# KME FIRE APPARATUS

# PROPOSAL SPECIFICATIONS

# FOR AN

# 102’ AERIALCAT™ PLATFORM

# FOR THE

# SUNNYSIDE FIRE DEPARTMENT

# SUNNYSIDE, WA

## PROPOSAL

Cascade Fire and Safety is pleased to offer the proposed vehicle to meet the intent of the fire department specifications. KME Fire Apparatus is a leading manufacturer in custom and commercial fire fighting vehicles.

Questions or concerns pertaining to this proposal can be answered by contacting the following KME representative:

Mark Merritt
Cascade Fire & Safety
123 South Front Street
Yakima, WA 98901

Phone: (800) 572 3939 / (509) 453 6527
Cell: (509) 930 1786
Fax: (509) 457 2890
Email: markm@cfireinc.com
Web: www.cfireinc.com

## VEHICLE WEIGHT COMPLIANCE

Acceptance of order will be contingent on KME being provided proof of exemption from vehicle weight laws or regulations in the State of Washington, or proof that the vehicle as specified will comply with applicable weight laws and regulations; if such proof cannot be provided at time of order, KME will not be able to accept the order unless given a waiver and indemnification by the purchaser regarding compliance with weight limits.

## GENERAL INFORMATION

The proposed apparatus will be constructed to withstand the severe and continuous use encountered during emergency fire fighting services. The apparatus will be of the latest type, carefully designed and constructed with due consideration to the nature and distribution of the load to be sustained.

This proposal details the general design criteria of cab and chassis components, aerial device (if applicable), fire pump and related components (if applicable), water tank (if applicable), fire body, electrical components, painting, and equipment.

All items of these proposal specifications will conform to the National Fire Protection Association Pamphlet No. 1901, latest edition.

KME will furnish satisfactory evidence of our ability to construct, supply service parts and technical assistance for the apparatus specified.

**FIRE APPARATUS DOCUMENTATION**

KME will supply, at the time of delivery, at least one (1) copy of the following documents:

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

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

Certification of slip resistance of all stepping, standing and walking surfaces.

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

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

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

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

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

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

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

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

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

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

Written load analysis and results of electrical performance tests.

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

The proposed chassis will be certified by KME as conforming to all applicable Federal Motor Vehicle Safety Standards (FMVSS) in effect at the date of contract. This will be attested to by the attachment of a FMVSS certify caution label on the vehicle by KME, who will be recognized as the responsible final manufacturer.

KME will be responsible for preparing and maintaining a record file of parts and assemblies used to manufacture the proposed apparatus. These records will be maintained in KME's factory for a minimum of twenty (20) years. The file will contain copies of any and all reported deficiencies, all replacement parts required to maintain the apparatus, and original purchase documents including specifications, contract, invoices, incomplete chassis certificates, quality control reports and final delivery acceptance documents. The purchaser will have access to any and all documents contained in this file upon official written request.

**"TOP OF THE LINE" CHASSIS**

KME is proposing a custom built chassis, which is "Top Of The Line" including the cab structure and design, Multiplex electrical system, drive train and frame assembly.

**GENERAL CONSTRUCTION - AERIAL**

The proposed apparatus, assemblies, subassemblies, component parts, etc., will be designed and constructed with the due consideration to the nature and distribution of the load to be sustained and to the general character of the service to which the apparatus is subjected to when placed in service. All parts of the apparatus will be designed with a factor of safety, which is equal to or greater than that which is considered standard and acceptable for this class of equipment in fire fighting service. All parts of the proposed apparatus will be strong enough to withstand general service under full load. The apparatus will be so designed that the various parts and readily accessible for lubrication, inspection, adjustment and repair.

The apparatus will be designed and constructed, and the equipment so mounted, with due consideration to distribution of the load between front and rear axles that all specified equipment, including a full complement of specified ground ladders, full water tank, loose equipment, and firefighters will be carried without overloading or injuring the apparatus.

The aerial ladder will be designed as a modular component of the apparatus. The aerial ladder, its support structure, and outrigger system will be designed to comprise an integrated assembly, removable from the carrier vehicle as a single self-supporting unit. The design will facilitate repair, modifications or replacement of the aerial device, apparatus body, or chassis individually, as required by wear from use, obsolescence, or for purposes of refurbishment.

