE AND WARRANTY SUPPORT (DEALERSHIP)

TO INSURE FULL SERVICE AFTER DELIVERY, THE SELLING BIDDER/DEALERSHIP MUST BE CAPABLE OF PROVIDING SERVICE WHEN REQUIRED.

The bidder/dealership shall show that the company is in position to render prompt service and to furnish replacement parts.

Each bidder/dealership must be able to display that they are actively in the fire apparatus service business by operating a factory authorized service center and parts repository capable of satisfying the warranty service requirements and parts requirements of the vehicle(s) being purchased.

The bidder/dealership must state the location of this authorized service center. This service center must have a staff of factory-trained mechanics, well versed in all aspects of service for all major components of the apparatus. The service center must be within twenty five (25) miles of the Fire Department.

## SERVICE AND WARRANTY SUPPORT (MANUFACTURER)

To provide an additional layer of service support, the successful manufacturer must also own a least two separate service facilities, one located in the northern portion of the US to service both Canada and the northern US states and one in the south to service the southern states.

The manufacturer shall stock 1 million parts equating to $5,000,000 of inventory dedicated to service and replacement parts to ensure quick response and minimize down time. Furthermore, the manufacturer shall house the inventory in a dedicated facility, with a dedicated shipping area that ensures service parts are given priority. The bidder shall provide detailed documentation of service and replacement part resources.

Parts identification shall be provided to both the dealer and the Fire Department through an on line web based application for the specific truck reflected in this specification. Access will be granted using the specific VIN number of the vehicle. The online web application will provide the ability to view complete bills of materials, digital photographs, parts drawings, assembly drawings, and access to all current operation, maintenance and service publications.

The manufacturer must also maintain a 24 hour/ 7 day a week, toll free emergency hot line.

The manufacturer shall employ a staff of adequate size (a minimum of 30 personnel) specifically dedicated to providing customer support and parts for the fielded fleet of vehicles it has produced.

The manufacturer must be capable of providing both in-house and on-site service for the apparatus.

The manufacturer shall offer regional factory hands-on repair and maintenance training classes.

The manufacturer shall employ a minimum of four certified EVT technicians on staff, not only providing technical expertise in the repair of fire apparatus, but also demonstrating the commitment to service after the sale.

## LIABILITY

The successful bidder shall defend any and all suits and assume all liability for the use of any patented process including any device or article forming a part of the apparatus or any appliance furnished under the contract. To ensure this will occur, the bidder shall carry the following minimum insurance.

## COMMERCIAL GENERAL LIABILITY INSURANCE

The successful bidder shall, during the performance of the contract and for three (3) years following acceptance of the product, keep in force at least the following minimum limits of commercial general liability insurance:

Each Occurrence$1,000,000

Products/Completed Operations Aggregate$1,000,000

Personal and Advertising Injury$1,000,000

General Aggregate$5,000,000

Coverage shall be written on a Commercial General Liability form. The policy shall be written on an occurrence form and shall include Contractual Liability coverage for bodily injury and property damage subject to the terms and conditions of the policy. The policy shall include Owner as an additional insured when required by written contract.

## COMMERCIAL AUTOMOBILE LIABILITY INSURANCE

The successful bidder shall, during the performance of the contract keep in force at least the following minimum limits of commercial automobile liability insurance:

Each Accident Combined Single Limit:$1,000,000

Coverage shall be written on a Commercial Automobile liability form.

## UMBRELLA/EXCESS LIABILITY INSURANCE

The successful bidder shall, during the performance of the contract and for three (3) years following acceptance of the product, keep in force at least the following minimum limits of umbrella liability insurance:

Aggregate:$25,000,000

Each Occurrence: $25,000,000

The umbrella policy shall be written on an occurrence basis and at a minimum provide excess to the Bidder's General Liability, Automobile Liability and Employer's Liability policies.

The required limits can be provided by one (1) or more policies provided all other insurance requirements are met.

Coverage shall be provided by a carrier(s) rated A- or better by A.M. Bests.

All policies shall provide a 30 day notice of cancellation to the named insured. The Certificate of Insurance shall provide the following cancellation clause: Should any of the above described polices be cancelled before the expiration date thereof, notice shall be delivered in accordance with the policy provisions. Bidder agrees to furnish owner with a current Certificate of Insurance with the coverages listed above along with its bid. The certificate shall show the purchaser as certificate holder.

## SINGLE SOURCE MANUFACTURER

Bids shall only be accepted from a single source apparatus manufacturer. The definition of single source is a manufacturer that designs and manufactures their products using an integrated approach, including the chassis, cab weldment, cab, pumphouse (including the sheet metal enclosure, valve controls, piping and operators panel) and body being designed, fabricated and assembled on the bidder's premises. The electrical system (hardwire or multiplex) shall be both designed and integrated by the same apparatus manufacturer. The warranties relative to these major components (excluding component warranties such as engine, transmission, axles, pump, etc.) must be from a single source manufacturer and not split between manufacturers (i.e. body, pumphouse, cab weldment and chassis). The bidder shall provide evidence that they comply with this requirement.

The bidder shall state the location of the factory where the apparatus is to be built.

## NFPA 2016 STANDARDS

This unit shall comply with the NFPA standards effective January 1, 2016, except for fire department specifications that differ from NFPA specifications. These exceptions shall be set forth in the Statement of Exceptions.

Certification of slip resistance of all stepping, standing and walking surfaces shall be supplied with delivery of the apparatus.

All horizontal surfaces designated as a standing or walking surface that are greater than 48.00" above the ground must be defined by a 1.00" wide line along its outside perimeter. Perimeter markings and designated access paths to destination points shall be identified on the customer approval print and are shown as approximate. Actual location(s) shall be determined based on materials used and actual conditions at final build. Access paths may pass through hose storage areas and opening or removal of covers or restraints may be required.Access paths may require the operation of devices and equipment such as the aerial device or ladder rack.

A plate that is highly visible to the driver while seated shall be provided. This plate shall show the overall height, length, and gross vehicle weight rating.

The manufacturer shall have programs in place for training, proficiency testing and performance for any staff involved with certifications.

An official of the company shall designate, in writing, who is qualified to witness and certify test results.

## NFPA COMPLIANCY

Apparatus proposed by the bidder shall meet the applicable requirements of the National Fire Protection Association (NFPA) as stated in the current edition at time of contract execution. Fire Department's specifications that differ from NFPA specifications shall be indicated in the proposal as "non-NFPA."

## PUMP TEST

The rated water pump shall be tested, approved, and certified by an ISO certified independent third party testing agency at the manufacturer's expense. The test results, along with the pump manufacturer's certification of hydrostatic test, the engine manufacturer's certified brake horsepower curve, and the manufacturer's record of pump construction details shall be forwarded to the Fire Department.

## GENERATOR TEST

If the unit has a generator, the generator shall be tested, approved, and certified by an ISO certified independent third party testing agency at the manufacturer's expense. The test results shall be provided to the Fire Department at the time of delivery.

## APPROVAL DRAWING

A drawing of the proposed apparatus shall be provided for approval before construction begins. The sales representative shall also have a copy of the same drawing. The finalized and approved drawing shall become part of the contract documents. This drawing shall indicate the chassis make and model, location of the lights, siren, horns, compartments, major components, etc.

A "revised" approval drawing of the apparatus shall be prepared and submitted by the manufacturer to the purchaser showing any changes made to the approval drawing.

## ELECTRICAL WIRING DIAGRAMS

Two (2) electrical wiring diagrams, prepared for the model of chassis and body, shall be provided.

## CHASSIS

Chassis provided shall be a new, tilt-type custom fire apparatus. The chassis shall be manufactured in the apparatus body builder's facility eliminating any split responsibility. The chassis shall be designed and manufactured for heavy-duty service, with adequate strength and capacity for the intended load to be sustained and the type of service required.

## WHEELBASE

The wheelbase of the vehicle shall be no greater than 194.00.

## GVW RATING

The gross vehicle weight rating shall be a minimum of 47,000.

## FRAME

The chassis frame shall be built with two (2) steel channels bolted to five (5) cross members or more, depending on other options of the apparatus. The side rails shall be heat-treated steel measuring 10.25" x 3.50" x .375".

Each rail shall have a section modulus of 16.00 cubic inches, yield strength of 120,000 psi, and a resisting bending moment (rbm) of 1,921,069 inch-pounds.

## FRAME REINFORCEMENT

A full-length mainframe "C" liner shall be provided.

The liner shall be an internal "C" design, heat-treated steel measuring 9.38" x 3.13" x 0.25". Each reinforcement member shall have a section modulus of 3.90 cubic inches, yield strength of 120,000 psi and resisting bending moment (rbm) of 938,762 in-lb.

## FRONT AXLE

The front axle shall be a reverse "I" beam type with inclined king pins. It shall be a Dana axle, Model D-2000F, with a rated capacity of 20,000 lb.

## FRONT SUSPENSION

The front springs shall be a Standens, three (3)-leaf, taper leaf design, 54.00" long x 4.00" wide, with a ground rating of 20,000 lb.

The two (2) top leaves shall wrap the forward spring hanger pin. The top leaf shall also wrap the rear spring hanger pin. Both the front and rear eyes shall be Berlin style wraps that shall place the eyes in the horizontal plane within the main leaf. This shall reduce bending stress from acceleration and braking.

A steel encased rubber bushing shall be used in the spring eye. The steel encased rubber bushing shall be maintenance free and require no lubrication.

## SHOCK ABSORBERS

Heavy-duty telescoping shock absorbers shall be provided on the front axle.

## FRONT OIL SEALS

Oil seals with viewing window shall be provided on the front axle.

## FRONT TIRES

Front tires shall be 20 ply, rated for 20,400 lb maximum axle load and 68 mph maximum speed.

The tires shall be mounted on Alcoa or equivalent polished aluminum disc wheels with a ten (10) stud, 11.25" bolt circle.

## REAR AXLE

The rear axle shall be a with a capacity of 27,000 lb.

## TOP SPEED OF VEHICLE

A rear axle ratio shall be furnished to allow the vehicle to reach a top speed of 68 mph.

## REAR SUSPENSION

The rear suspension shall be with a ground rating of 27,000 lb. The spring hangers shall be castings.

The two (2) top leaves shall wrap the forward spring hanger pin, and the rear of the spring shall be a slipper style end that shall ride in a rear slipper hanger. To reduce bending stress due to acceleration and braking, the front eye shall be a berlin eye that shall place the front spring pin in the horizontal plane within the main leaf.

A steel encased rubber bushing shall be used in the spring eye. The steel encased rubber bushing shall be maintenance free and require no lubrication.

## REAR OIL SEALS

Oil seals shall be provided on the rear axle(s).

## REAR TIRES

Rear tires shall be 16 ply all season tread, rated for 27,120 lb maximum axle load and 75 mph maximum speed.

The outside tires shall be mounted on Alcoa© or equivalent polished aluminum disc wheels with a ten (10) stud 11.25" bolt circle.

The inside tires shall be mounted on 22.50" x 8.25" steel disc wheels with a ten (10) stud 11.25" bolt circle.

An isolator shall be provided between the steel and aluminum rims.

## TIRE BALANCE

All tires shall be balanced with Counteract balancing beads. The beads shall be inserted into the tire and eliminate the need for wheel weights.

## TIRE PRESSURE MANAGEMENT

There shall be a RealWheels LED AirSecure™ or equivalent tire alert pressure management system provided, that shall monitor each tire's pressure. A sensor shall be provided on the valve stem of each tire for a total of six (6) tires.

The sensor shall calibrate to the tire pressure when installed on the valve stem for pressures between 10 and 200 psi. The sensor shall activate an integral battery operated LED when the pressure of that tire drops 5 to 8 psi.

Removing the cap from the sensor shall indicate the functionality of the sensor and battery. If the sensor and battery are in working condition, the LED shall immediately start to flash.

## FRONT HUB COVERS

Stainless steel hub covers shall be provided on the front axle. An oil level viewing window shall be provided.

## REAR HUB COVERS

A pair of stainless steel high hat hub covers shall be provided on rear axle hubs.

## CHROME LUG NUT COVERS

Chrome lug nut covers shall be supplied on front and rear wheels.

## MUD FLAPS

Mud flaps shall be installed behind the front and rear wheels of the apparatus.

## WHEEL CHOCKS

There shall be one (1) pair of folding aluminum alloy, Quick-Choc wheel blocks with easy-grip handle provided.

## WHEEL CHOCK BRACKETS

There shall be one horizontal mounting wheel chock brackets provided for the folding wheel chocks. The brackets shall be made of aluminum and consist of a quick release spring loaded rod to hold the wheel chocks in place. The brackets shall be mounted below the left side rear compartment.

## ANTI-LOCK BRAKE SYSTEM

The vehicle shall be equipped with a Meritor WABCO 4S4M or equivalent, anti-lock braking system. The ABS shall provide a 4-channel anti-lock braking control on both the front and rear wheels. A digitally controlled system that utilizes microprocessor technology shall control the anti-lock braking system. Each wheel shall be monitored by the system. When any particular wheel begins to lockup, a signal shall be sent to the control unit. This control unit shall then reduce the braking of that wheel for a fraction of a second and then reapply the brake. This anti-lock brake system shall eliminate the lockup of any wheel thus helping to prevent the apparatus from skidding out of control.

## BRAKES

The service brake system shall be full air type.

Front brakes shall be disc type with automatic pad wear adjustment and 17.00" rotors for improved stopping distance.

The rear brakes shall be cam operated with automatic slack adjusters.

## BRAKE SYSTEM AIR COMPRESSOR

The air compressor shall be a Cummins/WABCO or equivalent with 18.7 cubic feet per minute output.

## BRAKE SYSTEM

The brake system shall include:

* Bendix® or equivalent brake treadle valve
* Heated automatic moisture ejector on air dryer
* Total air system minimum capacity of 4,272 cubic inches
* Two (2) air pressure gauges with a red warning light and an audible alarm, that activates when air pressure falls below 60 psi
* Spring set parking brake system
* Parking brake operated by a push-pull style control valve
* A parking "brake on" indicator light on instrument panel
* Park brake relay/inversion and anti-compounding valve, in conjunction with a double check valve system, with an automatic spring brake application at 40 psi
* A pressure protection valve to prevent all air operated accessories from drawing air from the air system when the system pressure drops below 80 psi (550 kPa)
* 1/4 turn drain valves on each air tank

The air tank shall be primed and painted to meet a minimum 750 hour salt spray test.

To reduce the effects of corrosion, the air tank shall be mounted with stainless steel brackets (no exception).

## BRAKE SYSTEM AIR DRYER

The air dryer shall be a with internal wet tank, spin-on coalescing filter cartridge and 100 watt heater.

## BRAKE LINES

Color-coded nylon brake lines shall be provided. The lines shall be wrapped in a heat protective loom where necessary in the chassis.

## AIR INLET

One (1) air inlet with 3D series male coupling shall be provided. It shall allow station air to be supplied to the apparatus brake system through a shoreline hose. The inlet shall be located in the driver side lower step well of cab. A check valve shall be provided to prevent reverse flow of air. The inlet shall discharge into the "wet" tank of the brake system. A mating female fitting shall also be provided with the loose equipment.

## AIR OUTLET

One (1) air outlet shall be installed with a Milton style G or equivalent female coupling and shut off valve, located on the driver side pump panel. This system shall tie into the "wet" tank of the brake system and include an 85-psi pressure protection valve in the outlet line to prevent the brake system from losing all air.

A mating Milton style G male fitting or equivalent shall be provided with the loose equipment.

## ENGINE

The chassis shall be powered by an electronically controlled engine as described below:

|  |  |
| --- | --- |
| Make: | Cummins or equivalent |
| Model: | L9 |
| Power: | 450 hp at 2100 rpm |
| Torque: | 1250 lb-ft at 1400 rpm |
| Governed Speed: | 2200 rpm |
| Emissions Level: | EPA 2017 |
| Fuel: | Diesel |
| Cylinders: | Six (6) |
| Displacement: | 543 cubic inches (8.9L) |
| Starter: | Delco 39MT™ |
| Fuel Filters: | Spin-on style primary filter with water separator and water-in-fuel sensor. Secondary spin-on style filter. |

The engine shall include On-board diagnostics (OBD), which provides self diagnostic and reporting. The system shall give the owner or repair technician access to state of health information for various vehicle sub systems. The system shall monitor vehicle systems, engine and after treatment. The system shall illuminate a malfunction indicator light on the dash console if a problem is detected.

## HIGH IDLE

A high idle switch shall be provided, inside the cab, on the instrument panel, that shall automatically maintain a preset engine rpm. A switch shall be installed, at the cab instrument panel, for activation/deactivation.

The high idle shall be operational only when the parking brake is on and the truck transmission is in neutral. A green indicator light shall be provided, adjacent to the switch. The light shall illuminate when the above conditions are met. The light shall be labeled "OK to Engage High Idle."

## ENGINE BRAKE

A Jacobs® engine brake or equivalent is to be installed with the controls located on the instrument panel within easy reach of the driver.

The driver shall be able to turn the engine brake system on/off and have a high, medium and low setting.

The engine brake shall activate when the system is on and the throttle is released.

The high setting of the brake application shall activate and work simultaneously with the variable geometry turbo (VGT) provided on the engine.

The engine brake shall be installed in such a manner that when the engine brake is slowing the vehicle the brake lights are activated.

The ABS system shall automatically disengage the auxiliary braking device, when required.

## CLUTCH FAN

A fan clutch shall be provided. The fan clutch shall be automatic when the pump transmission is in "Road" position, and constantly engaged when in "Pump" position.

## ENGINE AIR INTAKE

The engine air intake shall be located above the engine cooling package. It shall draw fresh air from the front of the apparatus through the radiator grille.

A stainless steel metal screen shall be installed at the inlet of the air intake system that shall meet NFPA 1901 requirements.

The air cleaner and stainless steel screen shall be easily accessible by tilting the cab.

## EXHAUST SYSTEM

The exhaust system shall be stainless steel from the turbo to the engine's after treatment device, and shall be 4.00" in diameter. The exhaust system shall include a single module after treatment device to meet current EPA standards. An insulation wrap shall be provided on all exhaust pipes between the turbo and after treatment device to minimize the heat loss to the after treatment device . The exhaust shall terminate horizontally ahead of the right side rear wheels. A tailpipe diffuser shall be provided to reduce the temperature of the exhaust as it exits. Heat deflector shields shall be provided to isolate chassis and body components from the heat of the tailpipe diffuser.

## RADIATOR

The radiator and the complete cooling system shall meet or exceed NFPA and engine manufacturer cooling system standards.

For maximum corrosion resistance and cooling performance, the entire radiator core shall be constructed using long life aluminum alloy. The radiator core shall consist of aluminum fins, having a serpentine design, brazed to aluminum tubes. No solder joints or leaded material of any kind shall be acceptable in the core assembly.

The radiator core shall have a minimum front area of 1060 square inches.

Supply tank shall be made of heavy duty glass-reinforced nylon and the return tank shall be mode of aluminum. Both tanks shall be crimped onto the core assembly using header tabs and a compression gasket to complete the radiator core assembly. There shall be a full steel frame around the inserts to enhance cooling system durability and reliability.

The radiator shall be compatible with commercial antifreeze solutions.

The radiator assembly shall be isolated from the chassis frame rails with rubber isolators to prevent the development of leaks caused by twisting or straining when the apparatus operates over uneven terrain.

The radiator shall include a de-aeration/expansion tank. For visual coolant level inspection, the radiator shall have a built-in sight glass. The radiator shall be equipped with a 15 psi pressure relief cap.

A drain port shall be located at the lowest point of the cooling system and/or the bottom of the radiator to permit complete flushing of the coolant from the system.

Shields or baffles shall be provided to prevent recirculation of hot air to the inlet side of the radiator.

## COOLANT LINES

Gates, or Goodyear or equivalent, rubber hose shall be used for all engine coolant lines installed by the chassis manufacturer.

Hose clamps shall be stainless steel constant torque type to prevent coolant leakage. They shall react to temperature changes in the cooling system and expand or contract accordingly while maintaining a constant clamping pressure on the hose.

## FUEL TANK

A 65 gallon fuel tank shall be provided and mounted at the rear of the chassis. The tank shall be constructed of 12-gauge, hot rolled steel. It shall be equipped with swash partitions and a vent. To eliminate the effects of corrosion, the fuel tank shall be mounted with stainless steel straps (no exception).

A 0.75" drain plug shall be provided in a low point of the tank for drainage.

A fill inlet shall be located on the left hand side of the body and be covered with a hinged, spring loaded, stainless steel door that is marked "Ultra Low Sulfur - Diesel Fuel Only."

A 0.50" diameter vent shall be provided running from top of tank to just below fuel fill inlet.

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

All fuel lines shall be provided as recommended by the engine manufacturer.

## DIESEL EXHAUST FLUID TANK

A 4.5 gallon diesel exhaust fluid (DEF) tank shall be provided and mounted in the driver's side body rearward of the rear axle.

A 0.50" drain plug shall be provided in a low point of the tank for drainage.

A fill inlet shall be provided and marked "Diesel Exhaust Fluid Only". The fill inlet shall be located adjacent to the air bottle storage behind a common door on the driver side of the vehicle.

The tank shall meet the engine manufacturers requirement for 10 percent expansion space in the event of tank freezing.

The tank shall include an integrated heater unit that utilizes engine coolant to thaw the DEF in the event of freezing.

## TRANSMISSION

An Allison 5th generation, Model EVS 3000P or equivalent, electronic torque converting automatic transmission shall be provided.

The transmission shall be equipped with prognostics to monitor oil life, filter life, and transmission health. A wrench icon on the shift selector's digital display shall indicate when service is due.

Two (2) PTO openings shall be located on both sides of converter housing (positions 4 o'clock and 8 o'clock) as viewed from the rear.

A transmission temperature gauge with red light and audible alarm shall be installed on the cab dash.

## TRANSMISSION SHIFTER

A five (5)-speed push button shift module shall be mounted to right of driver on console. Shift position indicator shall be indirectly lit for after dark operation.

The transmission ratio shall be:

|  |  |
| --- | --- |
| 1st | 3.49 to 1.00 |
| 2nd | 1.86 to 1.00 |
| 3rd | 1.41 to 1.00 |
| 4th | 1.00 to 1.00 |
| 5th | 0.75 to 1.00 |
| R | 5.03 to 1.00 |

## TRANSMISSION COOLER

A Modine plate and fin transmission oil cooler shall be provided using engine coolant to control the transmission oil temperature.

## DRIVELINE

Drivelines shall be a heavy-duty metal tube and be equipped with Spicer® or equivalent 1710 universal joints.

The shafts shall be dynamically balanced before installation.

A splined slip joint shall be provided in each driveshaft, slip joint shall be coated with Glidecoat® or equivalent.

## STEERING

Dual steering gear, with integral heavy-duty power steering, shall be provided. For reduced system temperatures, the power steering shall incorporate an air to oil cooler and Vickers® V20NF or equivalent hydraulic pump with integral pressure and flow control. All power steering lines shall have wire braded lines with crimped fittings.

A tilt and telescopic steering column shall be provided to improve fit for a broader range of driver configurations.

## STEERING WHEEL

The steering wheel shall be 18.00" in diameter, have tilting and telescoping capabilities, and a 4-spoke design.

## HITCH RECEIVER

A hitch receiver shall be provided at the front of the vehicle, center position under the bumper extension. The hitch shall be a receiver for a 2.00" trailer ball insert and a portable winch with a maximum weight rating of 10,000 lb.

## BUMPER

A one (1) piece, ten (10) gauge, 304-2B type polished stainless steel bumper, a minimum 10.00" high shall be attached to a bolted modular extension frame constructed of 50,000 psi tensile steel "C" channel mounted directly behind it to provide adequate support strength.

The bumper shall be extended 27.00" from front face of cab. The bumper extension shall be designed specifically for the special booster reel installation.

### GRAVEL PAN

A gravel pan, constructed of bright aluminum treadplate, shall be furnished between the bumper and cab face. The gravel pan shall be properly supported from the underside to prevent flexing and vibration of the aluminum treadplate.

##

## TRAY, HOSE REEL

A hose reel tray, constructed of aluminum, shall be placed in the center of the bumper extension.

The tray shall be 28.75" wide x 22.50" front to back x 16.00" deep.

## TOW EYES

Two (2) chrome tow eyes shall be mounted through the front face of the bumper.

The inner and outer edges of the tow eyes shall have a .25" radius.

Tow eyes shall be mounted directly to the bumper frame.

Cutouts shall be provided in the front face of stainless steel bumper to allow tow eyes to extend out the front.

The tow eyes shall be designed and positioned to allow up to a 9,000 lb straight horizontal pull in line with the centerline of the vehicle. The tow eyes shall not be used for lifting of the apparatus.

## 3/4 WIDTH COVER

A bright aluminum treadplate cover shall be provided over the entire top of the bumper tray.

The cover shall be raised approximately 8.50" above the gravel pan. The cover shall provide adequate room for a front bumper mounted mechanical siren.

The cover shall be attached with a stainless steel hinge.

Two (2) rubber latches shall secure the cover in the closed position and two (2) gas springs shall hold the cover in the open position.

## CAB “minimum requirement”

The cab shall be designed specifically for the fire service and manufactured by the chassis builder.

The cab shall be built by the apparatus manufacturer in a facility located on the manufacturer's premises (no exception).

For reasons of structural integrity and enhanced occupant protection, the cab shall be a heavy duty design, constructed to the following minimal standards.

The cab shall have 12 main vertical structural members located in the A-pillar (front cab corner posts), B-pillar (side center posts), C-pillar (rear corner posts), and rear wall areas. The A-pillar shall be constructed of solid A356-T5 aluminum castings. The B-pillar and C-pillar shall be constructed from 0.13" wall extrusions. The rear wall shall be constructed of two (2) 2.00" x 2.00" outer aluminum extrusions and two (2) 2.00" x 1.00" inner aluminum extrusions. All main vertical structural members shall run from the floor to 4.625" x 3.864" x 0.090" thick roof extrusions to provide a cage-like structure with the A-pillar and roof extrusions being welded into a 0.25" thick corner casting at each of the front corners of the roof assembly.

The front of the cab shall be constructed of a 0.13" firewall plate, covered with a 0.090" front skin (for a total thickness of 0.22"), and reinforced with a full width x 0.50" thick cross-cab support located just below the windshield and fully welded to the engine tunnel. The cross-cab support shall run the full width of the cab and weld to each A-pillar, the 0.13" firewall plate, and the front skin.

The cab floors shall be constructed of 0.125" thick aluminum plate and reinforced at the firewall with an additional 0.25" thick cross-floor support providing a total thickness of 0.375" of structural material at the front floor area. The front floor area shall also be supported with two (2) triangular 0.30" wall extrusions that also provides the mounting point for the cab lift. This tubing shall run from the floor wireway of the cab to the engine tunnel side plates, creating the structure to support the forces created when lifting the cab.

The cab shall be 96.00" wide (outside door skin to outside door skin) to maintain maximum maneuverability (no exception).

The forward cab section shall have an overall height (from the cab roof to the ground) of approximately 99.00". The crew cab section shall have a 10.00" raised roof, with an overall cab height of approximately 109.00". The overall height listed shall be calculated based on a truck configuration with the lowest suspension weight rating, the smallest diameter tires for the suspension, no water weight, no loose equipment weight, and no personnel weight. Larger tires, wheels, and suspension shall increase the overall height listed.

The floor to ceiling height inside the crew cab shall be 64.50" in the center and outboard positions.

The crew cab floor shall measure 46.00" from the rear wall to the back side of the rear facing seat risers.

The engine tunnel, at the rearward highest point (knee level), shall measure 61.50" to the rear wall.

The crew cab shall be a totally enclosed design with the interior area completely open to improve visibility and verbal communication between the occupants.

The cab shall be a full tilt cab style.

A 3-point cab mount system with rubber isolators shall improve ride quality by isolating chassis vibrations from the cab.

## 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 painted to match the cab roof, and bonded to the sides of the cab. The drip rail shall extend the full length of the cab roof.

## INTERIOR CAB INSULATION“minimum requirement”

The cab shall include 1.00" insulation in the ceiling, 1.50" insulation in the side walls, and 2.00" insulation in the rear wall to maximize acoustic absorption and thermal insulation.

## FENDER LINERS

Full circular inner fender liners in the wheel wells shall be provided.

## PANORAMIC WINDSHIELD

A 1-piece safety glass windshield shall be provided with over 2,775 square inches of clear viewing area. The windshield shall be full width and shall provide the occupants with a panoramic view. The windshield shall consist of three (3) layers: outer light, middle safety laminate, and inner light. The 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. The inner light shall provide yet another chip resistant layer. The cab windshield shall be bonded to the aluminum windshield frame using a urethane adhesive. A custom frit pattern shall be applied on the outside perimeter of the windshield for a finished automotive appearance.

## WINDSHIELD WIPERS

Three (3) electric windshield wipers with washer shall be provided that meet FMVSS and SAE requirements.

The washer reservoir shall be able to be filled without raising the cab.

## ENGINE TUNNEL“minimum requirement”

Engine hood side walls shall be constructed of 0.375" aluminum. The top shall be constructed of 0.125" aluminum and shall be tapered at the top to allow for more driver and passenger elbow room.

The engine hood shall be insulated for protection from heat and sound. The noise insulation keeps the dBA level within the limits stated in the current NFPA 1901 standards.

The engine tunnel shall be no higher than 17.00" off the crew cab floor (no exception).

## INTERIOR CREW CAB REAR WALL ADJUSTABLE SEATING (PATENT PENDING)

The interior rear wall of the crew cab shall have mounting holes every 2.75" to allow for adjustability of the forward facing crew cab seating along the rear wall. Seats shall be adjustable with use of simple hand tools allowing departments flexibility of their seating arrangement should their department needs change.

## CAB REAR WALL EXTERIOR COVERING

The exterior surface of the rear wall of the cab shall be overlaid with bright aluminum treadplate that covers the entire rear wall .

## CAB LIFT

A hydraulic cab lift system shall be provided consisting of an electric powered hydraulic pump, dual lift cylinders, and necessary hoses and valves.

Lift controls shall be located on the right side pump panel or front area of the body in a convenient location.

The cab shall be capable of tilting 43 degrees to accommodate engine maintenance and removal.

The cab shall be locked down by a 2-point normally closed spring loaded hook type latch that fully engages after the cab has been lowered. The system shall be hydraulically actuated to release the normally closed locks when the cab lift control is in the raised position and cab lift system is under pressure. When the cab is completely lowered and system pressure has been relieved, the spring loaded latch mechanisms shall return to the normally closed and locked position.

The hydraulic cylinders shall be equipped with a velocity fuse that protects the cab from accidentally descending when the control is located in the tilt position.

For increased safety, a redundant mechanical stay arm shall be provided that must be manually put in place on the left side between the chassis and cab frame when the cab is in the raised position. This device shall be manually stowed to its original position before the cab can be lowered.

### Cab Lift Interlock

The cab lift system shall be interlocked to the parking brake. The cab tilt mechanism shall be active only when the parking brake is set and the ignition switch is in the on position. If the parking brake is released, the cab tilt mechanism shall be disabled.

## GRILLE

A single piece polished stainless steel grille and framework shall be provided on the front center of the cab.

## DOOR JAMB SCUFFPLATES

All cab door jambs shall be furnished with a polished stainless steel scuffplate, mounted on the striker side of the jamb.

## TRIM BAND ON CAB FACE

A 10.00" band of 22 gauge patterned stainless steel trim shall be installed across the front of the cab, from door hinge to door hinge. The trim band shall be centered on the headlights and applied with two-sided tape. A 0.625" self-adhesive trim strip shall be applied around the perimeter of the trim band.

## SIDE OF CAB MOLDING

Chrome molding shall be provided on both sides of cab.

## MIRRORS

A dual vision, motorized, west coast style or equivalent mirror, with chrome finish, shall be mounted on each side of the front cab door with spring loaded retractable arms. The flat glass and convex glass shall be heated and adjustable with remote control within reach of the driver.

## DOORS“minimum requirement”

To enhance entry and egress to the cab, the forward cab door openings shall be a minimum of 37.50" wide x 63.37" high. The crew cab doors shall be located on the sides of the cab and shall be constructed in the same manner as the forward cab doors. The crew cab door openings shall be a minimum of 34.30" wide x 73.25" high.

The forward cab and crew cab doors shall be constructed of extruded aluminum with a nominal material thickness of 0.093". The exterior door skins shall be constructed from 0.090" aluminum.

A customized, vertical, pull-down type door handle shall be provided on the exterior of each cab door. The exterior handle shall be designed specifically for the fire service to prevent accidental activation, and shall provide 4.00" wide x 2.00" deep hand clearance for ease of use with heavy gloved hands.

Each door shall also be provided with an interior flush, open style paddle handle that shall be readily operable from fore and aft positions, and be designed to prevent accidental activation. The interior handles shall provide 4.00" wide x 1.25" deep hand clearance for ease of use with heavy gloved hands.

The cab doors shall be provided with both interior (rotary knob) and exterior (keyed) locks exceeding FMVSS standards. The keys shall be Model [Key Model, Cab Doors]. The locks shall be capable of activating when the doors are open or closed. The doors shall remain locked if locks are activated when the doors are opened, then closed.

A full length, heavy duty, stainless steel, piano-type hinge with a 0.38" pin and 11 gauge leaf shall be provided on all cab doors. There shall be double automotive-type rubber seals around the perimeter of the door framing and door edges to ensure a weather-tight fit.

A chrome grab handle shall be provided on the inside of each cab door for ease of entry.

The bottom cab step at each cab door location shall be located below the cab doors and shall be exposed to the exterior of the cab.

### DOOR PANELS

The inner cab door panels shall be constructed out of brushed stainless steel.

## MANUAL CAB DOOR WINDOWS

All cab entry doors shall contain a conventional roll down window.

## CAB STEPS

The forward cab and crew cab access steps shall be a full size two (2) step design to provide largest possible stepping surfaces for safe ingress and egress. The bottom steps shall be designed with a grip pattern punched into bright aluminum treadplate material to provide support, slip resistance, and drainage. The bottom steps shall be a bolt-in design to minimize repair costs should they need to be replaced. The forward cab steps shall be a minimum 25.00" wide, and the crew cab steps shall be 21.65" wide with a 10.00" minimum depth. The inside cab steps shall not exceed 16.50" in height. A slip-resistant handrail shall be provided adjacent to each cab door opening to assist during cab ingress and egress.

The vertical surfaces of the step well shall be aluminum treadplate.

## STEP LIGHTS

There shall be six (6) white LED step lights installed for cab and crew cab access steps.

* One (1) light for the driver's access steps.
* Two (2) lights for the driver's side crew cab access steps.
* Two (2) lights for the passenger's side crew cab access steps.
* One (1) light for the passenger's side access step.

In order to ensure exceptional illumination, each light shall provide a minimum of 25 foot-candles (fc) covering an entire 15" x 15" square placed ten (10) inches below the light and a minimum of 1.5 fc covering an entire 30" x 30" square at the same ten (10) inch distance below the light.

The lights shall be activated when the battery switch is on and the adjacent door is opened.

## FENDER CROWNS

Stainless steel fender crowns shall be installed at the cab wheel openings.

## MOUNTING PLATE ON ENGINE TUNNEL

Equipment installation provisions shall be installed on the engine tunnel.

A 0.188" smooth aluminum plate shall be bolted to the top surface of the engine tunnel. The plate shall follow the contour of the engine tunnel and shall run the entire length of the engine tunnel. The plate shall be spaced off the engine tunnel .75" to allow for wire routing below the plate.

The mounting surface shall be painted to match the cab interior.

## CAB INTERIOR“minimum requirement”

The cab interior shall be constructed of primarily metal (painted aluminum) to withstand the severe duty cycles of the fire service.

The officer side dash shall be a flat faced design to provide easy maintenance and shall be constructed out of painted aluminum.

The instrument cluster shall be surrounded with a high impact ABS plastic contoured to the same shape of the instrument cluster.

The engine tunnel shall be padded and covered, on the top and sides, with gray woven with black Imperial 1200 vinyl coated polyester.

The headliner shall be installed in both forward and rear cab sections. Headliner material shall be vinyl. A sound barrier shall be part of its composition. Material shall be installed on aluminum sheet and securely fastened to interior cab ceiling.

Forward portion of cab headliner shall permit easy access for service of electrical wiring or other maintenance needs.

All wiring shall be placed in metal raceways. Routing through holes in tubing shall not be accepted due to chaffing that installation shall cause.

## CAB INTERIOR UPHOLSTERY

The cab interior upholstery shall be dark silver gray.

## CAB INTERIOR PAINT

The cab interior metal surfaces shall be painted fire smoke gray, vinyl texture paint.

## CAB FLOOR“minimum requirement”

The cab and crew cab floor areas shall be covered with Polydamp™ acoustical floor mat consisting of a black pyramid rubber facing and closed cell foam decoupler.

The top surface of the material has a series of raised pyramid shapes evenly spaced, which offer a superior grip surface. Additionally, the material has a 0.25" thick closed cell foam (no water absorption) which offers a sound dampening material for reducing sound levels.

## CAB DEFROSTER“minimum requirement”

To provide maximum defrost and heating performance, a 43,500 BTU heater-defroster unit with 350 CFM of air flow shall be provided inside the cab. The defroster unit shall be strategically located under the center forward portion of the vacuum formed instrument panel. For easy access, a removable vacuum formed cover shall be installed over the defroster unit. The defroster shall include an integral aluminum frame air filter, high performance dual scroll blowers, and ducts designed to provide maximum defrosting capabilities for the 1-piece windshield. The defroster ventilation shall be built into the design of the cab dash instrument panel and shall be easily removable for maintenance. The defroster shall be capable of clearing 98 percent of the windshield and side glass when tested under conditions where the cab has been cold soaked at 0 degrees Fahrenheit for 10 hours, and a 2 ounce per square inch layer of frost/ice has been able to build up on the exterior windshield. The defroster system shall meet or exceed SAE J382 requirements.

## CAB/CREW CAB HEATER“minimum requirement”

Two (2) 44,180 BTU auxiliary heaters with 276 CFM (each unit) of air flow shall be provided inside the crew cab, one (1) in each outboard rear-facing seat riser. The heaters shall include high performance dual scroll blowers, one (1) for each unit. Outlets for the heaters shall be located below each rear facing seat riser and below the fronts of the driver and passenger seats, for efficient airflow. An extruded aluminum plenum shall be incorporated in the cab structure that shall transfer heat to the forward cab seating positions.

The heater/defroster and crew cab heaters shall be controlled by a single integral electronic control panel. The heater control panel shall allow the driver to control heat flow to the front and rear simultaneously. The control panel shall include variable adjustment for temperature and fan control, and be conveniently located on the dash in clear view of the driver. The control panel shall include highly visible, progressive LED indicators for both fan speed and temperature.

## AIR CONDITIONING“minimum requirement”

A high performance, customized air conditioning system shall be furnished inside the cab and crew cab.

The air conditioning system shall be capable of cooling the average cab temperature from 100 degrees Fahrenheit to 75 degrees Fahrenheit within 30 minutes at 50 percent relative humidity. The cooling performance test shall be run only after the cab has been heat soaked at 100 degrees Fahrenheit for a minimum of 4 hours.

A radiator mounted condenser with a 59,644 BTU output that meets and exceed the performance specification shall be installed. Mounting the condenser below the cab or body would reduce the performance of the system and shall not be acceptable.

One (1) evaporator unit shall be installed in the center roof with two (2) cores, one (1) for the cab and one (1) for the crew cab. The evaporator unit shall have an adequate BTU rating to meet the performance specifications.

Adjustable air outlets shall be strategically located on the evaporator cover per the following:

* Four (4) shall be directed towards the driver's location
* Four (4) shall be directed towards the officer's location
* Seven (7) shall be directed towards the crew cab area

The air conditioner refrigerant shall be R-134A and shall be installed by a certified technician.

The air conditioner shall be controlled by a single electronic control panel. For ease of operation, the control panel shall include variable adjustment for temperature and fan control and be conveniently located on the dash in clear view of the driver.

## SUN VISORS

Two (2) smoked Lexan™ sun visors provided. The sun visors shall be located above the windshield with one (1) mounted on each side of the cab.

There shall be no retention bracket provided to help secure each sun visor in the stowed position.

## GRAB HANDLES

A black rubber covered grab handle shall be mounted on the door post of the driver and officer's side cab door to assist in entering the cab. The grab handles shall be securely mounted to the post area between the door and windshield.