## SINGLE-LINE RESPONSIBILITY

KME is a true "sole source" manufacturer. KME engineers, designs, manufactures, builds and paints our own fire apparatus cab, chassis, body, aerial devices and electrical systems. All work is done in KME owned and operated manufacturing facilities by KME direct employees. This capability provides consistent design and manufacturing procedures that will reduce warranty issues and provide ease in parts replacement.

## PRODUCT LIABILITY INSURANCE

KME provides liability and facility insurance equaling $30,000,000.00, which is one of the highest available in the fire industry. Reference attached documentation.

## CRITERIA AND CODE CONFORMANCE

The proposed KME aerial ladder will be designed to conform to the intent of NFPA-1901 Standard for Automotive Fire Apparatus.

The following additional design criteria will be applicable to this specification to the extent specified here in:

- American Society for Testing and Materials (ASTM) A-36 Specification for Structural Steel
- Society of Automotive Engineers, Inc. (SAE) SAE Hand-book American Welding Society (AWS)
- AWS014.4-77 Classification and Application of Welded Joints for Machinery and Equipment
- American Society of Non-Destructive Testing (ASNT). ASNT Guidelines; Procedure SNT-TC-1 A.

The aerial device will be designed, fabricated, and tested in accordance with these codes and specifications.

## PAINT PERFORMANCE CERTIFICATION

The proposed KME apparatus meets or exceeds the required Commercial Vehicle Paint Performance Standards.

## SERVICE CENTER AND PARTS DEPOT

Cascade Fire and Safety
Yakima, WA 98901

## KME FIRE APPARATUS SERVICE STATEMENT

The proposed KME Fire Apparatus vehicle is offered with service for in or out of warranty repairs can be promptly performed by the local KME authorized service center.

**Service is provided by:**
Cascade Fire and Safety
123 South Front Street
Yakima, WA 98901
Phone: (509) 453 6527 / (800) 572 3939

**Service Center Capabilities**

Cascade Fire & Safety is a full service EVT Certified facility for all makes and models of emergency and fire apparatus.

The following services and repairs are performed by certified EVT technicians in our 7,000 square foot service center in Yakima, Washington: vehicle repair & refurbishment, aerial & pump preventive maintenance, annual apparatus inspections, hydraulic & electrical services, major pump repairs and rebuilding. Jackleg outrigger upgrades, equipment mounting, apparatus parts, NFPA warning light upgrades, and lettering and striping.

Mobile Certified Service is available in Puget Sound, Southwestern Washington, and Oregon.

## PRICES AND PAYMENTS

The bid price will be F.O.B. Destination, on a delivered and accepted basis at the Fire Department.

Total price on KME's proposal sheet will include all items listed in these specifications.

KME has computed pricing less federal and state taxes. It is understood that any applicable taxes will be added to the proposed prices, unless the purchaser furnishes appropriate tax-exempt forms.

## DELIVERY TIME

KME is proposing to complete the apparatus delivery time based on the number of calendar days, starting from the date the sales contract is signed and accepted by KME Fire Apparatus.

Delivery Time: 340-380 Calendar Days

## BOND REQUIREMENTS

An original bid bond will be submitted with the KME's proposal. The bond will be for an amount equal to 10% of the proposed bid price.

KME's bonding company will meet the following requirements:

- An acceptable surety as outlined by the United States Department of Treasury on their most recent Federal Register at a limit of at least $10,000,000;
- A.M. Best rating of "A" or better with a financial rating of at least "VIII"; and licensed as a surety in the state where the sale is to be made.

## PERFORMANCE BOND

A performance bond will be supplied by the KME upon acceptance of the signed sales contract for the apparatus. The performance bond will be for an amount equal to the full contract price (i.e. 100% bond).

## FAIR, ETHICAL AND LEGAL COMPETITION

In order to ensure fair, ethical, and legal competition, neither original equipment manufacturer (O.E.M.) nor parent company of the O.E.M. will have ever been fined or convicted of price fixing, bid rigging, or collusion in any domestic or international fire apparatus market.

## NON-COLLUSIVE BIDDING CERTIFICATION

By submission of this bid, KME and each person signing on behalf of any bidder, certifies, and in the case of a joint bid, each party thereof certifies as to its own organization, under penalty of perjury, that to the best of their knowledge and belief:

- The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for purpose of restricting competition, as to any matter relating to sell prices with any other bidder or any competitor.
- Unless otherwise required by law, the prices that have been quoted in this bid have not been knowingly disclosed by KME and will not knowingly be disclosed by KME prior to opening, directly or indirectly, to any other bidder or to any competitor
- No attempt has been made by KME to induce any other person, partnership, or corporation to submit or not to submit a bid for the purpose of restricting competition.
- That all requirements of the law including amendatory provisions as to non-collusive bidding have been complied with.