## ENGINE COMPARTMENT LIGHTS

There shall be one (1) 12 volt DC, 3.00" white LED light(s) with chrome flange kit(s) installed under the cab to be used as engine compartment illumination.

These light(s) shall be activated automatically when the cab is raised.

## ACCESS TO ENGINE DIPSTICKS

For access to the engine oil and transmission fluid dipsticks, there shall be a door on the engine tunnel, inside the crew cab. The door shall be on the rear wall of the engine tunnel, on the vertical surface.

The engine oil dipstick shall allow for checking only. The transmission dipstick shall allow for both checking and filling.

The door shall have a rubber seal for thermal and acoustic insulation. One (1) flush latch shall be provided on the access door.

## SEATING CAPACITY

The seating capacity in the cab shall be six (6).

## DRIVER SEAT

A Seats Incorporated, 911or equivalent, scissor action, air ride, mid-height with headrest style seat shall be provided in the cab for the driver.

## OFFICER SEAT

A Seats Incorporated, 911or equivalent, SCBA seat shall be provided in the cab for the officer.

The SCBA cavity shall be adjustable front to rear in 0.50" increments to accommodate different size SCBA bottles. Moving the SCBA cavity shall be accomplished by unbolting, relocating and re-bolting in the desired location.

## RADIO COMPARTMENT

A radio compartment shall be provided under the officer's seat.

The inside compartment dimensions shall be 16.00" wide x 7.50" high x 15.00" deep, with the back of the compartment angled up to match the cab structure.

A drop-down door with a chrome plated lift and turn latch shall be provided for access.

The compartment shall be constructed of smooth aluminum and painted to match the cab interior.

## REAR FACING DRIVER SIDE EMS COMPARTMENT

A rear facing EMS compartment shall be provided in the crew cab at the driver side outboard position.

The compartment shall be 23.00" wide x 44.00" high x 26.75" deep with one (1) Amdor roll up door, non-locking, with white finish. The clear door opening of the compartment shall be 15.00" wide x 33.75" high.

The compartment shall be constructed of smooth aluminum and painted to match the cab interior.

### Compartment Light

There shall be one (1) white LED strip light installed on the left side of the compartment opening. The lights shall be controlled by an automatic door switch.

## REAR FACING PASSENGER SIDE EMS COMPARTMENT

A rear facing EMS compartment shall be provided in the crew cab at the passenger side outboard position.

The compartment shall be 22.00" wide x 44.00" high x 26.75" deep with one (1) Amdor roll up door, non-locking, with white finish. The clear door opening of the compartment shall be 15.00" wide x 33.75" high.

The compartment shall be constructed of smooth aluminum, and painted to match the cab interior.

### Compartment Light

There shall be one (1) white LED strip light installed on the right side of the compartment opening. The lights shall be controlled by an automatic door switch.

## FORWARD FACING CENTER SEATS

There shall be two (2) forward facing, Seats Incorporated 911 or equivalent SCBA seats provided at the center position in the crew cab. The SCBA cavity shall be adjustable front to rear in 0.50" increments to accommodate different size SCBA bottles.

Moving the SCBA cavity shall be accomplished by unbolting, relocating and re-bolting in the desired location.

## SEAT UPHOLSTERY

All seat upholstery shall be gray woven with black Imperial 1200 material.

## AIR BOTTLE HOLDERS

All SCBA type seats in the cab shall have a Ziamatic or equivalent SCBA holder bracket. This bracket shall be compliant with the current NFPA 1901 standards and shall include a back plate, two (2) seats, a footplate and the Model LLS (Load & Lock) strap to hold the bottle in the bracket. The bracket seats shall be a "one size fits all" style seat and shall accommodate SCBA cylinders from the high pressure 30-minute to the high pressure 60-minute. Seats shall be adjustable up and down by unbolting, relocating, and re-bolting in the desired position.

**SCBA MOUNTS**

There shall be mounts for 2 SCBA just inside the Crew Cab Door on the Rear wall, one each side.

## SEAT BELTS

All cab and tiller cab (if applicable) seating positions shall have red seat belts. The seat belts shall be furnished with a single automatic retractor. To provide quick, easy use for occupants wearing bunker gear, the female buckle and seat belt webbing length shall meet or exceed the current edition of NFPA 1901 and CAN/ULC - S515 standards.

The 3-point shoulder type belts shall also include the ReadyReach D-loop or equivalent assembly to the shoulder belt system. The feature adds an extender arm to the D-loop location placing the D-loop in a closer, easier to reach location.

To ensure safe operation, the seat shall be equipped with seat belt sensors in the seat cushion and belt receptacle that shall activate an alarm indicating a seat is occupied but not buckled.

## HELMET STORAGE PROVIDED BY FIRE DEPARTMENT

NFPA 1901, 2016 edition, section 14.1.7.4.1 requires a location for helmet storage be provided.

There is no helmet storage on the apparatus as manufactured. The fire department shall provide a location for storage of helmets.

## CAB DOME LIGHTS

There shall be four (4) dual LED dome lights with black bezels provided. Two (2) lights shall be mounted above the inside shoulder of the driver and officer and two (2) lights shall be installed and located, one (1) on each side of the crew cab.

The color of the LED's shall be red and white.

The white LED's shall be controlled by the door switches and the lens switch.

The color LED's shall be controlled by the lens switch.

In order to ensure exceptional illumination, each white LED dome light shall provide a minimum of 10.1 foot-candles (fc) covering an entire 20.00" x 20.00" square seating position when mounted 40.00" above the seat.

## PORTABLE HAND LIGHTS, PROVIDED BY FIRE DEPARTMENT

NFPA 1901, 2016 edition, section 5.9.4 requires two portable hand lights mounted in brackets fastened to the apparatus.

The hand lights are not on the apparatus as manufactured. The fire department shall provide and mount these hand lights.

## CAB INSTRUMENTATION

The cab instrument panel shall be a molded ABS panel and include gauges, telltale indicator lamps, control switches, alarms, and a diagnostic panel. The function of the instrument panel controls and switches shall be identified by a label adjacent to each item. Actuation of the headlight switch shall illuminate the labels in low light conditions. Telltale indicator lamps shall not be illuminated unless necessary. The cab instruments and controls shall be conveniently located within the forward cab section, forward of the driver. The gauge assembly and switch panels are designed to be removable for ease of service and low cost of ownership.

## GAUGES

The gauge panel shall include the following ten (10) black faced gauges with black bezels to monitor vehicle performance:

* Voltmeter gauge (volts):
	+ Low volts (11.8 VDC)
		- Amber telltale light on indicator light display with steady tone alarm
	+ High volts (15.5 VDC)
		- Amber telltale light on indicator light display with steady tone alarm
* Engine Tachometer (RPM)
* Speedometer MPH (Major Scale), KM/H (Minor Scale)
* Fuel level gauge (Empty - Full in fractions):
	+ Low fuel (1/8 full)
		- Amber indicator light in gauge dial with steady tone alarm
* Engine Oil pressure Gauge (PSI):
	+ Low oil pressure to activate engine warning lights and alarms
		- Red indicator light in gauge dial with steady tone alarm
* Front Air Pressure Gauges (PSI):
	+ Low air pressure to activate warning lights and alarm
		- Red indicator light in gauge dial with steady tone alarm
* Rear Air Pressure Gauges (PSI):
	+ Low air pressure to activate warning lights and alarm
		- Red indicator light in gauge dial with steady tone alarm
* Transmission Oil Temperature Gauge (Fahrenheit):
	+ High transmission oil temperature activates warning lights and alarm
		- Amber indicator light in gauge dial with steady tone alarm
* Engine Coolant Temperature Gauge (Fahrenheit):
	+ High engine temperature activates an engine warning light and alarms
		- Red indicator light in gauge dial with steady tone alarm
* Diesel Exhaust Fluid Level Gauge (Empty - Full in fractions):
	+ Low fluid (1/8 full)
		- Amber indicator light in gauge dial

## INDICATOR LAMPS

To promote safety, the following telltale indicator lamps shall be located on the instrument panel in clear view of the driver. The indicator lamps shall be "dead-front" design that is only visible when active. The colored indicator lights shall have descriptive text or symbols.

The following amber telltale lamps shall be present:

* Low coolant
* Trac cntl (traction control) (where applicable)
* Check engine
* Check trans (check transmission)
* Air rest (air restriction)
* DPF (engine diesel particulate filter regeneration)
* HET (engine high exhaust temperature) (where applicable)
* ABS (antilock brake system)
* MIL (engine emissions system malfunction indicator lamp) (where applicable)
* Regen inhibit (engine emissions regeneration inhibit) (where applicable)
* Side roll fault (where applicable)
* Front air bag fault (where applicable)
* Aux brake overheat (auxiliary brake overheat) (where applicable)
* The following red telltale lamps shall be present:
* Ladder rack down
* Parking brake
* Stop engine
* The following green telltale lamps shall be present:
* Left turn
* Right turn
* Battery on
* Ignition
* Aux brake (auxiliary brake engaged) (where applicable)
* The following blue telltale lamps shall be present:
* High beam

## ALARMS

Audible steady tone warning alarm: A steady audible tone alarm shall be provided whenever a warning condition is active.

## INDICATOR LAMP AND ALARM PROVE-OUT

A system shall be provided which automatically tests telltale indicator lights and alarms located on the cab instrument panel. Telltale indicators and alarms shall perform prove-out for 3 to 5 seconds when the ignition switch is moved to the on position with the battery switch on.

## CONTROL SWITCHES

For ease of use, the following controls shall be provided immediately adjacent to the cab instrument panel within easy reach of the driver. All switches shall have backlit labels for low light applications.

Headlight/Parking light switch: A three (3)-position maintained rocker switch shall be provided. The first switch position shall deactivate all parking and headlights. The second switch position shall activate the parking lights. The third switch shall activate the headlights.

Panel back lighting intensity control switch: A three (3)-position momentary rocker switch shall be provided. Pressing the top half of the switch, "Panel Up" increases the panel back lighting intensity and pressing the bottom half of the switch, "Panel Down" decreases the panel back lighting intensity. Pressing the half or bottom half of the switch several times shall allow back lighting intensity to be gradually varied from minimum to maximum intensity level for ease of use.

Ignition switch: A three (3)-position maintained/momentary rocker switch shall be provided. The first switch position shall turn off and deactivate vehicle ignition. The second switch position shall activate vehicle ignition and shall perform prove-out on the telltale indicators and alarms for 3 to 5 seconds after the switch is turned on. A green indicator lamp is activated with vehicle ignition. The third momentary position shall temporarily silence all active cab alarms. An alarm "chirp" may continue as long as alarm condition exists. Switching ignition to off position shall terminate the alarm silence feature and reset function of cab alarm system.

Engine start switch: A two (2)-position momentary rocker switch shall be provided. The first switch position is the default switch position. The second switch position shall activate the vehicle's engine. The switch actuator is designed to prevent accidental activation.

Hazard switch shall be provided on the instrument panel or on the steering column.

Heater and defroster controls.

Turn signal arm: A self-canceling turn signal with high beam headlight controls.

Windshield wiper control shall have high, low, and intermittent modes.

Parking brake control: An air actuated push/pull park brake control.

Chassis horn control: Activation of the chassis horn control shall be provided through the center of the steering wheel.

High idle engagement switch: A maintained rocker switch with integral indicator lamp shall be provided. The switch shall activate and deactivate the high idle function. The "OK To Engage High Idle" indicator lamp must be active for the high idle function to engage. A green indicator lamp integral to the high idle engagement switch shall indicate when the high idle function is engaged.

"OK To Engage High Idle" indicator lamp: A green indicator light shall be provided next to the high idle activation switch to indicate that the interlocks have been met to allow high idle engagement.

Emergency switching shall be controlled by multiple individual warning light switches for various groups or areas of emergency warning lights. An Emergency Master switch provided on the instrument panel that enables or disables all individual warning light switches is included.

An additional "Emergency Master" button shall be provided on the lower left hand corner of the gauge panel to allow convenient control of the "Emergency Master" system from inside the driver's door when standing on the ground.

## CUSTOM SWITCH PANELS

The design of cab instrumentation shall allow for emergency lighting and other switches to be placed within easy reach of the operator thus improving safety. There shall be positions for up to four (4) switch panels in the lower instrument console and up to six (6) switch panels in the overhead visor console. All switches have backlit labels for low light conditions.

## DIAGNOSTIC PANEL

A diagnostic panel shall be provided and accessible while standing on the ground. The panel shall be located inside the driver's 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 ABS systems to provide blink codes should a problem exist.

The diagnostic panel shall include the following:

* ENGINE/TRANSMISSION/ABS J1939 Diagnostic Port
* ABS Diagnostic Switch and Indicator - The switch and amber indicator shall allow access to diagnostic mode and display of standard ABS system fault blink codes that may be generated by the ABS system
* DPF REGEN (Diesel Particulate Filter Regeneration Switch) (where applicable) shall be provided to request regeneration of the engine emission system. An amber indicator shall be provided on top of the switch that shall illuminate in a "CHECK ENGINE" condition
* REGEN INHIBIT (Diesel Particulate Filter Regeneration Inhibit Switch) (where applicable) shall be provided that shall request that regeneration be temporarily prevented. A green indicator shall be provided on top of the Regen Inhibit switch that shall illuminate when the Regen Inhibit feature is active. Regen Inhibit shall be disabled upon cycling of the ignition switch to the off state.

## AIR RESTRICTION INDICATOR

A high air restriction warning indicator light (electronic) shall be provided.

## "DO NOT MOVE APPARATUS" INDICATOR

A flashing red indicator light, located in the driving compartment, shall be illuminated automatically per the current NFPA requirements. The light shall be labeled "Do Not Move Apparatus If Light Is On."

The same circuit that activates the Do Not Move Apparatus indicator shall activate a pulsing alarm when the parking brake is released.

## WIPER CONTROL

Wiper control shall consist of a two (2)-speed windshield wiper control with intermittent feature and windshield washer controls.

## SPARE CIRCUIT

There shall be two (2) pair of wires, including a positive and a negative, installed on the apparatus.

The above wires shall have the following features:

* The positive wire shall be connected directly to the battery power
* The negative wire shall be connected to ground
* Wires shall be protected to 15 amps at 12 volts DC
* Power and ground shall terminate officer side dash area
* Termination shall be with 15 amp, power point plug with rubber cover
* Wires shall be sized to 125 percent of the protection

The circuit(s) may be load managed when the parking brake is set.

## VEHICLE DATA RECORDER

There shall be a vehicle data recorder (VDR) capable of reading and storing vehicle information provided.

The information stored on the VDR can be downloaded through a USB port mounted in a convenient location determined by cab model. A USB cable can be used to connect the VDR to a laptop to retrieve required information. The program to download the information from the VDR will be available to download on-line.

The vehicle data recorder shall be capable of recording the following data via hardwired and/or CAN inputs:

* Vehicle Speed - MPH
* Acceleration - MPH/sec
* Deceleration - MPH/sec
* Engine Speed - RPM
* Engine Throttle Position - % of Full Throttle
* ABS Event - On/Off
* Seat Occupied Status - Yes/No by Position
* Seat Belt Buckled Status - Yes/No by Position
* Master Optical Warning Device Switch - On/Off
* Time - 24 Hour Time
* Date - Year/Month/Day

### Seat Belt Monitoring System

A seat belt monitoring system (SBMS) shall be provided. The SBMS shall be capable of monitoring up to 10 seating positions indicating the status of each seat position per the following:

* Seat Occupied & Buckled = Green LED indicator illuminated
* Seat Occupied & Unbuckled = Red LED indicator with audible alarm
* No Occupant & Buckled = Red LED indicator with audible alarm
* No Occupant & Unbuckled = No indicator and no alarm

The SBMS shall include an audible alarm that shall warn that an unbuckled occupant condition exists and the parking brake is released, or the transmission is not in park.

## RADIO ANTENNA MOUNT

There shall be one (1) standard 1.125", 18 thread antenna-mounting base(s) installed on the right side on the cab roof with high efficiency, low loss, coaxial cable(s) routed to the instrument panel area. A weatherproof cap shall be installed on the mount.

## VEHICLE CAMERA SYSTEM

There shall be a color vehicle camera system provided with the following:

* One (1) camera located at the rear of the apparatus, pointing rearward, displayed automatically with the vehicle in reverse.

The camera image shall be displayed on a 7.00" LCD display located in view of the driver in the custom dash, per instrument panel layout. The display shall include manual camera activation capability and audio from the active camera.

The following components will be included:

* One (1) MO700136DC, display
* One (1) SV-CW134639CAI, camera
* All necessary cables

## ELECTRICAL POWER CONTROL SYSTEM

A compartment shall be provided in or under the cab to house the vehicle's electrical power and signal circuit protection and control components. The power and signal protection and control compartment shall contain circuit protection devices and power control devices. Power and signal protection and control components shall be protected against corrosion, excessive heat, excessive vibration, physical damage and water spray.

Serviceable components shall be readily accessible.

Circuit protection devices, which conform to SAE standard, shall be utilized to protect each circuit. All circuit protection devices shall be sized to prevent wire and component damage when subjected to extreme current overload. General protection circuit breakers shall be Type-I automatic reset (continuously resetting) and conform to SAE J553 or J258. When required, automotive type fuses conforming to SAE J554, J1284, J1888 or J2077 shall be utilized to protect electronic equipment.

Power control relays and solenoids shall have a direct current (dc) rating of 125 percent of the maximum current for which the circuit is protected.

Visual status indicators shall be supplied to identify control safety interlocks and vehicle status. In addition to visual status indicators, audible alarms designed to provide early warning of problems before they become critical shall be used.

### VOLTAGE MONITOR SYSTEM

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

### POWER AND GROUND STUDS

Spare circuits shall be provided in the primary distribution center for two-way radio equipment.

The spare circuits shall consist of the following:

* One (1) 12-volt DC, 30 amp battery direct spare
* One (1) 12-volt DC ground and un-fused switched battery stud located in or adjacent to the power distribution center

### EMI/RFI PROTECTION

The electrical system proposed shall include means to control undesired electromagnetic and radio frequency emissions. State of the art electrical system design and components shall be used to ensure radiated and conducted EMI (electromagnetic interference) and RFI (radio frequency interference) emissions are suppressed at their source.

The apparatus proposed shall have the ability to operate in the electromagnetic environment typically found in fire ground operations. The contractor shall be able to demonstrate the EMI and RFI testing has been done on similar apparatus and certifies that the vehicle proposed meets SAE J551 requirements.

EMI/RFI susceptibility shall be controlled by applying immune circuit designs, shielding, twisted pair wiring and filtering. The electrical system shall be designed for full compatibility with low level control signals and high powered two-way radio communication systems. Harness and cable routing shall be given careful attention to minimize the potential for conducting and radiated EMI-RFI susceptibility.

## ELECTRICAL

All 12-volt electrical equipment installed by the apparatus manufacturer shall conform to modern automotive practices. All wiring shall be high temperature crosslink type. Wiring shall be run, in loom or conduit, where exposed and have grommets where wire passes through sheet metal. Automatic reset circuit breakers shall be provided which conform to SAE Standards. Wiring shall be color, function and number coded. Function and number codes shall be continuously imprinted on all wiring harness conductors at 2.00" intervals. 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:

1. All holes made in the roof shall be caulked with silicon, rope caulk is not acceptable. Large fender washers, liberally caulked, shall be used when fastening equipment to the underside of the cab roof.
2. 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.
3. Electrical components designed to be removed for maintenance shall not be fastened with nuts and bolts. Metal screws shall be used in mounting these devices. Also a coil of wire shall be provided behind the appliance to allow them to be pulled away from mounting area for inspection and service work.
4. Corrosion preventative compound shall be applied to all terminal plugs located outside of the cab or body. All non-waterproof connections shall require this compound in the plug to prevent corrosion and for easy separation (of the plug).
5. All lights that have their sockets in a weather exposed area shall have corrosion preventative compound added to the socket terminal area.
6. All electrical terminals in exposed areas shall have silicon (1890) applied completely over the metal portion of the terminal.

All lights and reflectors, required to comply with Federal Motor Vehicle Safety Standard #108, shall be furnished. Rear identification lights shall be recessed mounted for protection. Lights and wiring mounted in the rear bulkheads shall be protected from damage by installing a false bulkhead inside the rear compartments.