## MATERIAL AND WORKMANSHIP

All equipment furnished will be guaranteed to be new and of current manufacture, to meet all requirements of purchaser's specifications.

All workmanship will be of high quality and accomplished in a professional manner so as to insure a functional apparatus with a pleasing, aesthetic appearance.

## SALES ENGINEER

KME will designate an in house individual to perform KME's sales engineer functions. The sales engineer will provide a single point interface between the purchaser and KME on all matters concerning the contract.

## APPROVAL DRAWING

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

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

**INSPECTION VISITS**

KME will provide three (3) factory inspection trips to KME's facility. Transportation, meals, lodging, and other requisite expenses will be the bidder's responsibility.

Accommodations shall be for two (2) Fire Department representatives per trip.

The factory visits shall occur at the following stages of production of the apparatus:

- Pre-construction / blueprint review.
- Midpoint completion of entire apparatus.
- Final inspection upon completion.

Travel arrangements more than 1000 miles from the manufacturing facility will be via commercial airline transportation.

The customer maintains the right to inspect the apparatus, within KME's normal business hours. At any other point during construction expenses incurred during non-specified inspection visits will be the responsibility of the customer.

During inspection visits, the customer reserves the right to conduct actual performance tests to evaluate completed portions of the unit. Testing will be accomplished with the assistance and resources of the contractor.

**DELIVERY**

Delivery of the apparatus to the Fire Department will remain KME's responsibility.

A qualified and responsible representative of KME will deliver the apparatus to the Fire Department.

**INSTRUCTION MANUALS/DRAWINGS, SCHEMATIC**

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

The manual will contain the following:

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

**VEHICLE FLUIDS PLATE**

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

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

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

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

The principal dimensions of the completed apparatus will not exceed the following maximum acceptable dimensions:

**KME PROPOSED DIMENSIONS:**

- OVERALL LENGTH: 572"
- OVERALL WIDTH: 100"
- OVERALL HEIGHT: 141"
- WHEELBASE: 254"

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

- MINIMUM FRONT G.A.W.R.: 24,000 lbs.
- MINIMUM REAR G.A.W.R.: 60,000 lbs.
- MINIMUM TOTAL G.V.W.R.: 84,000 lbs.

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

**KME OWNERSHIP**

KME is a tightly held family owned corporation. All of the stockholders are members of the Kovatch family of Nesquehoning, PA. KME carries no (zero) long term debt and is the largest privately owned manufacturer of fire apparatus in the country.

**PRIMARY PLANT CONSTRUCTION**

In order to insure top quality construction, maximum assembly line and engineering communication and the highest level of manufacturing supervision the entire apparatus will be built at KME's (headquarters) manufacturing facility.

**PROPOSAL BLUEPRINT**

KME is providing a scaled drawing of the specific apparatus being proposed WITH THE BID. The drawing has been generated by KME's engineering department in order to maintain the accuracy of the drawing.

**FAMA MEMBERSHIP**

KME Fire Apparatus is a leading and proud member of the Fire Apparatus Manufacturer's Association (FAMA).

**U.S.A. MANUFACTURER**

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

**QUALITY MANAGEMENT**

KME is certified ISO 9001 at all company locations. KME received its certification from TÜV SÜD America Inc. after they assessed the company's quality system and found it to be in full compliance with ISO 9001. TÜV's is accredited as a registrar by ANSI-ASQ National Accreditation Board (ANAB), the organization responsible for qualifying registrars as competent to audit and certify organizations conforming to ISO 9001 or other management system standards.

The International Organization for Standardization (ISO) is a worldwide federation of national standards bodies from 130 countries. Its ISO 9001 standard is a quality assurance model made up of 20 sets of quality system requirements. This model applies to organizations that design, develop, produce, install, and service products.

This business management system allows KME to monitor processes to ensure they are effective; keep adequate records; check output for defects, with appropriate and corrective action where necessary; regularly review individual processes and the quality system itself for effectiveness; and facilitate continual improvement.

A copy of KME's certificate is included in this proposal.

## STEPPING, STANDING, & WALKING SURFACES

All stepping, standing, and walking surfaces on the body will meet NFPA #1901 anti-slip standards. Aluminum tread plate utilized for stepping, standing, and walking surfaces will be Alcoa No-Slip type. This material will be a minimum 3/16 (0.1875") in thickness. KME will supply proof of compliance with this requirement. All vertical surfaces on the body, which incorporate aluminum tread plate material, will utilize the same material pattern to provide a consistent overall appearance.

## AMP DRAW REPORT

The bidder shall provide with their bid proposal and at the time of delivery, an itemized print out of the expected amp draw of the entire vehicle's electrical system.

A written load analysis, which shall include the following:

- The rating of the alternator.
- The minimum continuous load of each component that is specified per: Applicable NFPA-1901.
- 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.

## COOPERATIVE PURCHASING

KME is pleased to allow other public agencies to use the purchase agreement resulting from this invitation to bid. The condition of such use by other agencies will be that any such agency must make and pursue contact, purchase order/contract, and all contractual remedies with KME. Such tag-on's will be done so that the original purchasing agency has no responsibility for performance by either KME or the agency using the contract.

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

The proposed unit will be tested and certified for KME Fire Apparatus by Underwriters Laboratories Inc. (UL) Underwriters Laboratories Inc. (UL) is recognized worldwide as a leading third party product safety certification organization for over 100 years. UL has served on National Fire Protection Association (NFPA) technical committees for over thirty years.

## INDEPENDENT TESTING ORGANIZATION QUALIFICATIONS

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

All work outlined in NFPA 1911, current Edition, including nondestructive testing, will be conducted at the manufacturer's facility. In addition, the following test work outlined in Section 19, Certification Tests, of NFPA 1901 will be conducted:

- **1-1/2 Times Rated Capacity on Level Ground Stability Test:** A load of 1-1/2 times rated capacity (as specified by the manufacturer) will be suspended from the tip of the aerial ladder, or the platform of the elevating platform, when it is in the position of least stability. If the manufacturer specifies a rated capacity while flowing water, then one times the water load and the worst case nozzle reaction will be added to the stability test weights. The apparatus will show no signs of instability. For a water tower, the stability test includes 1-1/2 times the weight of the water in the system and 1-1/2 times the maximum nozzle reaction force when it is in the position of least stability.
- **1-1/3 Times Rated Capacity on a 5 degree Slope Stability Test:** A load of 1-1/3 times rated capacity will be suspended from the tip of the aerial ladder, the platform of the elevating platform, or the tip of the water tower when it is in the position of least stability. The apparatus will show no signs of instability.
- **Aerial Device Water System Tests:** A friction loss test will be conducted for an aerial device equipped with a permanent water system and has a rated vertical height of 110 ft. or less. The standard model flow test results will be provided to the manufacturer. If the water system has been modified from the standard model configuration, a new flow test will be conducted to determine that the friction loss in the water system between the base of the swivel and the monitor outlet does not exceed 100 psi with 1000 gpm flowing and the water system at full extension.
- A maximum vertical height flow test will be conducted to determine that the water system is capable of flowing 1000 gpm at 100 psi nozzle pressure with the aerial device at full elevation and extension. If the apparatus is equipped with a fire pump designed to supply the water system, the test will be conducted using the onboard fire pump. The intake pressure to the fire pump will not exceed 20 psi.

UL provides the manufacturer a complete written Examination and Test Report for each aerial device inspection performed at the manufacturer's facility. This Report specifies the points of inspection and results of such examinations and tests. The test report, as required by NFPA 1911, will include the following test results:

- Torque verification of all mounting bolts including bolt size, grade, and torque specification.

The following NDT methods and results will be recorded:

- All ferrous welds will be magnetic particle inspected for defects. All nonferrous welds will be visually inspected, and if questionable defects are identified, a penetrating dye will be used to further evaluate the quality of the weld. All bolts and pins will be ultrasonically inspected for internal flaws.

The following measurements will be taken and recorded in the examination and test record:

- Bearing clearance and backlash, elevation cylinder drift, engine speed operating rpm, relief pressure, stabilizer extension cylinder drift, ladder section twist, hardness readings, base rail thickness, winch drift, extension brake drift, and extension cylinder drift.

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

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

KME will designate, in writing, who is qualified to witness and certify these test results.