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.

The results of the tests shall be recorded and provided to the purchaser at time of delivery.

## BATTERY SYSTEM

There shall be four (4) 12 volt batteries that include the following features shall be provided:

* 950 CCA, cold cranking amps
* 190 amp reserve capacity
* High cycle
* Group 31
* Rating of 3800 CCA at 0 degrees Fahrenheit
* 760 minutes of reserve capacity
* Threaded stainless steel studs

Each battery case shall be a black polypropylene material with a vertically ribbed container for increased vibration resistance. The cover shall be manifold vented with a central venting location to allow a 45 degree tilt capacity.

The inside of each battery shall consist of a "maintenance free" grid construction with poly wrapped separators and a flooded epoxy bottom anchoring for maximum vibration resistance.

## BATTERY SYSTEM

There shall be a single starting system with an ignition switch and starter button provided and located on the cab instrument panel.

## MASTER BATTERY SWITCH

There shall be a master battery switch provided within the cab within easy reach of the driver to activate the battery system.

An indicator light shall be provided on the instrument panel to notify the driver of the status of the battery system.

## BATTERY COMPARTMENTS

Batteries shall be placed on non-corrosive mats and be stored in well ventilated compartments located under the cab.

Heavy-duty battery cables shall be used to provide maximum power to the electrical system. Cables shall be color coded.

Battery terminal connections shall be coated with anti-corrosion compound. Battery solenoid terminal connections shall be encapsulated with semi-permanent rubberized compound.

## JUMPER STUDS

One (1) set of battery jumper studs with plastic color-coded covers shall be included on the battery compartments.

## BATTERY CHARGER

There shall be an 45 amp battery charger provided.

The battery charger shall be wired to the AC shoreline inlet through an AC receptacle adjacent to this battery charger.

The battery charger shall be located in the left body compartment mounted on the left wall as high as possible.

## AUTO EJECT FOR SHORELINE

There shall be one (1) Kussmaul™ or equivalent, 20 amp 120 volt AC shoreline inlet(s) provided to operate the dedicated 120 volt AC circuits on the apparatus.

The shoreline inlet(s) shall include red weatherproof flip up cover(s).

There shall be a release solenoid wired to the vehicle's starter to eject the AC connector when the engine is starting.

The shoreline(s) shall be connected to the battery charger.

There shall be a mating connector body supplied with the loose equipment.

There shall be a label installed near the inlet(s) that state the following:

* Line Voltage
* Current Ratting (amps)
* Phase
* Frequency

The shoreline receptacle shall be located on the driver side of cab, above wheel.

## ALTERNATOR

A Delco Remy®, Model 40SI or equivalent, alternator shall be provided. It shall have a rated output current of 320 amps, as measured by SAE method J56. The alternator shall feature an integral regulator and rectifier system that has been tested and qualified to an ambient temperature of 257 degrees Fahrenheit (125 degrees Celsius). The alternator shall be connected to the power and ground distribution system with heavy-duty cables sized to carry the full rated alternator output.

## ELECTRONIC LOAD MANAGEMENT

An electronic load management (ELM) system that monitors the vehicles 12-volt electrical system, and automatically reduces the electrical load in the event of a low voltage condition and by doing so, ensures the integrity of the electrical system.

The ELM shall monitor the vehicle's voltage while at the scene (parking brake applied). It shall sequentially shut down individual electrical loads when the system voltage drops below a preset value. Two (2) separate electrical loads shall be controlled by the load manager. The ELM shall sequentially re-energize electrical loads as the system voltage recovers.

## HEADLIGHTS

There shall be four (4) rectangular halogen lights mounted in the front quad style, chrome housing on each side of the cab grille:

* The outside light on each side shall contain a halogen low and high beam module.
* The inside light on each side shall contain a halogen high beam module only.

## DIRECTIONAL LIGHTS

There shall be two (2) amber LED populated arrow directional lights provided on the front of the cab, above the headlights. Each light shall be housed in the same quad common bezel as the front warning light. The lens color(s) to be the same as the LEDs.

## INTERMEDIATE LIGHT

There shall be two (2) amber LED turn signal marker lights furnished, one (1) each side, in the rear fender panel. The light shall double as a turn signal and marker light.

## CAB CLEARANCE/MARKER/ID LIGHTS

There shall be five (5) amber LED lights provided to indicate the presence and overall width of the vehicle in the following locations:

* Three (3) amber LED identification lights shall be installed in the center of the cab above the windshield.
* Two (2) amber LED clearance lights shall be installed, one (1) on each outboard side of the cab above the windshield.

## FRONT CAB SIDE DIRECTIONAL/MARKER LIGHTS

There shall be two (2) amber LED lights installed front of the cab door, one (1) on each side of the cab.

The lights shall activate as marker lights with the headlight switch and directional lights with the corresponding directional circuit.

## REAR CLEARANCE/MARKER/ID LIGHTING

There shall be a three (3) LED light bar used as identification lights located at the rear of the apparatus per the following:

* As close as practical to the vertical centerline
* Centers spaced not less than 6.00" or more than 12.00" apart
* Red in color
* All at the same height

There shall be two (2) LED lights installed at the rear of the apparatus used as clearance lights located at the rear of the apparatus per the following:

* To indicate the overall width of the vehicle
* One (1) each side of the vertical centerline
* As near the top as practical
* Red in color
* To be visible from the rear
* All at the same height

There shall be two (2) LED lights installed on the side of the apparatus used as marker lights as close to the rear as practical per the following:

* To indicate the overall length of the vehicle
* One (1) each side of the vertical centerline
* As near the top as practical
* Red in color
* To be visible from the side
* All at the same height

There shall be two (2) red reflectors located on the rear of the truck facing to the rear. One (1) each side, as far to the outside as practical, at a minimum of 15.00", but no more than 60.00", above the ground.

There shall be two (2) red reflectors located on the side of the truck facing to the side. One (1) each side, as far to the rear as practical, at a minimum of 15.00", but no more than 60.00", above the ground.

Per FMVSS 108 and CMVSS 108 requirements.

## REAR FMVSS LIGHTING

There shall be the following stop/tail and directional lighting provided at the rear of the truck:

* Two (2) red LED stop/tail lights with clear lenses
* Two (2) amber LED directional lights

The lights shall be mounted in a polished combination housing.

Two (2) LED backup lights shall be provided.

## LICENSE PLATE BRACKET

There shall be one (1) license plate bracket mounted on the rear of the body.

A white LED light shall illuminate the license plate. A polished stainless steel light shield shall be provided over the light that shall direct illumination downward, preventing white light to the rear.

## LIGHTING BEZEL

Two (2) Whelen, Model PLAST4Vor equivalent, four (4) light chrome plated composite plastic housings shall be provided for the rear stop/tail, directional, scene lights and warning.

## BACK-UP ALARM

A PRECO, Model 1040 or equivalent, solid-state electronic audible back-up alarm that actuates when the truck is shifted into reverse shall be provided. The device shall sound at 60 pulses per minute and automatically adjust its volume to maintain a minimum ten (10) dBA above surrounding environmental noise levels.

## CAB PERIMETER SCENE LIGHTS

There shall be four (4) white LED lights with grommets provided, one (1) for each cab and crew cab door.

These lights shall be activated automatically when the battery switch is on and the exit doors are opened or by the same means as the body perimeter scene lights.

## PUMP HOUSE PERIMETER LIGHTS

There shall be two (2) white 12 volt DC LED weatherproof strip lights provided under the pump panel running boards, one (1) each side.

The lights shall be controlled by the same means as the body perimeter lights.

## BODY PERIMETER SCENE LIGHTS

There shall be two (2) white LED lights with grommets provided under at the rear step area of the body, one (1) each side shining to the rear.

The perimeter scene lights shall be activated when the parking brake is applied.

## STEP LIGHTS

Four (4) white LED step lights shall be provided. One (1) step light shall be provided on each side, on the front compartment face and two (2) step lights at the rear to illuminate the tailboard.

In order to ensure exceptional illumination, each light shall provide a minimum of 25 foot-candles (fc) covering an entire 15.00" x 15.00" square placed 10.00" below the light and a minimum of 1.5 fc covering an entire 30.00" x 30.00" square at the same 10.00" distance below the light.

These step lights shall be actuated with the pump panel light switch.

All other steps on the apparatus shall be illuminated per the current edition of NFPA 1901.

## 12 VOLT LIGHTING

There shall be one (1) Spectra Max, Model SPA260-Q20 or equivalent, 12 volt LED surface mounted scene light(s) with chrome bezel(s) provided Side of Cab.

The light(s) shall be controlled in the following way:

* a switch at the driver's side switch panel
* a switch at the pump operator's panel
* no additional switch location
* no additional switch location

The light(s) may be load managed when the parking brake is applied.

## 12 VOLT LIGHTING

There shall be one (1) Fire Research Spectra Max, Model SPA260-Q20 or equivalent, 12 volt LED surface mounted scene light(s) with white bezel(s) provided Side of Cab.

The light(s) shall be controlled in the following way:

* a switch at the driver's side switch panel
* a switch at the pump operator's panel
* no additional switch location
* no additional switch location

The light(s) may be load managed when the parking brake is applied.

## 12 VOLT LIGHTING

There shall be one (1) Fire Research Evolution, Model FCA851-V20-\* or equivalent, 12 volt LED floodlight(s) provided on the front visor, centered.

The painted parts of this light assembly to be white with a chrome bezel.

The light(s) shall flash in a warning mode when the emergency master switch is activated, the parking brake is released and with a separate switch powered from emergency master power, included on the switch panel.

The lights shall be in a steady burning scene light mode with the following:

* a switch at the driver's side switch panel
* a switch at the pump operator's panel
* no additional switch location

The scene light mode shall be the priority control.

These lights may be load managed when the parking brake is applied.

## REAR WORK LIGHTS

There shall be one (1) pair of Whelen®, Model PELCC or equivalent, white 12 volt DC LED scene lights installed at the rear of the body to the outside of the rear compartment. The lights shall be directed down ward by a 40 degree angle and mounted with a chrome flange.

The lights shall be controlled by a control from a switch at the rear of the truck.

## HOSE BED LIGHTS

There shall be white 12 volt DC LED light strips with stainless steel protective cover, provided to light the hose bed area. Hose Bed lights shall meet the photometric levels listed in NFPA 1901 for Hose Bed lighting requirements.

* Light strip(s) shall be installed along the upper edge of the left side of the hose bed.
* Light strip(s) shall be installed along the upper edge of the right side of the hose bed.

The lights shall be activated by a cup switch at the rear of the apparatus no more than 62.00" from the ground.

## WALKING SURFACE LIGHT

There shall be a 4" round black 12 volt DC LED floodlight with bolt mount provided to illuminate the entire designated walking surface on top of the body.

The light shall be activated when the body step lights are on.

## WATER TANK

Booster tank shall have a capacity of 1000 gallons and be constructed of polypropylene plastic by United Plastic Fabricating, Incorporated.

Tank joints and seams shall be nitrogen welded inside and out.

Tank shall be baffled in accordance with NFPA Bulletin 1901 requirements.

Baffles shall have vent openings at both the top and bottom to permit movement of air and water between compartments.

Longitudinal partitions shall be constructed of .38" polypropylene plastic and shall extend from the bottom of the tank through the top cover to allow for positive welding.

Transverse partitions shall extend from 4.00" off the bottom of the tank to the underside of the top cover.

All partitions shall interlock and shall be welded to the tank bottom and sides.

Tank top shall be constructed of .50" polypropylene. It shall be recessed .38" and shall be welded to the tank sides and the longitudinal partitions.

Tank top shall be sufficiently supported to keep it rigid during fast filling conditions.

Construction shall include 2.00" polypropylene dowels spaced no more than 30.00" apart and welded to the transverse partitions. Two (2) of the dowels shall be drilled and tapped (.50" diameter, 13.00" deep) to accommodate lifting eyes.

A sump that is 8.00" long x 8.00" wide x 6.00" deep shall be provided at the bottom of the water tank.

Sump shall include a drain plug and the tank outlet.

Tank shall be installed in a fabricated cradle assembly constructed of structural steel.

Sufficient crossmembers shall be provided to properly support bottom of tank. Crossmembers shall be constructed of steel bar channel or rectangular tubing.

Tank shall "float" in cradle to avoid torsional stress caused by chassis frame flexing. Rubber cushions, .50" thick x 3.00" wide, shall be placed on all horizontal surfaces that the tank rests on.

Stops or other provision shall be provided to prevent an empty tank from bouncing excessively while moving vehicle.

Mounting system shall be approved by the tank manufacturer.

Fill tower shall be constructed of .50" polypropylene and shall be a minimum of 8.00" wide x 14.00" long.

Fill tower shall be furnished with a .25" thick polypropylene screen and a hinged cover.

An overflow pipe, constructed of 4.00" schedule 40 polypropylene, shall be installed approximately halfway down the fill tower and extend through the water tank and exit to the rear of the rear axle.

One (1) sleeve shall be provided in the water tank for a 3.00" pipe to the rear.

## DIRECT TANK FILL

There shall be one (1) - 2.50" gated tank fill(s) installed and properly labeled at the driver's side pump panel.

Piping, for the fill, shall be routed through the front wall of the tank and include a flow deflector to break up the stream of water entering the water tank.

A 2.50" full flow ball valve with 2.50" piping and a 2.50" (F)NST chrome swivel shall be located at the inlet.

The valve for the inlet shall be recessed behind the pump panel.

A chrome plated plug and chain shall be provided for the tank fill.

## HOSE BED“minimum requirement”

The hose bed shall be fabricated of .125"-5052 aluminum with a nominal 38,000 psi tensile strength.

Standard hose bed width shall be 68.00" inside.

Upper and rear edges of side panels shall have a double break for rigidity, a split tube finish shall not be acceptable.

The upper inside area of the beavertails shall be covered with brushed stainless steel to prevent damage to painted surface when hose is removed.

Flooring of the hose bed shall be removable aluminum grating with the top surface corrugated to aid in hose aeration. The grating slats shall be a minimum of 0.50" x 4.50" with spacing between slats for hose ventilation.

The hose bed shall accommodate 1000 feet of 5.00" hose and 1000 feet of 3.00" hose.

## HOSE BED DIVIDER

Two (2) adjustable hosebed dividers shall be furnished for separating hose.

Each divider shall be constructed of a .25" brushed aluminum sheet. Flat surfaces shall be sanded for uniform appearance, or constructed of brushed aluminum.

Divider shall be fully adjustable by sliding in tracks, located at the front and rear of the hose bed.

Divider shall be held in place by tightening bolts, at each end.

Acorn nuts shall be installed on all bolts in the hose bed which have exposed threads.

## HOSE BED HOSE RESTRAINT

The hose in the hose bed shall be restrained by a black nylon Velcro® strap at the top of the hose bed. At the rear of the hose bed, 2.00" black nylon webbing with a 1.50" x 4.00" box pattern shall attach at the top rear outside corners with seat belt buckle fasteners. The webbing shall have straps connected with seat belt buckle fasteners located at the rear body sheet below the hose bed.

A cross-divider shall be provided just behind the fill tower. The divider shall be bolted to the side sheet.

## RUNNING BOARDS

Running boards shall be fabricated of .125" bright aluminum treadplate.

Each running board shall be supported by a welded 2.00" square tubing and channel assembly, which shall be bolted to the pump compartment substructure.

Running boards shall be 12.75" deep and spaced .50" away from the pump panel.

A splash guard shall be provided above the running board treadplate.

## TAILBOARD

The tailboard shall also be constructed of .125" bright aluminum treadplate and spaced .50" from the body, as well as supported by a structural steel assembly.

The tailboard area shall be 16.00" deep.

The exterior side shall be flanged down and in for increased rigidity of tailboard structure.

## REAR WALL, SMOOTH ALUMINUM/BODY MATERIAL

The rear facing surfaces of the center rear wall shall be smooth aluminum.

The bulkheads, the surface to the rear of the side body compartments, shall be smooth and the same material as the body.

Any inboard facing surfaces below the height of the hosebed shall be aluminum diamondplate .

## TOW BARS

Two (2) tow bars shall be installed under the tailboard.

Tow bars shall be fabricated of 1.00" CRS bar rolled into a 3.00" radius.

Tow bar assemblies shall be constructed of .38" structural angle. When force is applied to the bar, it shall be transmitted to the frame rail.

Tow bar assemblies shall be designed and positioned to allow up to a 30 degree upward angled pull of 17,000 lb, or a 20,000 lb straight horizontal pull in line with the centerline of the vehicle.

Tow bar design shall have been fully tested and evaluated using strain gauge testing and finite element analysis techniques.

## HITCH RECEIVER

A hitch receiver shall be installed at the rear and the sides of the apparatus. The side receivers shall be located to the rear of the wheels, under the rear platform.

The hitch receivers shall be constructed of heavy steel tubing and reinforced to the truck framework, for the receiving portion. This shall be a Class III/IV trailer hitch. A class IV rating shall be obtained only when a weight distributing hitch is used.

Slide-in portion shall be held in place by one (1) safety pin with clip.

## COMPARTMENTATION“minimum requirement”

Body and compartments shall be fabricated of .125", 5052-H32 aluminum.

Side compartments shall be an integral assembly with the rear fenders.

Circular fender liners shall be provided for prevention of rust pockets and ease of maintenance.

Compartment flooring shall be of the sweep out design with the floor higher than the compartment door lip.

The compartment door opening shall be framed by flanging the edges in 1.75" and bending out again .75" to form an angle.

Drip protection shall be provided above the doors by means of bright aluminum extrusion, formed bright aluminum treadplate or polished stainless steel.

The top of the compartment shall be covered with bright aluminum treadplate rolled over the edges on the front, rear and outward side. These covers shall have the corners welded.

Side compartment covers shall be separate from the compartment tops.

Front facing compartment walls shall be covered with bright aluminum treadplate.

All screws and bolts which protrude into a compartment shall have acorn nuts on the ends to prevent injury.

## UNDERBODY SUPPORT SYSTEM“minimum requirement”

Due to the severe loading requirements of this pumper a method of body and compartment support suitable for the intended load shall be provided.

The backbone of the support system shall be the chassis frame rails which is the strongest component of the chassis and is designed for sustaining maximum loads.

The support system shall include .375" thick steel vertical angle supports bolted to the chassis frame rails with .625" diameter bolts.

Attached to the bottom of the steel vertical angles shall be horizontal angles, with gussets welded to the vertical members, which extend to the outside edge of the body.

A steel frame shall be mounted on the top of these supports to create a floating substructure which shall result in a 500 lb equipment support rating per lower compartment.

The floating substructure shall be separated from the horizontal members with neoprene elastomer isolators. These isolators shall reduce the natural flex stress of the chassis from being transmitted to the body.

Isolators shall have a broad load range, proven viability in vehicular applications, be of a fail safe design and allow for all necessary movement in three (3) transitional and rotational modes.

The neoprene isolators shall be installed in a modified V three (3)-point mounting pattern to reduce the natural flex of the chassis being transmitted to the body.

A design with body compartments hanging on the chassis in an unsupported fashion shall not be acceptable.

## AGGRESSIVE WALKING SURFACE

All exterior surfaces designated as stepping, standing, and walking areas shall comply with the required average slip resistance of the current NFPA standards.

## LOUVERS

Louvers shall be stamped into compartment walls to provide the proper airflow inside the body compartments and to prevent water from dripping into the compartment. Where these louvers are provided, they shall be formed into the metal and not added to the compartment as a separate plate.

## TESTING OF BODY DESIGN“minimum requirement”

Body structural analysis shall be fully tested. Proven engineering and test techniques such as finite element analysis, stress coating and strain gauging shall be performed with special attention given to fatigue, life and structural integrity of the cab, body and substructure.

Body shall be tested while loaded to its greatest in-service weight.

The criteria used during the testing procedure shall include:

* Raising opposite corners of the vehicle tires 9.00" to simulate the twisting a truck may experience when driving over a curb.
* Making a 90 degree turn, while driving at 20 mph to simulate aggressive driving conditions.
* Driving the vehicle at 35 mph on a washboard road.
* Driving the vehicle at 55 mph on a smooth road.
* Accelerating the vehicle fully, until reaching the approximate speed of 45 mph on rough pavement.

Evidence of actual testing techniques shall be made available upon request.

## LEFT SIDE COMPARTMENTATION“minimum requirement”

The left side compartmentation shall consist of three rollup door compartments.

THE COMPARTMENT WILL BE FULL DEPTH.

A full height, rollup door compartment ahead of the rear wheels shall be provided. The interior dimensions of this compartment shall be “**MINIMUM”** 54.00" wide x 65.13" high x 25.88" deep. The clear door opening shall be a minimum of 48.25" wide x 56.88" high.

A rollup door compartment over the rear wheels shall be provided. The interior dimensions of this compartment shall be “**MINUMUM**” 66.50" wide x 31.38" high x 25.88" deep. The clear door opening shall be a minimum of 58.25" wide x 23.13" high.

A full height, rollup door compartment behind the rear wheels shall be provided.The interior dimensions of this compartment shall be “**MINIMUM”** 47.75" wide x 66.13" high x 25.88" deep. The clear door opening shall be a minimum of 44.75" wide x 57.88" high.

The interior height of the compartments shall be measured from the compartment floor to the ceiling. The spool of the rollup door at the top of the compartment takes up some usable space. The depth of the compartments shall be measured from the back wall to the inside of the door frame.

Closing of the door shall not require releasing, unlocking, or unlatching any mechanism and shall easily be accomplished with one hand.

## RIGHT SIDE COMPARTMENTATION“minimum requirement”

The right side compartmentation shall consist of three rollup door compartments.

THE COMPARTMENT WILL BE FULL DEPTH.

A full height, rollup door compartment ahead of the rear wheels shall be provided. The interior dimensions of this compartment shall be“**MINIMUM”** 54.00" wide x 65.13" high x 25.88" deep. The clear door opening shall be a minimum of 48.25" wide x 56.88" high.

A rollup door compartment over the rear wheels shall be provided. The interior dimensions of this compartment shall be “**MINIMUM”**66.50" wide x 31.38" high x 25.88" deep. The clear door opening shall be a minimum of 58.25" wide x 23.13" high.

A full height, rollup door compartment behind the rear wheels shall be provided.The interior dimensions of this compartment shall be “**MINIMUM”**47.75" wide x 66.13" high x 25.88" deep. The clear door opening shall be a minimum of 44.75" wide x 57.88" high.

The interior height of the compartments shall be measured from the compartment floor to the ceiling. The spool of the rollup door at the top of the compartment takes up some usable space. The depth of the compartments shall be measured from the back wall to the inside of the door frame.

Closing of the door shall not require releasing, unlocking, or unlatching any mechanism and shall easily be accomplished with one hand.

## ROLLUP DOOR, SIDE COMPARTMENTS

There shall be six (6) compartment doors installed on the side compartments. The doors shall be double faced aluminum construction, an anodized satin finish.

Lath sections shall be an interlocking rib design and shall be individually replaceable without complete disassembly of door.

Between each slat at the pivoting joint shall be a PVC inner seal to prevent metal to metal contact and prevent dirt or moisture from entering the compartments. Seals shall allow door to operate in extreme temperatures ranging from 180 to -40 degrees Fahrenheit. Side, top and bottom seals shall be provided to resist ingress of dirt and weather and be made of Santoprene.

All hinges, barrel clips and end pieces shall be nylon 66. All nylon components shall withstand temperatures from 300 to -40 degrees Fahrenheit. Hardened plastic shall not be acceptable.

A polished stainless steel lift bar to be provided for each roll-up door. Lift bar shall be located at the bottom of door and have latches on the outer extrusion of the doors frame. A ledge shall be supplied over lift bar for additional area to aid in closing the door.

Doors shall be constructed from an aluminum box section. The exterior surface of each slat shall be flat. The interior surfaces shall be concave to provide strength and prevent loose equipment from jamming the door from inside.

To conserve space in the compartments, the spring roller assembly shall not exceed 3.00" in diameter. A garage style roll door shall not be acceptable.

The header for the rollup door assembly shall not exceed 4.00".

A heavy-duty magnetic switch shall be used for control of open compartment door warning lights.

## COMPARTMENTATION, REAR

A rollup door compartment above the rear tailboard shall be provided.

Interior dimensions of this compartment shall be“**MINIMUM”**40.00" wide x 47.38" high x 25.88" deep in the lower 38.75" of height and 15.75" deep in the remaining upper portion. Depth of the compartment shall be calculated with the compartment door closed.

For a chassis with a rear mounted fuel tank, a louvered removable access panel shall be furnished on the back wall of the compartment.

Rear compartment shall be open into the rear side compartments.

Clear door opening of this compartment shall be“**MINIMUM”**33.25" wide x 38.75" high.

Closing of the door shall not require releasing, unlocking, or unlatching any mechanism and shall easily be accomplished with one hand.

## ROLLUP DOOR, REAR COMPARTMENT

There shall be a rear rollup door. The door shall be double faced aluminum construction, an anodized satin finish.

Lath sections shall be an interlocking rib design and shall be individually replaceable without complete disassembly of door.

Between each slat at the pivoting joint shall be a PVC inner seal to prevent metal to metal contact and prevent dirt or moisture from entering the compartments. Seals shall allow door to operate in extreme temperatures ranging from 180 to -40 degrees Fahrenheit. Side, top and bottom seals shall be provided to resist ingress of dirt and weather and be made of Santoprene.

All hinges, barrel clips and end pieces shall be nylon 66. All nylon components shall withstand temperatures from 300 to -40 degrees Fahrenheit. Hardened plastic shall not be acceptable.

A polished stainless steel lift bar to be provided for each roll-up door. Lift bar shall be located at the bottom of door and have latches on the outer extrusion of the doors frame. A ledge shall be supplied over lift bar for additional area to aid in closing the door.

Door shall be constructed from an aluminum box section. The exterior surface of each slat shall be flat. The interior surface shall be concave to provide strength and prevent loose equipment from jamming the door from inside.

To conserve space in the compartments, the spring roller assembly shall not exceed 3.00" in diameter. A garage style roll door shall not be acceptable.

The header for the rollup door assembly shall not exceed 4.00".

A heavy-duty magnetic switch shall be used for control of open compartment door warning lights.

## COMPARTMENT LIGHTING

There shall be 11 compartment(s) with two (2) white 12 volt DC LED compartment light strips. The dual light strips shall be centered vertically along each side of the door framing. There shall be two (2) light strips per compartment.The dual light strips shall be in all body compartment(s).

Any remaining compartments without light strips shall have a 6.00" diameter light. Each light shall have a number 1076 one filament, two wire bulb.

Opening the compartment door shall automatically turn the compartment lighting on.

## HATCH COMPARTMENT“minimum requirement”

Two (2) hatch compartments “**MINIMUM”**171.25" long x 27.75" wide x 22.00" maximum depth shall be provided above the driver and passenger side compartments, with two (2) liftup top opening hatch doors.

Compartment shall extend the full length of the side body compartmentation.

Sides of the compartment shall be constructed of the same material as the body and painted job color. A chrome and black vinyl molding shall be provided to cover the seam between the top of the body panel and the bottom of the hatch compartment.

Top of the compartment shall be constructed of bright aluminum treadplate.

Two (2) liftup, bright aluminum treadplate doors shall be provided on the top of the compartment, each with a chrome grab handle.

Doors shall have lipped edges with a rubber seal for weather resistance, and an inner pan with one (1) recessed light.

Doors shall be hinged on the outboard side and shall be held open with pneumatic stay arms.

One (1) socket and plunger type latch shall be provided with each door to hold the doors in the closed position.

Each door shall have a clear door opening of 69.00" long x 21.50" wide.

Compartment shall drain to an area below the hose bed.

## MOUNTING TRACKS

There shall be seven (7) sets of tracks for mounting shelf(s) in D3, D2, D1, R1, P1, P2 and P3. These tracks shall be installed vertically to support the adjustable shelf(s), and shall be full height of the compartment. The tracks shall be unpainted with a natural finish.

## ADJUSTABLE SHELVES

There shall be six (6) shelves with a capacity of 500 lb provided.

The shelf construction shall consist of .188" aluminum painted spatter gray with 2.00" sides.

Each shelf shall be infinitely adjustable by means of a threaded fastener, which slides in a track.

The shelves shall be held in place by .12" thick stamped plated brackets and bolts.

The location(s) shall be determined at a later date.

## SWING OUT TOOLBOARD

A swing out aluminum toolboard shall be provided.

It shall be a minimum of .188" thick with .20" diameter holes in a pegboard pattern with 1.00" centers between holes.

A 1.00" x 1.00" aluminum tube frame shall be welded to the edge of the pegboard.

The board shall be mounted on a pivoting device at the back of the compartment on the top and bottom to allow easy movement in and out of the compartment. The maximum tool load shall be 400 pounds.

The board shall have positive lock in the stowed and extended position.

The board shall be mounted stationary within the compartment.

There shall be One (1) toolboard(s) provided. The toolboard(s) shall be spatter gray painted and installed D2.

## RUB RAIL

Bottom edge of the side compartments shall be trimmed with a bright aluminum extruded rub rail.

Trim shall be 2.12" high with 1.38" flanges turned outward for rigidity.

The rub rails shall not be an integral part of the body construction, which allows replacement in the event of damage.

## BODY FENDER CROWNS

Stainless steel fender crowns shall be provided around the rear wheel openings.

A rubber welting shall be provided between the body and the crown to seal the seam and restrict moisture from entering.

A dielectric barrier shall be provided between the fender crown fasteners (screws) and the fender sheet metal to prevent corrosion.

## HARD SUCTION HOSE

Hard suction hose shall not be required.

## HOSE TROUGHS

One (1) hard suction hose trough shall be provided in the hatch compartment on the passenger side.

The trough shall be constructed of aluminum painted job color.

A floor shall be provided above the hard suction hose in each hatch compartment to allow storage of additional equipment in the compartment above the hard suction hose.

## HANDRAILS

The handrails shall be 1.25" diameter anodized aluminum extrusion, with a ribbed design, to provide a positive gripping surface.

Chrome plated end stanchions shall support the handrail. Plastic gaskets shall be used between end stanchions and any painted surfaces.

Drain holes shall be provided in the bottom of all vertically mounted handrails.

Handrails shall be provided to meet NFPA 1901 section 15.8 requirements. The handrails shall be installed as noted on the sales drawing.

One (1) vertical handrail, not less than 29.00" long, shall be located on the passenger side rear beavertail.

* One (1) full width horizontal handrail shall be provided below the hose bed at the rear of the apparatus.

- Two (2) handrails 12.00" handrails shall be provided mounted (1) on the front cross divider, (1) DS body side sheet near rear access ladder..

## AIR BOTTLE STORAGE (Single)

A quantity of one air bottle compartment, approximately 7.50" wide x 7.50" tall x 26.00" deep, shall be provided on the driver side rearward of the rear wheels. The triangular door shall cover the air bottle opening, the DEF tank access, and fuel fill. The compartment will be square with angled corners. A polished stainless steel door with a Southco M1 series 25 push to close latch or (equivalent) shall be provided to contain the air bottle. A dielectric barrier shall be provided between the door hinge or equivalent hinge fasteners and the body sheet metal.

Inside the compartment, black rubber matting shall be provided.

## AIR BOTTLE COMPARTMENT STRAP

A strap shall be provided in the air bottle compartment to help contain the air bottle when the vehicle is parked on an incline. The strap shall wrap around the neck and attach to the wall of the compartment.

## AIR BOTTLE STORAGE (Triple)

A quantity of three (3) air bottle compartments designed to hold (3) air bottles up to 7.25" in diameter x 26.00" deep shall be provided on the driver side forward of the rear wheels, on the passenger side forward of the rear wheels and on the passenger side rearward of the rear wheels. A polished stainless steel door with a Southco M1 series 25 push to close latch or (equivalent) shall be provided to contain the air bottle. A dielectric barrier shall be provided between the door hinge, hinge fasteners and the body sheet metal.

Inside the compartment, black Dura-Surf friction reducing material shall be provided.

## AIR BOTTLE COMPARTMENT STRAP

A strap shall be provided in the air bottle compartment(s) to help contain the air bottles when the vehicle is parked on an incline. The strap shall wrap around the neck and attach to the wall of the compartment.

## EXTENSION LADDER

There shall be a 24' two-section aluminum extension ladder provided.

## ROOF LADDER

There shall be a 14' aluminum roof ladder provided.

## LADDER STORAGE

The ladders shall be stored inside the upper section of the passenger's side compartments. This ladder rack shall reduce the depth of the upper section in the side compartments.

A partition shall be installed inside the compartment on the side of the rack to allow for equipment storage and to conceal the ladders.

The ladders shall be banked in separate storage troughs.

The ladder storage assembly shall be fabricated of stainless steel track angles to aid in loading and removal of ladders.

Rear of the ladder storage area shall have a vertically hinged smooth aluminum door with lift-and-turn latches to contain the ladders.

## FOLDING LADDER

One (1) 10.00' aluminum, folding ladder shall be installed in a U-shaped trough inside the ladder storage compartment.

## PIKE POLE PROVIDED BY FIRE DEPARTMENT

NFPA 1901, 2016 edition, Section 5.9.4 requires one (1) 8 ft or longer pike pole mounted in a bracket fastened to the apparatus.

The pike pole is not on the apparatus as manufactured. The fire department shall provide and mount the pike pole.

The pike pole(s) shall be a 10' pike pole.

## 6' PIKE POLE PROVIDED BY FIRE DEPARTMENT

NFPA 1901, 2016 edition, Section 5.9.4 requires one (1) 6' pike pole or plaster hook mounted in a bracket fastened to the apparatus.

The pike pole is not on the apparatus as manufactured. The fire department shall provide and mount the pike pole.

The pike pole(s) shall be a 6' pike pole.

## PIKE POLE STORAGE

Aluminum tubing shall be used for the storage of two (2) pike poles and shall be located in ladder storage compartment. If the head of a pike pole can come in contact with a painted surface, a stainless steel scuffplate shall be provided.

## STEPS

A folding step shall be provided on the front of each fender compartment. The step shall be bright finished, non-skid with a black coating. Each step shall incorporate an LED light to illuminate the stepping surface. The step can be used as a hand hold with two openings wide enough for a gloved hand.

## LADDER, HOSE BED ACCESS

A hose bed access ladder, constructed of aluminum rungs and extruded aluminum rails, shall be provided on the left side rear of the apparatus.

One (1) additional folding step shall be located on the front of the cargo area. The step(s) shall be bright finished, non-skid with a black coating. Each step shall incorporate an LED light to illuminate the stepping surface. The step(s) can be used as a hand hold with two openings wide enough for a gloved hand.

## MIDSHIP FIRE PUMP

Midship fire pump shall be a Hale QMAX-150 or (equivalent), 1500 gpm single (1) stage midship mounted centrifugal type (no exception).

Pump shall be the class "A" type.

Pump shall deliver the percentage of rated discharges at the pressures indicated below:

- 100% of rated capacity at 150 psi net pump pressure.

- 100% of rated capacity at 165 psi net pump pressure.

-70% of rated capacity at 200 psi net pump pressure.

-50% of rated capacity at 250 psi net pump pressure.

Entire pump and both suction and discharge passages shall be hydrostatically tested to a pressure of 500 psi.

Pump shall be fully tested at the pump manufacturer's factory to the performance requirements as outlined by the current NFPA 1901 standards and shall be free from objectionable pulsation and vibration.

Pump body and related parts shall be of fine grain, alloy cast iron with a minimum tensile strength of 30,000 psi (2041.2 bar).

All moving parts in contact with water shall be of high quality bronze or stainless steel. Pumps utilizing castings made of lower tensile strength cast iron shall not be acceptable.

Pump body shall be horizontally split, on a single plane in two (2) sections, for easy removal of entire impeller assembly, including wear rings and bearings from beneath the pump, without disturbing pump piping or the mounting of the pump in the chassis.

Pump shall have one (1) double suction impeller. The pump body shall have two (2) opposed discharge volute cutwaters to eliminate radial unbalance.

Pump impeller shall be hard, fine grain bronze of the mixed flow design, accurately machined, hand-ground, and individually balanced. The vanes of the impeller intake eyes shall be hand-ground and polished to a sharp edge. They shall be of sufficient size and design to provide ample reserve capacity utilizing minimum horsepower.

Impeller clearance rings shall be bronze and easily renewable without replacing impeller or pump volute body. They shall be of the wrap-around double labyrinth design for maximum efficiency.

Pump shaft shall be electric furnace heat-treated, corrosion resistant stainless steel. It shall be super-finished under packing with galvanic corrosion (zinc separators in packing) protection for longer shaft life. Pump shaft shall be sealed with double oil seal to keep road dirt and water out of drive unit.

Pump shaft shall be rigidly supported by three (3) bearings for minimum deflection. A high lead bronze sleeve bearing shall be located immediately adjacent to the impeller (on the side opposite of the drive unit). The sleeve bearing shall be automatically oil lubricated and pressure balanced to exclude foreign material. The remaining bearings shall be heavy-duty, deep groove ball bearings in the gearbox and shall be splash lubricated.

## MECHANICAL SEAL ON PUMP

Only one (1) mechanical seal (no exception) shall be used on the suction (inboard) side of the pump. The mechanical seal shall be 2.00" in diameter and shall be spring loaded, maintenance-free, and self-adjusting.

The mechanical seal construction shall be a carbon sealing ring, stainless steel coil spring, Viton® rubber boot, and a tungsten carbide seat with a Teflon backup seal.

## PUMP TRANSMISSION

The drive unit shall be cast and completely manufactured and tested at the pump manufacturer's factory. The pump drive unit shall be of sufficient size to withstand up to 16,000 foot/pound of torque from the engine in both road and pump operating conditions. The drive unit shall be designed with ample lubrication reserve to maintain the proper operating temperature.

The gearbox drive shafts shall be of heat treated chrome nickel steel and at least 2.75 inches in diameter, on both the input and output drive shafts. They shall be designed to withstand the full torque of the engine in both road and pump operating conditions. All gears, both drive and pump, shall be of the highest quality, electric furnace, chrome nickel steel. Bores shall be ground to size and teeth integrated, crown-shaved and hardened, to give an extremely accurate gear for long life, smooth, quiet running and higher load carrying capability. An accurately cut spur design shall be provided to eliminate all possible end thrust.

The pump ratio shall be selected by the apparatus manufacturer to provide the maximum performance with the engine and transmission selected. Three (3) green warning lights shall be provided to indicate to the operator(s) when the pump has completed the shift from Road to Pump position. Two (2) lights shall be located in the truck driving compartment and one (1) light on pump operator's panel, adjacent to the throttle control.

## PUMPING MODE

An interlock system shall be provided to ensure that the pump drive system components are properly engaged so that the apparatus can be safely operated. The interlock system shall be designed to allow stationary pumping only.

## AIR PUMP SHIFT

Pump shift engagement shall be made by a two (2) position sliding collar, actuated pneumatically (by air pressure), with a three (3) position air control switch located in the cab.

Two (2) indicator lights shall be provided adjacent to the pump shift inside the cab. One (1) green light shall indicate the pump shift has been completed and be labeled "pump engaged". The second green light shall indicate when the pump has been engaged and the chassis transmission is in pump gear. This indicator light shall be labeled "OK to pump".

Another green indicator light shall be installed adjacent to the hand throttle on the pump panel and indicate either the pump is engaged and the road transmission is in pump gear, or the road transmission is in neutral and the pump is not engaged. This light shall be labeled "Warning: Do not open throttle unless light is on".

The pump shift shall be interlocked to prevent the pump from being shifted out of gear when the chassis transmission is in gear to meet NFPA requirements.

The pump shift control in the cab shall be illuminated to meet NFPA requirements.

## TRANSMISSION LOCK-UP

The direct gear transmission lock-up for the fire pump operation shall engage automatically when the pump shift control in the cab is activated.

## AUXILIARY COOLING SYSTEM

A supplementary heat exchange cooling system shall be provided to allow the use of water from the discharge side of the pump for cooling the engine water. Heat exchanger shall be cylindrical type and shall be a separate unit. It shall be installed in the pump or engine compartment with the control located on the pump operator's control panel. Exchanger shall be plumbed to the master drain valve.

## INTAKE RELIEF VALVE

An Elkhart relief valve or (equivalent) shall be installed on the suction side of the pump preset at 125 psig.

Relief valve shall have a working range of 75 psig to 250 psig.

Outlet shall terminate below the frame rails with a 2.50" National Standard hose thread adapter and shall have a "do not cap" warning tag.