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

When the unit successfully meets all the requirements outlined in NFPA 1901, 2009 Edition, UL will issue a Certificate of Automotive Fire Apparatus Examination and Test stating the units compliance with NFPA-1901.

**LINE VOLTAGE ELECTRICAL SYSTEM CERTIFICATION**

When the unit successfully meets all the requirements outlined in NFPA 1901, 2009 Edition, UL will issue a Certificate of Automotive Fire Apparatus Examination and Test stating the unit's compliance with the required line voltage section of NFPA.

**FOAM PROPORTIONING SYSTEM CERTIFICATION**

When the unit successfully meets all the requirements outlined in NFPA 1901, 2009 Edition, UL will issue a Certificate of Automotive Fire Apparatus Examination and Test stating the unit's compliance with the required foam proportioning section of NFPA.

## GENERAL APPARATUS DESCRIPTION "AERIAL"

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

- Chapter 1 Administration
- Chapter 2 Referenced Publications
- Chapter 3 Definitions
- Chapter 4 General Requirements
- Chapter 8 Aerial Fire Apparatus
- Chapter 12 Chassis and Vehicle Components
- Chapter 13 Low Voltage Electrical Systems and Warning Devices
- Chapter 14 Driving and Crew Areas
- Chapter 15 Body, Compartments and Equipment Mounting
- Chapter 19 Aerial Devices
- Chapter 16 Fire Pump and Associated Equipment
- Chapter 18 Water Tanks
- Chapter 20 Foam Proportioning Systems
- Chapter 22 Line Voltage Electrical Systems
- Chapter 24 Air Systems

## CAB SAFETY SIGNS

The following safety signs shall be provided in the cab:

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

## CHASSIS DATA LABELS

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

Fluid Data

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

Chassis Data

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

Manufacturers weight certification:

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

## ROLLOVER STABILITY

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

## SEAT BELT ANCHOR TESTING

Each seat belt anchor shall be tested to withstand 3,000lbs of pull on both the lap and shoulder belt in accordance with FMVSS 210 section 4.2.

**SEAT MOUNTING TESTING**

Each seat mounting position shall be tested to withstand 20G's of force in accordance with FMVSS 207 section 4.2(c).

Both tests shall be performed and verified at a third party testing and evaluation center.

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

**"PREDATOR™" CAB TYPE**

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

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

Cab shall be designed, fabricated, assembled in its entirety, and installed on the frame rails in the manufacturer's factory. This requirement will eliminate any split responsibility in warranty and service.

**OPEN SPACE DESIGN**

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

**CAB MATERIAL - ALUMINUM**

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

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

**CAB - BASE CONSTRUCTION**

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

The front cab wall shall be of double wall type construction, featuring an inner and outer panel.

**CRASH TESTING CERTIFICATION**

To ensure the safety of the cab occupants and cab integrity, proof of third party testing shall be provided. The cab shall be certified for SAEJ2422 side impact, SAEJ2420 with ECER29 cab front impact, and ECER29 cab roof strength.

Furthermore, proof of testing and certification shall be provided that the cab, in accordance to SAE J2420 was front impact tested at 2.1 times the standard energy required in SAE J2420, thus exceeding the NFPA requirement.

This test shall be performed with no support immediately behind the cab, thus providing an authentic test result.

## ROOF AND SIDE LOAD TESTING

The cab design will include additional third party testing to ensure the safety of the cab occupants and cab integrity, proof of third party testing shall be provided. The cab shall be certified for SAEJ2422 side impact, SAEJ2420 with ECER29 cab front impact, and ECER29 cab roof strength.

The manufacturer shall provide proof that third party testing has been conducted to prove a static roof and a static side-load test has been completed. In these tests, a 120,000 pound static load was first applied to the roof. This test was followed by applying the same 120,000 pound static load to the side of the cab.

These tests will be conducted per the SAE J2422, Cab Roof Strength Evaluation, protocol and the ECE R29, Uniform provisions concerning the approval of vehicles with regard to the protection of occupants of the cab of a commercial vehicle, protocol.

During both tests, the cab will withstand these loads without encroachment into the occupant survivable space and all doors remained closed during the test. The tests will be documented with photographs and real-time video in a report provided to the manufacturer.

## DIMENSIONS - MEDIUM FOUR DOOR STYLE CAB

The cab shall be fully enclosed, capable of comfortably seating six (6) fire fighters in full fire fighting turnout gear, cab over engine design, with integral tilt mechanism and engine access on top of doghouse.

Minimum Cab Dimensions:

- Overall width 100"
- Inside width across ceiling 92"
- Front area floor to ceiling 63"
- Top of front seat to ceiling 44" (depending upon seat type)
- Seat back to steering wheel 22" (depending upon seat type)
- Inside width (door to engine enclosure) 24" (driver's side, at floor)
- Inside width (door to engine enclosure) 20-1/2" (officer's side, at floor)
- Crew seat area width 92"
- Outer crew seat risers to rear wall 42"
- Centerline front axle to back of cab 62-1/2"
- Floor to top of engine enclosure 29.5"
- Centerline axle to front of cab 74”

Glass Area Dimensions:

- Windshield (Contour) 3,422 sq. in.
- Front door window, retractable 743 sq. in. each
- Rear door window, retractable 875 sq. in. each
- Fixed side windows 620 sq. in. each

Cab Entry Door Width Dimensions

- Forward door opening 40" wide
- Rear door opening 37" wide

Cab Entry Step Dimensions

- Forward door recessed step — 30" wide x 9" deep
- Rear door recessed step — 29" wide x 9" deep

Cab Entry Door Height Dimensions

- Forward door opening — 74-1/4" high
- Rear door opening — 84-1/4" high

**CAB ROOF**

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

The cab roof over the rear crew area shall be raised ten (10) inches higher than the front driver and officer area. The front face of the raised roof section shall be sloped at a 45 degree angle, creating a streamlined interface with the standard, lower, forward roof section. This design shall allow for additional interior height in the rear crew area.

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

Approximate dimensions:

- Crew area floor to ceiling — 61 1/2"
- Top of crew seat to ceiling — 45" (depending upon seat type)

**REAR CREW AREA NOTCHED ROOF**

The center roof section over the rear seating area shall be notched to the level of the front roof section to accommodate the aerial device.

The raise roof notch shall be 52" wide to accommodate the aerial device.

**CAB DOORS**

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

The forward cab door opening shall be a minimum of 40" wide, and the rear cab door opening shall be a minimum of 37" wide. The rearward cab doors shall have a radius cutout allowing the door opening to protrude forward over the cab wheel well, while providing full access to the rear crew area.

There shall be a heavy duty piano type stainless steel hinge on each door with a minimum pin diameter of 5/16". Hinges shall be slotted for ease of horizontal and vertical adjustment. There shall be a cab door seal and the doors shall close flush with the side of the cab. A heavy-duty 2 1/2" wide reinforced rubber strap shall be utilized to prevent the cab doors from opening greater than 90 degrees.

**ENTRY STEP AREA**

Each of the forward entrance steps shall be a minimum of 8-1/2" deep with the floor board recessed a minimum of 5" to avoid "shin knocking". Each step shall be a bolt-in cast aluminum step. The cab steps risers shall be overlaid with bright finish aluminum tread plate.

Each of the rear entrance steps shall be a minimum of 8-1/2" deep. An intermediate step shall be provided between the lower entrance step and the crew area floor for ease of entry and egress. Each upper section of the steps and respective step risers shall be constructed as an integral part of the cab construction and shall be overlaid with bright finish aluminum tread plate. Each lower step shall be a bolt-in cast aluminum step.

**DOOR INSULATION**

A 1" insulation panel shall be installed in each cab door. This insulation panel shall provide an additional acoustical barrier as well as help with heating/cooling properties of the apparatus.

**DOOR LATCHES**

A semi-recessed chrome plated pull handle, capable of operating with a gloved hand, shall be provided on the exterior of each cab door. Heavy-duty, bright finish cast paddle latches shall be provided on the interior of each cab door. Door latch mechanisms which utilize spring steel clamps shall not be considered due to their tendency to both rust and break. The interior door latch cables are to be designed to reduce adjustment or possible wear at the adjustment turnbuckles.

**LOCKING CAB DOORS**

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

**DOOR WINDOWS**

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

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

**INNER DOOR PANELS**

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

Each interior cab door panel shall be equipped with reflective ScotchLite material that shall cover at least 96 $in^2$.

**WINDSHIELD/GLASS**

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

The windshield will be a contour design with 3422 sq. in. of area for improved visibility and style. The windshield glass shall be designed so it can be used on either the driver or officer side. Single piece windshields that utilize epoxy or that are bonded to the cab structure shall not be acceptable.