Control shall be located behind an access door at a side pump panel.

## PRESSURE CONTROLLER

A Pump Boss Model PMA300 pressure governor shall be provided or equivalent.

A pressure transducer shall be installed in the water discharge manifold on the pump.

The display panel shall be located at the pump operator's panel.

## PRIMING PUMP

The priming pump shall be a Trident Emergency Products or equivalent compressed air powered, high efficiency, multistage venturi based AirPrime System, conforming to standards outlined in the current edition of NFPA 1901.

All wetted metallic parts of the priming system are to be of brass and stainless steel construction.

One (1) priming control shall open the priming valve and start the pump primer.

## PUMP MANUALS

There shall be a total of two (2) pump manuals provided by the pump manufacturer and furnished with the apparatus. The manuals shall be provided by the pump manufacturer in the form of two (2) electronic copies. Each manual shall cover pump operation, maintenance, and parts.

## PLUMBING, STAINLESS STEEL AND HOSE

All inlet and outlet lines shall be plumbed with either stainless steel pipe, flexible polypropylene tubing or synthetic rubber hose reinforced with hi-tensile polyester braid. All hose's shall be equipped with brass or stainless steel couplings. All stainless steel hard plumbing shall be a minimum of a schedule 10 wall thickness.

Where vibration or chassis flexing may damage or loosen piping or where a coupling is required for servicing, the piping shall be equipped with victaulic or rubber couplings.

Plumbing manifold bodies shall be ductile cast iron or stainless steel.

All piping lines are to be drained through a master drain valve or shall be equipped with individual drain valves. All drain lines shall be extended with a hose to drain below the chassis frame.

All water carrying gauge lines shall be of flexible polypropylene tubing.

All piping, hose and fittings shall have a minimum of a 500 PSI hydrodynamic pressure rating.

## MAIN PUMP INLETS

A 6.00" pump manifold inlet shall be provided on each side of the vehicle. The suction inlets shall include removable die cast zinc screens that are designed to provide cathodic protection for the pump, thus reducing corrosion in the pump.

## MAIN PUMP INLET CAP

The main pump inlets shall have National Standard Threads with a long handle chrome cap.

The cap shall incorporate a thread design to automatically relieve stored pressure in the line when disconnected (no exception).

## VALVES

All ball valves shall be Akron® Brass or equivalent in-line valves. The valves shall be heavy-duty style with a stainless steel ball and a simple two-seat design. No lubrication or regular maintenance is required on the valve.

Valves shall have a **ten (10) year** warranty.

## LEFT SIDE INLET

There shall be one (1) auxiliary inlet with a 2.50" valve at the left side pump panel, terminating with a 2.50" (F) National Standard hose thread adapter.

The auxiliary inlet shall be provided with a strainer, chrome swivel and plug.

The location of the valve for the one (1) inlet shall be recessed behind the pump panel.

## INLET CONTROL

The side auxiliary inlet(s) shall incorporate a quarter-turn ball valve with the control located at the inlet valve. The valve operating mechanism shall indicate the position of the valve.

## FRONT INLET PROVISION

Provisions for a front inlet shall be provided on the passenger side pump suction manifold. Flange shall be capped off for possible addition of front inlet at a later date.

## INLET BLEEDER VALVE

A 0.75" bleeder valve shall be provided for each side gated inlet. The valves shall be located behind the panel with a swing style handle control extended to the outside of the panel. The handles shall be chrome plated and provide a visual indication of valve position. The swing handle shall provide an ergonomic position for operating the valve without twisting the wrist and provides excellent leverage. The water discharged by the bleeders shall be routed below the chassis frame rails.

## TANK TO PUMP

The booster tank shall be connected to the intake side of the pump with heavy duty piping and a quarter turn 3.00" full flow line valve with the control remotely located at the operator's panel. Tank to pump line shall run straight (no elbows) from the pump into the front face of the water tank and angle down into the tank sump. A rubber coupling shall be included in this line to prevent damage from vibration or chassis flexing.

A check valve shall be provided in the tank to pump supply line to prevent the possibility of "back filling" the water tank.

## TANK REFILL

A 1.50" combination tank refill and pump re-circulation line shall be provided, using a quarter-turn full flow ball valve controlled from the pump operator's panel.

## LEFT SIDE DISCHARGE OUTLETS

There shall be two (2) discharge outlets with a 2.50" valve on the left side of the apparatus, terminating with a 2.50" (M) National Standard hose thread adapter.

## RIGHT SIDE DISCHARGE OUTLETS

There shall be one (1) discharge outlet with a 2.50" valve on the right side of the apparatus, terminating with a 2.50" (M) National Standard hose thread adapter.

## FRONT DISCHARGE OUTLET

There shall be one (1) 1.50" discharge outlet piped to the front of the apparatus and located in the center bumper tray.

Plumbing shall consist of 2.00" piping and flexible hose with a 2.00" ball valve with control at the pump operator's panel. A fabricated weldment made of stainless steel pipe shall be used in the plumbing where appropriate. The piping shall terminate with a 1.50" NST with 90 degree stainless steel swivel.

There shall be Class 1 automatic drains provided at all low points of the piping.

## REAR DISCHARGE OUTLET

There shall be one (1) discharge outlet piped to the rear of the hose bed, driver's side, installed so proper clearance is provided for spanner wrenches or adapters. Plumbing shall consist of 2.50" piping along with a 2.50" full flow ball valve with the control from the pump operator's panel.

## DISCHARGE CAPS

Chrome plated, rocker lug, caps with chains shall be furnished for all side discharge outlets.

The caps shall incorporate a thread design to automatically relieve stored pressure in the line when disconnected (no exception).

## OUTLET BLEEDER VALVE

A 0.75" bleeder valve shall be provided for each outlet 1.50" or larger. Automatic drain valves are acceptable with some outlets if deemed appropriate with the application.

The valves shall be located behind the panel with a swing style handle control extended to the outside of the side pump panel. The handles shall be chrome plated and provide a visual indication of valve position. The swing handle shall provide an ergonomic position for operating the valve without twisting the wrist and provides excellent leverage. Bleeders shall be located at the bottom of the pump panel. They shall be properly labeled identifying the discharge they are plumbed in to. The water discharged by the bleeders shall be routed below the chassis frame rails.

## LEFT SIDE OUTLET ELBOWS

The 2.50" discharge outlets located on the left side pump panel shall be furnished with a 2.50" (F) National Standard hose thread x 2.50" (M) National Standard hose thread, chrome plated, 45 degree elbow.

The elbow shall incorporate a thread design to automatically relieve stored pressure in the line when disconnected (no exception).

## RIGHT SIDE OUTLET ELBOWS

The 2.50" discharge outlets located on the right side pump panel shall be furnished with a 2.50" (F) National Standard hose thread x 2.50" (M) National Standard hose thread, chrome plated, 45 degree elbow.

The elbow shall incorporate a thread design to automatically relieve stored pressure in the line when disconnected (no exception).

## REAR OUTLET ELBOWS

The 2.50" discharge outlets located at the rear of the apparatus shall be furnished with a 2.50" (F) National Standard hose thread x 2.50" (M) National Standard hose thread, chrome plated, 45 degree elbow.

The elbow shall incorporate a thread design to automatically relieve stored pressure in the line when disconnected (no exception).

## DISCHARGE OUTLET CONTROLS

The discharge outlets shall incorporate a quarter-turn ball valve with the control located at the pump operator's panel. The valve operating mechanism shall indicate the position of the valve.

If a handwheel control valve is used, the control shall be a minimum of a 3.9" diameter stainless steel handwheel with a dial position indicator built in to the center of the handwheel.

## DELUGE RISER WITH BYPASS

A 3.00" deluge riser shall be installed above the pump in such a manner that a monitor can be mounted and used effectively. Piping shall be installed securely so no movement develops when the line is charged. The riser shall be gated and controlled at the pump operator's panel. This outlet shall have two (2) supply lines teed together to allow proper water flow in the water only operation and the water/foam operation. The water only piping shall consist of a 3.00" ball valve. The water/foam piping shall include a 2.50" ball valve and it shall be plumbed into the foam system.

The deluge riser shall have male National Pipe Threads for mounting the monitor.

## SPEEDLAYS WITH TRAYS

Ahead of the pump enclosure shall be two (2)-1.50" speedlay hose beds. Each bed shall have a 1.50" pre-connect line with a 2.00" quarter-turn ball valve and terminate with a 1.50" National Standard hose thread 90 degree swivel. The swivel shall be located at the top of the speedlay compartment to allow easy removal of the hose in either direction.

Below the above speedlay shall be one (1)-2.50" speedlay hose bed. This bed shall have a 2.50" pre-connect line with a 2.50" quarter-turn ball valve and terminate with a 2.50" National Standard hose thread 90 degree swivel. The swivel shall be located at the top of the speedlay compartment to allow easy removal of the hose in either direction.

Individual controls for the speedlays shall be at the pump operator's panel.

Each speedlay capacity shall be as follows: 200' 1.75", 200' 2.5".

A removable tray shall be provided for each speedlay hosebed. The speedlay trays shall be constructed of black poly to provide a lightweight sturdy tray.Two (2) hand holes shall be in the floor and additional hand holes shall be provided in the sides for easy removal and installation from the compartment. The floor of the trays shall be perforated to allow for drainage and hose drying. The bottom of the speedlay compartments shall be lined with stainless steel to allow the tray to slide with ease. Scuffplates shall be provided on both sides, at the sides and bottom of each opening to protect the paint.

## SPEEDLAY HOSE RESTRAINT

There shall be red vinyl end flaps provided across each end of three (3) speedlay(s) to secure the hose during travel. The vinyl end flaps shall be permanently attached at the bottom of the speedlay opening. There shall be velcro fasteners located at the opposite end of the permanently attached vinyl.

A nylon strap with snap shall be provided to hold the flap in the open position for reloading of hose.

## FOAM PROPORTIONER“no exceptions”

A foam proportioning system shall be provided that is an on demand, automatic proportioning, single point, direct injection system suitable for all types of Class A and B foam concentrates, including the high viscosity (6000 cps), alcohol resistant Class B foams. Operation shall be based on direct measurement of water flow, and remain consistent within the specified flows and pressures. The system shall automatically balance and proportion foam solution at rates from .1 percent to 9.9 percent regardless of variations in water pressure and flow, up to the maximum rated capacity of the foam concentrate pump.

The design of the system shall allow operation from draft, hydrant, or relay operation. This shall provide a versatile system to meet the demands at a fire scene.

## System Capacity “no exceptions”

The system shall have the ability to deliver the following minimum foam solution flow rates that meet or exceed NFPA requirements at a pump rating of 250 psi.

200 gpm @ 6 percent

400 gpm @ 3 percent

1200 gpm @ 1 percent

The foam concentrate setting may be adjusted in .1 percent increments from .1 percent to 9.9 percent. Typical settings are .3 percent, .5 percent and 1.0 percent (The maximum capacity shall be limited to the plumbing and water pump capacity).

## Control System

The system shall be equipped with a digital electronic control display located on the pump operator's panel. Push button controls shall be integrated into the panel to turn the system on/off, control the foam percentage, direct which foam to use on a multi-tank system, and to set the operation modes (automatic, manual, draft, calibration, or flush).

The percent of injection shall have presets for Class A and Class B foam. These presets can be changed at the fire department as desired. The percent of injection shall be able to be easily changed at the scene to adjust to changing demands.

In order to minimize the use of abbreviations and interpretations, system information shall be displayed on the panel by way of .50 tall LEDs that total 14 characters (two (2) lines of seven (7) each). System on and foam pump on indicator lights shall also be included. Information displayed shall include mode of operation (automatic, manual, draft, calibration, or flush), foam supply selected (Class A or Class B), water total, foam total, foam percentage, remaining gallons, and time remaining.

The control display shall direct a microprocessor, which receives input from the systems water flow meter while also monitoring the position of the foam concentrate pump. The microprocessor shall compare the values of the water flow versus the position/rate of the foam pump, to ensure the proportion rate is accurate. One (1) check valve shall be installed in the plumbing to prevent foam from contaminating the water pump.

## Low Level, Foam Tank

The control head shall display a warning message when the foam tank in use is below a quarter tank.

## Hydraulic Drive System“no exceptions”

The foam concentrate pump shall be powered by a hydraulic drive system, which is automatically activated, whenever the vehicle water pump is engaged. A system that drives the foam pump via an electric motor shall not be acceptable. A large parasitic electric load used to power the foam pump can cause an overload of the chassis electrical system.

Hydraulic oil cooler shall be provided to automatically prevent overheating of the hydraulic oil, which is detrimental to system components. The oil/water cooler shall be designed to allow continuous system operation without allowing hydraulic oil temperature to exceed the oil specifications.

The hydraulic oil reservoir shall be of four (4) gallons minimum capacity and shall also be of sufficient size to minimize foaming and be located to facilitate checking oil level or adding oil without spillage or the need to remove access panels.

## Foam Concentrate Pump“no exceptions”

The foam concentrate pump shall be of positive displacement, self-priming; linear actuated design, driven by the hydraulic motor. The pump shall be constructed of brass body; chrome plated stainless steel shaft, with a stainless steel piston. In order to increase longevity of the pump, no aluminum shall be present in its construction.

A relief system shall be provided which is designed to protect the drive system components and prevent over pressuring the foam concentrate pump

The foam concentrate pump shall have minimum capacity for 12 gpm with all types of foam concentrates with a viscosity at or below 6000 cps including protein, fluoroprotein, AFFF, FFFP, or AR-AFFF. The system shall deliver only the amount of foam concentrate flow required, without recirculating foam back to the storage tank. Recirculating foam concentrate back to the storage tank can cause agitation and premature foaming of the concentrate, which can result in system failure. The foam concentrate pump shall be self-priming and have the ability to draw foam concentrate from external supplies such as drums or pails.

## External Foam Concentrate Connection“no exceptions”

An external foam pick-up shall be provided to enable use of a foam agent that is not stored on the vehicle. The external foam pick-up shall be designed to allow continued operation after the on-board foam tank is empty. The external foam pick-up shall be designed to allow use with training foam or colored water for training purposes.

## Panel Mounted Strainer/External Pick-Up Connection

A bronze body strainer/connector unit shall be provided. The unit shall be mounted to the pump panel. The external foam pick-up shall be one (1) 1.00" male connection with chrome-plated cap integrated to a 2.00" strainer cleanout cap. A check valve shall be installed in the pick-up portion of the cleanout cap. A basket style stainless steel screen shall be installed in the body of the strainer/connector unit. Removal of the 2.00" cleanout cap shall be all that is required to gain access to and remove the stainless steel basket screen. The strainer/connector unit shall be ahead of the foam concentrate pump inlet port to insure that all agent reaching the foam pump has been strained.

## Pick-Up Hose

A 1.00" flexible hose with an end for insertion into foam containers shall be provided. The hose shall be supplied with a 1.00" female swivel NST thread swivel connector. The hose shall be shipped loose.

## Discharges“no exceptions”

The foam system shall be plumbed to five (6) discharges. The discharges capable of dispensing foam shall be Front Bumper, 3 Speedlays, Rear Discharge, and Deck Gun with Foam Bypass.

## System Electrical Load

The foam proportioning shall not impose an electrical load on the vehicle electrical system any greater than five (5) amps at 12VDC.

## Foam Supply Valve

Electric valves shall be used for the foam supply. The foam supply valves shall be controlled at the foam system control head for ease of operation. The supply valves shall be electric, remote controlled, to eliminate air pockets in the foam tank supply hose.

## Maintenance Message

A message shall be displayed on the control head to advise when system maintenance needs to be performed. The message shall display interval for cleaning the foam strainer, cleaning for the water strainers, and changing the hydraulic oil.

## Flush System

The system shall be designed such that a flush mode shall be provided to allow the system to flush all foam concentrate with clear water. The flush circuit control logic shall ensure the foam tank supply valve is closed prior to opening the flush valve. The flush valve shall be operated at the foam system control head for ease of operation. The valve shall be electrically controlled and located as close to the foam tank supply valve as possible. A manual flush drain valve shall be labeled and located under the driver's side running board.

## REFILL, FOAM TANKS“no exceptions”

The foam system's proportioning pump shall be used to fill the Class A foam tank. This shall allow use of the auxiliary foam pick-up to pump the foam from pails or a drum on the ground into the foam tank. A foam shut-off switch shall be installed in the fill dome of the tank to shut the system down when the tank is full. The fill operation shall be controlled by a mode in the foam system controller stating TANK A FILL. While the proportioner pump is filling the tank, the controller shall display FILL TANK A. When the tank is full, as determined by the float switch in the tank dome, the pump shall stop and the controller shall display TANK A FULL.

A separate air operated fill pump, controlled by the foam system controller, shall be provided for filling the Class B foam tank. A separate inlet connection, mounted on the pump panel shall be provided for this fill system. A foam shut-off switch shall be installed in the fill dome of the tank to shut the system down when the tank is full. The connection shall be the same as the foam intake connection, in order to allow the use of the foam pick-up hose as the fill hose. The fill operation shall be controlled by a mode in the foam system controller stating TANK B FILL. To fill the tank, the controller shall start and run the air operated pump. While the pump runs, the controller shall display FILL TANK B. When the tank is full, as determined by the float switch in the tank dome, the pump shall stop and the controller shall display TANK B FULL.

## FOAM TANK

The foam tank shall be an integral portion of the polypropylene water tank. The cell shall have a capacity of 30 gallons of foam with the intended use of Class A foam. The brand of foam stored in this tank shall be TBD. The foam cell shall reduce the capacity of the water tank. The foam cell shall have a screen in the fill dome and a breather in the lid.

## FOAM TANK DRAIN

A system of 1.00" foam tank drains shall be provided, integrated into the foam systems strainer and tank to foam pump valve management system.The tank to pump hoses running from the tank(s) to the panel mounted strainer shall 1.00" diameter.The foam system controller shall have a mode that allows for a given foam valve to be opened at will. Flow of foam from the tank valve to the strainer shall be usable as a tank drain mode.

An adaptor shall be supplied, that allows the 1.00" foam intake screen to assembly to be used as a drain outlet. The standard supplied 1.00" foam pick up hose shall be attached to the screen assembly by way of the adapter. The drain mode shall allow the operator to open and close the tank valve as required from the control head, to drain foam and re-fill foam containers through the connected hose, without foam spillage beneath the vehicle.

## FOAM CELL

The foam cell shall be an integral portion of the polypropylene water tank. The cell shall have a capacity of 30 gallons of foam with the intended use of Class B foam. The brand of foam stored in this cell shall be TBD. The foam cell shall reduce the water capacity of the tank. The foam cell shall have a screen in the fill dome and a breather in the lid.

## FOAM TANK DRAIN

A system of 1.00" foam tank drains shall be provided, integrated into the foam systems strainer and tank to foam pump valve management system.The tank to pump hoses running from the tank(s) to the panel mounted strainer shall 1.00" diameter.The foam system controller shall have a mode that allows for a given foam valve to be opened at will. Flow of foam from the tank valve to the strainer shall be usable as a tank drain mode.

An adaptor shall be supplied, that allows the 1.00" foam intake screen to assembly to be used as a drain outlet. The standard supplied, 1.00" foam pick up hose shall be attached to the screen assembly by way of the adapter. The drain mode shall allow the operator to open and close the tank valve as required from the control head, to drain foam and re-fill foam containers through the connected hose, without foam spillage beneath the vehicle.

## PUMP COMPARTMENT

The pump compartment shall be separate from the hose body and compartments so that each may flex independently of the other. It shall be a fabricated assembly of steel tubing, angles and channels which supports both the fire pump and the side running boards.

The pump compartment shall be mounted on the chassis frame rails with rubber biscuits in a four point pattern to allow for chassis frame twist.

Pump compartment, pump, plumbing and gauge panels shall be removable from the chassis in a single assembly.

## PUMP MOUNTING

Pump shall be mounted to a substructure which shall be mounted to the chassis frame rail using rubber isolators. The mounting shall allow chassis frame rails to flex independently without damage to the fire pump.

## LEFT SIDE PUMP CONTROL PANELS

All pump controls and gauges shall be located at the left (driver's) side of the apparatus and properly identified.

Layout of the pump control panel shall be ergonomically efficient and systematically organized.