**WINDSHIELD WIPERS AND WASHER**

Dual, electric operated, pantographic type windshield wipers shall be provided. One (1) electric drive motor shall be provided for each wiper.

Wipers shall have "HI/LO" and "INTERMITTENT" operating speeds. "HI/LO" speeds shall be controlled by a steering column control, within the turn signal control stem. "INTERMITTENT" operation shall be controlled by a twist switch within the control on the steering column. The wipers shall be of the self-parking type.

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

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

**WINDSHIELD WIPER DURABILITY CERTIFICATION**

Windshield wipers shall survive testing in excess of 3 million cycles 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 "Third party tested" and that the wiper system has met this criteria.

**CAB SIDE VIEWING WINDOWS**

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

**DARK TINTED REAR WINDOW GLASS**

The windshield and the forward cab door glass shall be provided with standard DOT green automotive tint. The side cab windows to the rear of the front doors, the rear cab door windows and any rear viewing windows shall be equipped with a dark automotive tint.

**GRAB HANDLES**

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

**INTERIOR GRAB RAILS**

Grab rails shall be provided to assist in entry and exiting of the cab. Each grab rail shall be a cast aluminum "D" style handle that shall have a wheelabrated finish and shall be located in the following locations:

- Three (3) 12" long, vertically mounted, one (1) on the officer's side of the cab interior "A" post and one (1) on each side of the cab interior on the "C" post in the crew area
- One (1) 11" long, horizontally mounted, on each front cab door on the interior door panel
- One (1) 11" long, horizontally mounted, on each rear cab door on the interior door panel
- One (1) 30" long, horizontally mounted, on each rear cab door, located approximately 8" above the bottom of the window opening.
- One (1) 12" long, vertically mounted, one (1) on the driver's side cab interior on the "A" post.

**FRONT CAB GRILL**

A shaped polished stainless steel grille shall be installed to allow for maximum air flow to the charge air cooler and the radiator.

**AIR INTAKE/OUTLET**

Two (2) shaped, polished stainless steel air inlets/outlets shall be provided horizontally above the wheel well opening, one on each side of the cab. The grilles {will/shall} be equipped with a mesh screen to serve as a secondary ember separator. The design shall permit proper ducting of air through the engine compartment and cooling system.

**ENGINE AIR INTAKE SYSTEM**

The left side inlet, used for the air intake to the air cleaner, shall be equipped with dual ember separators for separating burning embers from the air intake system. This system shall be such that particles larger than .039 inches (1 mm) in diameter cannot reach the air filter element.

No part of the air intake system for the engine shall be lower than the top of the frame rails to ensure the vehicle can navigate pooled water without any part of the air intake system being exposed to water when the vehicle is stopped or in motion. Chassis designs, which the engine air intake system is lower than the frame rails shall not be acceptable!

**WHEEL WELL LINERS**

The front cab wheel wells shall be equipped with fully removable, bolt-in, aluminum inner wheel well liners. The liners shall extend full depth into the truck frame. The completely washable wheel well liners shall be designed to protect the cab substructure, inner panels, and other miscellaneous installed components from road salts, debris, dirt accumulation and corrosion.

**FENDERETTES**

The cab wheel well openings shall be trimmed with replaceable, bolt-in, polished aluminum fenderettes. The fenderettes shall be secured to the cab with stainless steel threaded fasteners along the internal perimeter of the wheel well. Dissimilar metal tape and black vinyl trim molding shall be used where the cab and fender meet.

**FRONT MUD FLAPS**

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

**CAB RADIUS MOUNTED MIRROR**

Two (2) Ramco model 6001 PCHR polished aluminum, full face, heated, remote operated, 13 inches high X 9 3/4 wide mirrors, with a bottom heated / remote convex mirror, on a standard arm length of 15 inches {will/shall} be provided and installed. The flat glass and bottom mirror head {will/shall} be remote operated with a control switch mounted on the dash. The mirror head {will/shall} be attached to a polished aluminum arm mounted on the cab radius panel.

All switching, bracketing and wiring inside the cab needed for installation of the electric mirrors shall be supplied.

**INTERIOR CAB TRIM**

The cab interior shall be constructed to create an ergonomically designed interior to be user friendly and functional for the driver and officer.

The forward overhead panel shall be covered with a three (3) piece custom formed ABS vinyl overlay, which shall have integrated windshield defroster/heat vents and four (4) comfort vents.