The pump operator's control panel shall be removable in two (2) main sections for ease of maintenance:

The upper section shall contain sub panels for the mounting of the pump pressure control device, engine monitoring gauges, electrical switches, and foam controls (if applicable). Sub panels shall be removable from the face of the pump panel for ease of maintenance. Below the sub panels shall be located all valve controls and line pressure gauges.

The lower section of the panel shall contain all inlets, outlets, and drains.

All push/pull valve controls shall have 1/4 turn locking control rods with polished chrome plated zinc tee handles. Guides for the push/pull control rods shall be chrome plated zinc castings securely mounted to the pump panel. Push/pull valve controls shall be capable of locking in any position. The control rods shall pull straight out of the panel and shall be equipped with universal joints to eliminate binding.

## IDENTIFICATION TAGS

The identification tag for each valve control shall be recessed in the face of the tee handle.

All discharge outlets shall have color coded identification tags, with each discharge having its own unique color. Color coding shall include the labeling of the outlet and the drain for each corresponding discharge.

All line pressure gauges shall be mounted directly above the corresponding discharge control tee handles and recessed within the same chrome plated casting as the rod guide for quick identification. The gauge and rod guide casting shall be removable from the face of the pump panel for ease of maintenance. The casting shall be color coded to correspond with the discharge identification tag.

All remaining identification tags shall be mounted on the pump panel in chrome plated bezels.

The pump panel on the right (passenger's) side shall be removable with lift and turn type fasteners.

Trim rings shall be installed around all inlets and outlets.

The trim rings for the side discharge outlets shall be color coded and labeled to correspond with the discharge identification tag.

## PUMP PANEL CONFIGURATION

The pump panel configuration shall be arranged and installed in an organized manner that shall provide user-friendly operation.

## PUMP AND GAUGE PANEL

The pump and gauge panels shall be constructed of aluminum with a black vinyl finish. A polished aluminum trim molding shall be provided around each panel.

The passenger's side pump panel shall be removable and fastened with swell type fasteners.

## PUMP COMPARTMENT LIGHT

There shall be one (1) white 12 volt DC LED light(s) installed in the pump compartment.

There shall be a switch accessible through a door on the pump panel included with this installation.

Engine monitoring graduated LED indicators shall be incorporated with the pressure controller.

## VACUUM AND PRESSURE GAUGES

The pump vacuum and pressure gauges shall be liquid filled and manufactured by Class 1 Incorporated ©.

The gauges shall be a minimum of 4.00" in diameter and shall have white faces with black lettering, with a pressure range of 30.00"-0-600#.

Gauge construction shall include a nylon case with adhesive mounting gasket and threaded retaining nut.

The pump pressure and vacuum gauges shall be installed adjacent to each other at the pump operator's control panel.

Test port connections shall be provided at the pump operator's panel. One (1) shall be connected to the intake side of the pump, and the other to the discharge manifold of the pump. They shall have 0.25 in. standard pipe thread connections and non-corrosive polished stainless steel or brass plugs. They shall be marked with a label.

This gauge shall include a 10 year warranty against leakage, pointer defect, and defective bourdon tube.

## PRESSURE GAUGES

The individual "line" pressure gauges for the discharges shall be interlube filled.

They shall be a minimum of 2.00" in diameter and shall have white faces with black lettering.

Gauge construction shall include a nylon case with adhesive mounting gasket and threaded retaining nut.

Gauges shall have a pressure range of 30"-0-400#.

The individual pressure gauge shall be installed as close to the outlet control as practical.

This gauge shall include a 10 year warranty against leakage, pointer defect, and defective bourdon tube.

## WATER LEVEL GAUGE

There shall be an electronic water level gauge provided on the operator's panel that registers water level by means of five (5) colored LED lights. The lights shall be durable, ultra-bright five (5) LED design viewable through 180 degrees. The water level indicators shall be as follows:

* 100 percent = Green
* 75 percent = Yellow
* 50 percent = Yellow
* 25 percent = Yellow
* Refill = Red

The light shall flash when the level drops below the given level indicator to provide an eighth of a tank indication. To further alert the pump operator, the lights shall flash sequentially when the water tank is empty.

The level measurement shall be based on the sensing of head pressure of the fluid in the tank.

The display shall be constructed of a solid plastic material with a chrome plated die cast bezel to reduce vibrations that can cause broken wires and loose electronic components. The encapsulated design shall provide complete protection from water and environmental elements. An industrial pressure transducer shall be mounted to the outside of the tank. The field calibratable display measures head pressure to accurately show the tank level.

## FOAM LEVEL GAUGE

An electronic foam level gauge shall be provided on the operator's panel for each foam tank, that registers foam level by means of five colored LED lights. The lights shall be durable, ultra-bright five LED design viewable through 180 degrees. The foam level indicators shall be as follows:

- 100% = Green

- 75% = Yellow

- 50% = Yellow

- 25% = Yellow

- Refill = Red

The light shall flash when the level drops below the given level indicator to provide an eighth of a tank indication. To further alert the pump operator, the lights shall flash sequentially when the foam tank is empty.

The level measurement shall be based on the sensing of head pressure of the fluid in the tank.

The display shall be constructed of a solid plastic material with a chrome plated die cast bezel to reduce vibrations that can cause broken wires and loose electronic components. The encapsulated design shall provide complete protection from foam and environmental elements. An industrial pressure transducer shall be mounted to the outside of the tank. The field calibratable display measures head pressure to accurately show the tank level.

## LIGHT SHIELD

There shall be a polished, 16 gauge stainless steel light shield installed over the pump operator's panel.

* There shall be 12 volt DC white LED lights installed under the stainless steel light shield to illuminate the controls, switches, essential instructions, gauges, and instruments necessary for the operation of the apparatus. These lights shall be activated by the pump panel light switch. Additional lights shall be included every 18.00" depending on the size of the pump house.
* One (1) pump panel light shall come on when the pump is in ok to pump mode.

There shall be a light activated above the pump panel light switch when the parking brake is set. This is to afford the operator some illumination when first approaching the control panel.

There shall be a green pump engaged indicator light activated on at the operator's panel when the pump is shifted into gear from inside the cab.

## AIR HORN SYSTEM

There shall be two (2) air horns recessed in the front bumper. The horn system shall be piped to the air brake system wet tank utilizing 0.38" tubing. A pressure protection valve shall be installed in-line to prevent loss of air in the air brake system.

### Air Horn Location

The air horns shall be located on each side of the bumper, towards the outside.

## AIR HORN CONTROL

The air horns shall be actuated by a chrome push button located on the officer's side of the engine tunnel and by the horn button in the steering wheel. The driver shall have the option to control the air horns or the chassis horns from the horn button by means of a selector switch located on the instrument panel.

## ELECTRONIC SIREN

A electronic siren with noise canceling microphone shall be provided.

This siren to be active when the battery switch is on and that emergency master switch is on.

Electronic siren head shall be recessed in the driver side inside switch panel.

Siren shall be actuated by one (1) foot switch located on the officer's side.

## SPEAKER

There shall be one (1) speaker provided. Each speaker shall be a Whelen®, Model SA315P or equivalent, black nylon composite, 100-watt, with through bumper mounting brackets and polished stainless steel grille. Each speaker shall be connected to the siren amplifier.

The speaker(s) shall be recessed in the front bumper on the driver's side.

## AUXILIARY MECHANICAL SIREN

A Q2B® siren shall be furnished. A siren brake button shall be installed on the switch panel.

The control solenoid shall be powered up after the emergency master switch is activated.

The mechanical siren shall be mounted on the bumper deck plate. It shall be mounted on the left side. The siren mounting shall include a reinforcement plate.

The mechanical siren shall be actuated by two (2) foot switches, one (1) located on the officer's side and one (1) on the driver's side.

## FRONT ZONE UPPER WARNING LIGHTS

There shall be one (1) 60.00" Whelen Freedom IV LED or equivalent lightbar mounted on the cab roof.

The lightbar shall include the following:

* One (1) red flashing LED module in the driver's side rear corner position.
* Open in the driver's side end position.
* One (1) red flashing LED module in the driver's side front corner position.
* One (1) red flashing LED module in the driver's side first front position.
* Open in the driver's side second front position.
* Open in the driver's side third front position.
* Open in the driver's side fourth front position.
* One (1) red flashing LED module in the driver's side fifth front position.
* One (1) red flashing LED module in the passenger's side fifth front position.
* Open in the passenger's side fourth front position.
* Open in the passenger's side third front position.
* Open in the passenger's side second front position.
* One (1) red flashing LED module in the passenger's side first front position.
* One (1) red flashing LED module in the passenger's side front corner position.
* Open in the passenger's side end position.
* One (1) red flashing LED module in the passenger's side rear corner position.

There shall be clear lenses included on the lightbar.

There shall be a switch in the cab on the switch panel to control this lightbar.

The four (4) red flashing LED modules in the front positions may be load managed when the parking brake is applied.

## FRONT ZONE LOWER LIGHTS

There shall be one (1) pair of Whelen, Model 60\*02F\*R or equivalent, flashing LED lights installed on the cab face above the headlights, in a common bezel with the directional lights.

The color of these lights shall be red Super LED/clear lens.

There shall be a switch located in the cab on the switch panel to control the lights..

## HEADLIGHT FLASHER

The high beam headlights shall flash alternately between the left and right side.

There shall be a switch installed in the cab on the switch panel to control the high beam flash. This switch shall be live when the battery switch and the emergency master switches are on.

The flashing shall automatically cancel when the hi-beam headlight switch is activated or when the parking brake is set.

## SIDE ZONE LOWER LIGHTING

There shall be four (4) Whelen®, Model 60\*02F\*R or equivalent, flashing LED warning lights installed per the following:

* Two (2) lights, one (1) each side on the bumper extension. The red Super LED/clear lens each side.
* Two (2) lights, one (1) each side above rear wheels. The red Super LED/clear lens each side.

These lights shall be installed with a flange.

There shall be a switch in the cab on the switch panel to control the lights.

## REAR ZONE LOWER LIGHTING

There shall be two (2) Whelen®, Model 60\*02F\*R or equivalent, red Super LED/clear lens lights located at the rear of the apparatus.

Each light shall be mounted in a housing.

There shall be a switch located in the cab on the switch panel to control the lights.

## REAR/SIDE ZONE UPPER WARNING LIGHTS

There shall be four (4) Whelen, Model 60\*02F\*R or equivalent, LED light with Whelen, Model 6EFLANGE, chrome flanges provided.

* The side rear upper light(s) on the driver's side to be red.
* The rear upper light(s) on the driver's side to be red.
* The rear upper light(s) on the passenger's side to be red.
* The side rear upper light(s) on the passenger's side to be red.

The color of the lenses shall be clear.

There shall be a switch located in the cab on the switch panel to control the lights.

The rear warning lights shall be mounted on top of the compartmentation with all wiring totally enclosed. The rear deck lights shall be mounted on the beavertails as high as possible.

## ELECTRICAL SYSTEM GENERAL DESIGN for ALTERNATING CURRENT

The following guidelines shall apply to the 120/240 VAC system installation:

### General

Any fixed line voltage power source producing alternating current (ac) line voltage shall produce electric power at 60 cycles plus or minus 3 cycles.

Except where superseded by the requirements of NFPA 1901, all components, equipment and installation procedures shall conform to NFPA 70, National Electrical Code (herein referred to as the NEC).

Line voltage electrical system equipment and materials included on the apparatus shall be listed and installed in accordance with the manufacturer's instructions. All products shall be used only in the manner for which they have been listed.

### Grounding

Grounding shall be in accordance with Section 250-6 "Portable and Vehicle Mounted Generators" of the NEC. Ungrounded systems shall not be used. Only stranded or braided copper conductors shall be used for grounding and bonding.

An equipment grounding means shall be provided in accordance with Section 250-91 (Grounding Conductor Material) of the NEC.

The grounded current carrying conductor (neutral) shall be insulated from the equipment grounding conductors and from the equipment enclosures and other grounded parts. The neutral conductor shall be colored white or gray in accordance with Section 200-6 (Means of Identifying Grounding Conductors) of the NEC.

In addition to the bonding required for the low voltage return current, each body and driving or crew compartment enclosure shall be bonded to the vehicle frame by a copper conductor. This conductor shall have a minimum amperage rating of 115 percent of the nameplate current rating of the power source specification label as defined in Section 310-15 (amp capacities) of the NEC. A single conductor properly sized to meet the low voltage and line voltage requirements shall be permitted to be used.

All power source system mechanical and electrical components shall be sized to support the continuous duty nameplate rating of the power source.

### Operation

Instructions that provide the operator with the essential power source operating instructions, including the power-up and power-down sequence, shall be permanently attached to the apparatus at any point where such operations can take place.

Provisions shall be made for quickly and easily placing the power source into operation. The control shall be marked to indicate when it is correctly positioned for power source operation. Any control device used in the drive train shall be equipped with a means to prevent the unintentional movement of the control device from its set position.

A power source specification label shall be permanently attached to the apparatus near the operator's control station. The label shall provide the operator with the following information:

* Rated voltage(s) and type (ac or dc)
* Phase
* Rated frequency
* Rated amperage
* Continuous rated watts
* Power source engine speed

Direct drive (PTO) and portable generator installations shall comply with Article 445 (Generators) of the NEC.

### Overcurrent protection

The conductors used in the power supply assembly between the output terminals of the power source and the main over current protection device shall not exceed 144.00" (3658 mm) in length.

For fixed power supplies, all conductors in the power supply assembly shall be type THHW, THW, or use stranded conductors enclosed in nonmetallic liquid tight flexible conduit rated for a minimum of 194 degree Fahrenheit (90 degrees Celsius).

For portable power supplies, conductors located between the power source and the line side of the main overcurrent protection device shall be type SO or type SEO with suffix WA flexible cord rated for 600-volts at 194 degrees Fahrenheit (90 degrees Celsius).

#### Wiring Methods

Fixed wiring systems shall be limited to the following:

* Metallic or nonmetallic liquid tight flexible conduit rated at not less than 194 degrees Fahrenheit (90 degrees Celsius)
* or
* Type SO or Type SEO cord with a WA suffix, rated at 600 volts at not less than 194 degrees Fahrenheit (90 degrees Celsius)

Electrical cord or conduit shall not be attached to chassis suspension components, water or fuel lines, air or air brake lines, fire pump piping, hydraulic lines, exhaust system components, or low voltage wiring. In addition the wiring shall be run as follows.

* Separated by a minimum of 12.00" (305 mm), or properly shielded, from exhaust piping
* Separated from fuel lines by a minimum of 6.00" (152 mm) distance

Electrical cord or conduit shall be supported within 6.00" (152 mm) of any junction box and at a minimum of every 24.00" (610 mm) of continuous run. Supports shall be made of nonmetallic materials or corrosion protected metal. All supports shall be of a design that does not cut or abrade the conduit or cable and shall be mechanically fastened to the vehicle.

### Wiring Identification

All line voltage conductors located in the main panel board shall be individually and permanently identified. The identification shall reference the wiring schematic or indicate the final termination point. When prewiring for future power sources or devices, the unterminated ends shall be labeled showing function and wire size.

### Wet Locations

All wet location receptacle outlets and inlet devices, including those on hardwired remote power distribution boxes, shall be of the grounding type provided with a wet location cover and installed in accordance with Section 210-7 "Receptacles and Cord Connections" of the NEC.

All receptacles located in a wet location shall be not less than 24.00" (610 mm) from the ground. Receptacles on off-road vehicles shall be a minimum of 30.00" (762 mm) from the ground.

The face of any wet location receptacle shall be installed in a plane from vertical to not more than 45 degrees off vertical. No receptacle shall be installed in a face up position.

### Dry Locations

All receptacles located in a dry location shall be of the grounding type. Receptacles shall be not less than 30.00" (762 mm) above the interior floor height.

All receptacles shall be marked with the type of line voltage (120-volts or 240-volts) and the current rating in amps. If the receptacles are direct current, or other than single phase, they shall be so marked.

### Listing

All receptacles and electrical inlet devices shall be listed to UL 498, Standard for Safety Attachment Plugs and Receptacles, or other appropriate performance standards. Receptacles used for direct current voltages shall be rated for the appropriate service.

### Electrical System Testing

The wiring and associated equipment shall be tested by the apparatus manufacturer or the installer of the line voltage system.

The wiring and permanently connected devices and equipment shall be subjected to a dielectric voltage withstand test of 900-volts for one (1) minute. The test shall be conducted between live parts and the neutral conductor, and between live parts and the vehicle frame with any switches in the circuit(s) closed. This test shall be conducted after all body work has been completed.

Electrical polarity verification shall be made of all permanently wired equipment and receptacles to determine that connections have been properly made.

### Operational Test per Current NFPA 1901 Standard

The apparatus manufacturer shall perform the following operation test and ensure that the power source and any devices that are attached to the line voltage electrical system are properly connected and in working order. The test shall be witnessed and the results certified by an independent third-party certification organization.

The prime mover shall be started from a cold start condition and the line voltage electrical system loaded to 100 percent of the nameplate rating.

The power source shall be operated at 100 percent of its nameplate voltage for a minimum of two (2) hours unless the system meets category certification as defined in the current NFPA 1901 standard.

Where the line voltage power is derived from the vehicle's low voltage system, the minimum continuous electrical load as defined in the current NFPA 1901 standard shall be applied to the low voltage electrical system during the operational test.

## GENERATOR

The apparatus shall be equipped with a complete electrical power system. The generator shall be a Harrison or **equivalent** 10.0 kW Hydraulic unit (NO EXCEPTIONS). The wiring and generator installation shall conform to the present National Electrical Codes Standards of the National Fire Protection Association. The installation shall be designed for continuous operation without overheating and undue stress on components.

Generator Performance

- Continuous Duty Rating: 10,000 watts

- Nominal Volts: 120/240

- Amperage: 83 @ 120 volts, 41 @ 240 volts

- Phase: Single

- Cycles: 60 hertz

- Engine Speed at Engagement: Idle

- Pump RPM range: 900 to 3,300

The output of the generator shall be controlled by an internal hydraulic system. An electrical instrument gauge panel shall be provided for the operator to monitor and control all electrical operations and output.

The generator shall be driven by a transmission power take off unit, through a hydraulic pump and motor.

The generator shall include an electrical control inside the cab. The hydraulic engagement supply shall be operational only after the chassis parking brake is applied.

An electric/hydraulic valve shall supply hydraulic fluid to the clutch engagement unit provided on the chassis PTO drive.

Generator Instruments and Controls

To properly monitor the generator performance a digital meter panel shall be furnished and mounted next to the circuit breaker panel. The meter shall indicate the following items:

- Voltage

- Amperage for both lines

- Frequency

- Generator run hours

- Over current indication

- Over temperature indication

- "Power On" indication

- Two (2) fuse holders with two (2) amp fuses (for indicator light protection)

The meter and indicators shall be installed near eye level in the compartment. Instruments shall be flush mounted in an appropriate sized weatherproof electrical enclosure. All instruments used shall be accurate within +/- two (2) percent.

Generator Wiring:

The system shall be installed by highly qualified electrical technicians to assure the required level of safety and protection to the fire apparatus operators. The wiring, electrical fixtures and components shall be to the highest industry quality standards available on the domestic market. The equipment shall be the type as designed for mobile type installations subject to vibration, moisture and severe continuous usage. The following electrical components shall be the minimum acceptable quality standards for this apparatus:

Wiring:

All electrical wiring shall be fine stranded copper type. The wire shall be sized to the load and circuit breaker rating; ten (10) gauge on 30 amp circuits, 12 gauge on 20 amp circuits and 14 gauge on 15 amp circuits. The cable shall be run in corner areas and extruded aluminum pathways built into the body for easy access.

Load Center:

The main load center shall be a provided with circuit breakers rated to load demand.

Circuit Breakers:

Individual breakers shall be provided for all on-line equipment.

## GENERATOR LOCATION

The generator shall be mounted in the cargo area above the pump on the passenger's side. The flooring in this area shall be either reinforced or constructed, in such a manner, that it shall handle the additional weight of the generator.

## GENERATOR START

There shall be a switch provided on the cab instrument panel to engage the generator.

## CIRCUIT BREAKER PANEL

The circuit breaker panel shall be located high on the forward wall of compartment D4. Charging items in the Cab will be by Shoreline, and the Generator when on Scene.

## HYDRAULIC REEL WITH CAPACITY FOR 100' OF HOSE

A hydraulic hose reel shall be provided. The reel shall be operated by a 12 volt electric motor controlled by a rewind switch. The motor shall be protected by a circuit breaker and the rewind circuit shall be protected by a fuse. The switch shall be installed at a height not to exceed 72.00" above the operator's standing position. The switch shall be guarded to prevent accidental operation.

The reel capacity shall be a minimum of 100' of 0.25" inside diameter dual hydraulic hose. Surfaces where the hose comes in contact with the reel roller shall be constructed of either stainless steel, chrome plated steel or plastic.

A captive roller assembly to be provided to aid in the payout and loading of the reel. A ball stop shall be provided to prevent the hose from being wound around the reel.

A label shall be provided in a readily visible location adjacent to the reel. The label shall indicate maximum flow pressure and total length of hose installed on the reel.

A total of two (2) reels shall be installed in the Front Bumper (NO EXCEPTIONS).

The reel shall be designed for a [Brand, Model, Age of Tool].

## LOOSE EQUIPMENT

The following equipment shall be furnished with the completed unit:

- One (1) bag of chrome, stainless steel, or cadmium plated screws, nuts, bolts and washers, as used in the construction of the unit

## PAINT PROCESS

The exterior custom cab and/or body painting procedure shall consist of a seven (7) step finishing process. A commercial chassis paint process shall follow similar processes as determined by the chassis manufacturer. The following procedure shall be used by the apparatus manufacturer:

1. Manual Surface Preparation - All exposed metal surfaces on the custom cab and body shall be thoroughly cleaned and prepared for painting. Imperfections on the exterior surfaces shall be removed and sanded to a smooth finish. Exterior seams shall be sealed before painting. Exterior surfaces that shall not be painted include; chrome plating, polished stainless steel, anodized aluminum and bright aluminum treadplate.
2. Chemical Cleaning and Pretreatment - All surfaces shall be chemically cleaned to remove dirt, oil, grease, and metal oxides to ensure the subsequent coatings bond well. The aluminum surfaces shall be properly cleaned and treated using a high pressure, high temperature 4 step Acid Etch process. The steel and stainless surfaces shall be properly cleaned and treated using a high temperature 3 step process specifically designed for steel or stainless. The chemical treatment converts the metal surface to a passive condition to help prevent corrosion. A final pure water rinse shall be applied to all metal surfaces.
3. Surfacer Primer - The Surfacer Primer shall be applied to a chemically treated metal surface to provide a strong corrosion protective base coat. A minimum thickness of 2 mils of Surfacer Primer is applied to surfaces that require a critical aesthetic finish. The surfacer primer shall be a two-component high solids urethane that has excellent sanding properties and an extra smooth finish when sanded.
4. Finish Sanding - The surfacer primer shall be sanded with a fine grit abrasive to achieve an ultra-smooth finish. This sanding process is critical to produce the smooth mirror like finish in the topcoat.
5. Sealer Primer - The sealer primer is applied prior to the base coat in all areas that have not been previously primed with the surfacer primer. The sealer primer is a two-component high solids urethane that goes on smooth and provides excellent gloss hold out when top coated.
6. Base coat Paint - Two coats of a high performance, two component high solids polyurethane base coat shall be applied. The Base coat shall be applied to a thickness that shall achieve the proper color match. The Base coat shall be used in conjunction with a urethane clear coat to provide protection from the environment.
7. Clear Coat - Two (2) coats of clear coat shall be applied over the base coat color. The clear coat is a two-component high solids urethane that provides superior gloss and durability to the exterior surfaces. Lap style doors shall be clear coated to match the body. Paint warranty for the roll-up doors shall be provided by the roll-up door manufacturer.

Specifications are written to define cyclic corrosion testing, physical strengths, durability and minimum appearance requirements must be met in order for an exterior paint finish to be considered acceptable as a quality finish.

Each batch of base coat color shall be checked for a proper match before painting of the cab and the body. After the cab and body are painted, the color is verified again to make sure that it matches the color standard. Electronic color measuring equipment shall be used to compare the color sample to the color standard entered into the computer. Color specifications are used to determine the color match. A Delta E reading shall be used to determine a good color match within each family color.

All removable items such as brackets, compartment doors, door hinges, and trim shall be removed and separately if required, to ensure paint behind all mounted items. Body assemblies that cannot be finish painted after assembly shall be finish painted before assembly.

### PAINT - ENVIRONMENTAL IMPACT

Contractor shall meet or exceed all current State regulations concerning paint operations. Pollution control shall include measures to protect the atmosphere, water and soil. Controls shall include the following conditions:

* Topcoats and primers shall be chrome and lead free.
* Metal treatment chemicals shall be chrome free. The wastewater generated in the metal treatment process shall be treated on-site to remove any other heavy metals.
* Particulate emission collection from sanding operations shall have a 99.99% efficiency factor.
* Particulate emissions from painting operations shall be collected by a dry filter or water wash process. If the dry filter is used, it shall have an efficiency rating of 98.00%. Water wash systems shall be 99.97% efficient
* Water from water wash booths shall be reused. Solids shall be removed on a continual basis to keep the water clean.
* Paint wastes shall be disposed of in an environmentally safe manner.
* Empty metal paint containers shall be recycled to recover the metal.
* Solvents used in clean-up operations shall be recycled on-site or sent off-site for distillation and returned for reuse.

Additionally, the finished apparatus shall not be manufactured with or contain products that have ozone depleting substances. Contractor shall, upon demand, present evidence that the manufacturing facility meets the above conditions and that it is in compliance with the state EPA rules and regulations.

## PAINT

The cab shall be two-tone, with the upper section painted white and lower section of the cab and body painted red.

## PAINT CHASSIS FRAME ASSEMBLY

The chassis frame assembly shall be painted black before the installation of the cab and body, and before installation of the engine and transmission assembly, air brake lines, electrical wire harnesses, etc.

Components that are included with the chassis frame assembly that shall be painted are:

* Frame rails
* Frame liners
* Cross members
* Axles
* Suspensions
* Steering gear
* Battery boxes
* Bumper extension weldment
* Frame extensions
* Body mounting angles
* Rear Body support substructure (front and rear)
* Pump house substructure
* Air tanks
* Fuel tank
* Castings
* Individual piece parts used in chassis and body assembly

Components treated with epoxy E-coat protection prior to paint:

* Two (2) C-channel frame rails
* Two (2) frame liners

The E-coat process shall meet the technical properties shown.

## PAINT, REAR WHEELS

All wheel surfaces, inside and outside of inboard steel wheels only, shall be provided with powder coat paint #101 black.

## COMPARTMENT INTERIOR PAINT

The interior of compartmentation shall be painted with a gray spatter type paint.

## REFLECTIVE STRIPES

Three (3) reflective stripes shall be provided across the front of the vehicle and along the sides of the body. The reflective band shall consist of a 1.00" white stripe at the top with a 1.00" gap then a 6.00" white stripe with a 1.00" gap and a 1.00" white stripe on the bottom.

## REFLECTIVE STRIPE ON CAB FACE

The reflective band provided on the cab face shall be located below the stainless steel trim band and above the front bumper.

## REAR CHEVRON STRIPING

There shall be alternating chevron striping located on the rear-facing vertical surface of the apparatus. The rear surface, excluding the rear compartment door, shall be covered.

The colors shall be red and fluorescent yellow green diamond grade.

Each stripe shall be 6.00" in width.

This shall meet the requirements of the current edition of NFPA 1901, which states that 50% of the rear surface shall be covered with chevron striping.

## OUTLINE, REFLECTIVE STRIPE

A Black outline shall be applied on the top and the bottom of the reflective band. There shall be three (3) set of outline stripes required.

## CAB DOOR REFLECTIVE STRIPE

A 6.00" x 16.00" fluorescent yellow green diamond grade reflective stripe shall be provided across the interior of each cab door. The stripe shall be located approximately 1.00" up from the bottom, on the door panel.

This stripe shall meet the NFPA 1901 requirement.

## FIRE APPARATUS PARTS CD MANUAL

There shall be two (2) custom parts manuals for the complete fire apparatus provided in CD format with the completed unit.

The manuals shall contain the following:

* Job number
* Part numbers with full descriptions
* Table of contents
* Parts section sorted in functional groups reflecting a major system, component, or assembly
* Parts section sorted in alphabetical order
* Instructions on how to locate parts

The manuals shall be specifically written for the chassis and body model being purchased. It shall not be a generic manual for a multitude of different chassis and bodies.

### SERVICE PARTS INTERNET SITE

The service parts information included in these manuals are also available on the factory website. The website offers additional functions and features not contained in this manual, such as digital photographs and line drawings of select items. The website also features electronic search tools to assist in locating parts quickly.

## CHASSIS SERVICE CD MANUALS

There shall be two (2) CD format chassis service manuals containing parts and service information on major components provided with the completed unit.

The manual shall contain the following sections:

* Job number
* Table of contents
* Troubleshooting
* Front Axle/Suspension
* Brakes
* EngineTires
* Wheels
* Cab
* Electrical, DC
* Air Systems
* Plumbing
* Appendix

The manual shall be specifically written for the chassis model being purchased. It shall not be a generic manual for a multitude of different chassis and bodies.

## CHASSIS OPERATION CD MANUALS

There shall be two (2) CD format chassis operation manuals provided.

## ONE (1) YEAR MATERIAL AND WORKMANSHIP

Each new piece of apparatus shall be provided with a minimum **one (1) year** basic apparatus material and workmanship limited warranty. The warranty shall cover such portions of the apparatus built by the manufacturer as being free from defects in material and workmanship that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package (no exception).

## ENGINE WARRANTY

A **five (5) year** limited engine warranty shall be provided. A copy of the warranty certificate shall be submitted with the bid package.

## STEERING GEAR WARRANTY

A **one (1) year** limited steering gear warranty shall be provided. A copy of the warranty certificate shall be submitted with the bid package.

## FIFTY (50) YEAR STRUCTURAL INTEGRITY

The chassis frame shall be provided with a **fifty (50) year** material and workmanship limited warranty. The warranty shall cover the chassis frame as being free from defects in material and workmanship that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package (no exception).

## FRONT AXLE WARRANTY

A **five (5)-year/100,000 mile** parts and labor warranty shall be provided.

## REAR AXLE WARRANTY

A **five (5)-year/100,000 mile** parts and labor warranty shall be provided.

## ABS BRAKE SYSTEM THREE (3) YEAR MATERIAL AND WORKMANSHIP WARRANTY

A ABS brake system **three (3) year** limited warranty shall be provided.

## TEN (10) YEAR STRUCTURAL INTEGRITY

The new cab shall be provided with a **ten (10) year** material and workmanship limited warranty. The warranty shall cover such portions of the cab built by the manufacturer as being free from structural failures caused by defects in material and workmanship that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package (no exception).

## TEN (10) YEAR PRO-RATED PAINT AND CORROSION

Each new piece of apparatus shall be provided with a **ten (10) year** pro-rated paint and corrosion limited warranty on the apparatus cab. The warranty shall cover painted exterior surfaces of the body to be free from blistering, peeling, corrosion, or any other adhesion defect caused by defective manufacturing methods or paint material selection that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package (no exception).

## CAMERA SYSTEM WARRANTY

A fifty four (54) monthwarranty shall be provided for the camera system**.**

## COMPARTMENT LIGHT WARRANTY

A ten (10) year material and workmanship limitedwarranty shall be provided for the 12 volt DC LED strip lights**.** The warranty shall cover the LED strip lights to be free from defects in material and workmanship that would arise under normal use.

A copy of the warranty certificate shall be submitted with the bid package (no exception).

## TRANSMISSION WARRANTY

The transmission shall have a **five (5) year/unlimited mileage** warranty covering 100 percent parts and labor. The warranty is to be provided by Allison Transmission and not the apparatus builder.

## TRANSMISSION COOLER WARRANTY

The transmission cooler shall carry a five (5) year parts and labor warranty (exclusive to the transmission cooler). In addition, a collateral damage warranty shall also be in effect for the first three (3) years of the warranty coverage and shall not exceed $10,000 per occurrence. A copy of the warranty certificate shall be submitted with the bid package.

## WATER TANK WARRANTY

The UPF poly water tank shall be provided with a lifetime material and workmanship limited warranty.

A copy of the warranty certificate shall be submitted with the bid package (no exception).

## TEN (10) YEAR STRUCTURAL INTEGRITY

Each new piece of apparatus shall be provided with a **ten (10) year** material and workmanship limited warranty on the apparatus body. The warranty shall cover such portions of the apparatus built by the manufacturer as being free from defects in material and workmanship that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package (no exception).

## ROLL UP DOOR MATERIAL AND WORKMANSHIP WARRANTY

A roll-up door limited warranty shall be provided. The mechanical components of the roll-up door shall be warranted against defects in material and workmanship for the lifetime of the vehicle. A **six (6) year** limited warranty shall be provided on painted and satin roll up doors.

A copy of the warranty certificate shall be submitted with the bid package.

## PUMP WARRANTY

The **five (5) year** limited warranty on parts and **two (2) year** limited warranty on labor shall be provided for the pump.

A copy of the warranty certificate shall be submitted with the bid package (no exception).

## TEN (10) YEAR PUMP PLUMBING WARRANTY

The stainless steel plumbing components and ancillary brass fittings used in the construction of the water/foam plumbing system shall be warranted for a period of **ten (10) years or 100,000 miles**. This covers structural failures caused by defective design or workmanship, or perforation caused by corrosion, provided the apparatus is used in a normal and reasonable manner. This warranty is extended only to the original purchaser for a period of ten years from the date of delivery.

A copy of the warranty certificate shall be submitted with the bid package (no exception).

## FOAM SYSTEM WARRANTY

A **one (1) year** material and workmanship limited warranty shall be provided on the foam system. A **five (5) year** material and workmanship limited warranty shall be provided on the foam system control head.

A copy of the warranty certificate shall be submitted with the bid package (no exception).

## SIX (6) YEAR GENERATOR MATERIAL AND WORKMANSHIP WARRANTY

A generator **six (6) year** limited warranty shall be provided.

## TEN (10) YEAR PRO-RATED PAINT AND CORROSION

Each new piece of apparatus shall be provided with a **ten (10) year** pro-rated paint and corrosion limited warranty on the apparatus body. The warranty shall cover painted exterior surfaces of the body to be free from blistering, peeling, corrosion, or any other adhesion defect caused by defective manufacturing methods or paint material selection that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package (no exception).

## VEHICLE STABILITY CERTIFICATION

The fire apparatus manufacturer shall provide a certification stating the apparatus complies with NFPA 1901, current edition, section 4.13, Vehicle Stability. The certification shall be provided at the time of bid.

## ENGINE INSTALLATION CERTIFICATION

The fire apparatus manufacturer shall provide a certification, along with a letter from the engine manufacturer stating they approve of the engine installation in the bidder's chassis. The certification shall be provided at the time of delivery.

## POWER STEERING CERTIFICATION

The fire apparatus manufacturer shall provide a certification stating the power steering system as installed meets the requirements of the component supplier. The certification shall be provided at the time of bid.

## CAB INTEGRITY CERTIFICATION

The fire apparatus manufacturer shall provide a cab crash test certification with this proposal. The certification shall state that a specimen representing the substantial structural configuration of the cab has been tested and certified by an independent third party test facility. Testing events shall be documented with photographs, real-time and high-speed video, vehicle accelerometers, cart accelerometers, and a laser speed trap. The fire apparatus manufacturer shall provide a state licensed professional engineer to witness and certify all testing events. Testing shall meet or exceed the requirements below:

- European Occupant Protection Standard ECE Regulation No.29.

- SAE J2422 Cab Roof Strength Evaluation - Quasi-Static Loading Heavy Trucks.

- SAE J2420 COE Frontal Strength Evaluation - Dynamic Loading Heavy Trucks.

- Roof Crush

The cab shall be subjected to a roof crush force of 22,500 lb. This value meets the ECE 29 criteria, and is equivalent to the front axle rating up to a maximum of ten (10) metric tons.

- Side Impact

The same cab shall be subjected to dynamic preload where a 13,275-lb moving barrier is slammed into the side of the cab at 5.50 mph, striking with an impact of 13,000 ft-lb of force. This test is part of the SAE J2422 test procedure and more closely represents the forces a cab shall see in a rollover incident.

- Frontal Impact

The same cab shall withstand a frontal impact of 32,600 ft-lb of force using a moving barrier in accordance with SAE J2420.

- Additional Frontal Impact

The same cab shall withstand a frontal impact of 65,200 ft-lb of force using a moving barrier. (Twice the force required by SAE J2420)

The same cab shall withstand all tests without any measurable intrusion into the survival space of the occupant area.

There shall be no exception to any portion of the cab integrity certification. Nonconformance shall lead to immediate rejection of bid.

## CAB DOOR DURABILITY CERTIFICATION

Robust cab doors help protect occupants. Cab doors shall survive a 200,000 cycle door slam test where the slamming force exceeds 20 G's of deceleration. The bidder shall certify that the sample doors similar to those provided on the apparatus have been tested and have met these criteria without structural damage, latch malfunction, or significant component wear.

## WINDSHIELD WIPER DURABILITY CERTIFICATION

Visibility during inclement weather is essential to safe apparatus performance. Windshield wipers shall survive a 3 million cycle durability test in accordance with section 6.2 of SAE J198 *Windshield Wiper Systems - Trucks, Buses and Multipurpose Vehicles.* The bidder shall certify that the wiper system design has been tested and that the wiper system has met these criteria.

## SEAT BELT ANCHOR STRENGTH

Seat belt attachment strength is regulated by Federal Motor Vehicle Safety Standards and should be validated through testing. Each seat belt anchor design shall withstand 3000 lb of pull on both the lap and shoulder belt in accordance with FMVSS 571.210 Seat Belt Assembly Anchorages. The bidder shall certify that each anchor design was pull tested to the required force and met the appropriate criteria.

## SEAT MOUNTING STRENGTH

Seat attachment strength is regulated by Federal Motor Vehicle Safety Standards and should be validated through testing. Each seat mounting design shall be tested to withstand 20 G's of force in accordance with FMVSS 571.207 Seating Systems. The bidder shall certify, at time of delivery, that each seat mount and cab structure design was pull tested to the required force and met the appropriate criteria.

## CAB DEFROSTER CERTIFICATION

Visibility during inclement weather is essential to safe apparatus performance. The defroster system shall clear the required windshield zones in accordance with SAE J381 Windshield Defrosting Systems Test Procedure And Performance Requirements - Trucks, Buses, And Multipurpose Vehicles.The bidder shall certify that the defrost system design has been tested in a cold chamber and passes the SAE J381 criteria.

## CAB HEATER CERTIFICATION

Good cab heat performance and regulation provides a more effective working environment for personnel, whether in-transit, or at a scene. The cab heaters shall warm the cab 77 degrees Fahrenheit from a cold-soak, within 30 minutes when tested using the coolant supply methods found in SAE J381. The bidder shall certify, at time of delivery, that a substantially similar cab has been tested and has met these criteria.

## CAB AIR CONDITIONING PERFORMANCE CERTIFICATION

Good cab air conditioning temperature and air flow performance keeps occupants comfortable, reduces humidity, and provides a climate for recuperation while at the scene. The cab air conditioning system shall cool the cab from a heat-soaked condition at 100 degrees Fahrenheit to an average of 78 degrees Fahrenheit in 30 minutes. The bidder shall certify that a substantially similar cab has been tested and has met these criteria.

## AMP DRAW REPORT

The bidder shall provide, at the time of bid and delivery, an itemized print out of the expected amp draw of the entire vehicle's electrical system.

The manufacturer of the apparatus shall provide the following:

* Documentation of the electrical system performance tests.
* A written load analysis, which shall include the following:
	+ The nameplate rating of the alternator.
	+ The alternator rating under the conditions specified per:
		- Applicable NFPA 1901 or 1906 (Current Edition).
	+ The minimum continuous load of each component that is specified per:
		- Applicable NFPA 1901 or 1906 (Current Edition).
	+ Additional loads that, when added to the minimum continuous load, determine the total connected load.
	+ Each individual intermittent load.

All of the above listed items shall be provided by the bidder per the applicable NFPA 1901 or 1906 (Current Edition).

**TRADE IN (NO EXCEPTIONS)**

Proposal price shall include trade in of 2001 E-One pumper known as “Engine 8.” Specifications can be obtained at the Somerset Fire Department.