All ABS formed material panels, as well as all of the interior upholstery panels shall be medium gray in color. The upholstered cab overhead and side wall portions shall utilize gray Durawear upholstery with padding underneath to provide additional insulation.

The interior metal surfaces of the cab shall be finish painted with a textured gray paint.

**INTERIOR REAR WALL**

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

A twelve (12) inch high bright finish aluminum tread plate scuff plate shall be provided on the lower portion of the rear interior cab wall.

**UNDER SEAT STORAGE COMPARTMENTS**

There shall be a compartment provided under each front seat. Each compartment shall be accessible from the front of the seat riser when the door is opened.

**BARYFOL FLOORING**

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

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

**CAB ACOUSTICAL INSULATION**

One (1) inch thick acoustical insulation shall be provided on the cab roof and rear and side walls of the cab. This material shall be fitted between the cab structural members and secured with adhesive to provide an insulation barrier for noise and heat.

**ENGINE ENCLOSURE**

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

A, hinged access door shall be provided in the top rearward portion of the engine enclosure. The door shall allow access to the engine oil, transmission fluid, power steering fluid level dipsticks and the windshield washer fluid reservoir. The access door shall be provided with two (2) flush mounted latches and gas shock holders. There shall be a gray ABS vinyl cover over the access door to give a cleaner look to the top of the engine enclosure and doghouse area.

**ADDITIONAL ENGINE ENCLOSURE INSULATION**

Premium soundproofing/insulation material, Barymat BTRLAX3-14BY shall be installed in the engine enclosure. To ensure a clean, smooth surface, this material shall be retained by flat aluminum panels fastened to studs that are welded to cab as needed. These panels shall be removable. Any gaps in this insulation barrier shall be sealed with 3M #425 aluminized high temperature tape.

To further reduce the noise and heat levels inside the cab, 1/4" foam upholstery material shall be installed on all interior surfaces of the engine enclosure, below the upholstery material.

**SUN VISORS**

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

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

**DRIVERS SEAT**

The driver's seat shall be a H. O. Bostrom Sierra Air-50RX/HD/ABTS LH air suspension, high back bucket seat. The seat shall have a tapered and padded seat cushion with lumbar support. The seat shall have a five inch fore and aft adjustment, a three inch height adjustment with a reclining seat back. The seat air ride suspension shall be pneumatically controlled from a control switch on the forward lower edge of the seat.

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

**OFFICERS SEAT**

The officer's seat shall be a H. O. Bostrom Tanker 450 Air-50 RX/ABTS RH series air-suspension, SCBA seat. The seat shall have a tapered and padded seat cushion with lumbar support. The seat shall have a five inch fore and aft adjustment, a three inch height adjustment. The seat shall include a SCBA storage area with integral headrest. The seat air ride suspension shall be pneumatically controlled from a control switch on the forward lower edge of the seat.

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

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

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

**REAR FACING, OUTBOARD, DRIVER SIDE SEAT**

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

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

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

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

**REAR FACING, OUTBOARD, OFFICER SIDE SEAT**

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

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

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

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

**SEAT UPHOLSTERY MATERIAL**

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

**SEAT BELT CUSHION SENSORS AND BELT SENSORS**

The apparatus shall be equipped with a Class 1 seat belt warning system. The system shall consist of a Seat Belt module, dash mounted Icon style display and an audible alarm.

Seat belt and seat cushion sensors shall be provided on the four (4) specified seating positions.

**VEHICLE DATA RECORDER**

A Class 1 Vehicle Data Recorder (VDR) system shall be provided. The system shall include an NFPA compliant "Black Box" with reporting software that shall be capable of data storage to coincide with the NFPA requirements.

Data storage capabilities shall include interfaces with the following systems:

- Display module (Master Optical Warning Device)
- VDR, date & time stamp
- Max Vehicle speed (MPH)
- Vehicle acceleration / deceleration (MPH/Sec.)
- Engine Speed (RPM)
- ABS event
- Data password protected
- Data sampled once per second, in 48-hour loop
- Data sampled min by min for 100 engine hours
- Throttle position (% of Throttle)
- Data software
- PC / Mac Compatible
- Data summary reports

The VDR data shall be downloadable by USB cable to a computer using either Microsoft or Apple operating systems.

**INTERIOR CAB STORAGE COMPARTMENT**

A storage compartment shall be mounted against the rear wall of the cab crew area. The compartment shall be approximately 20" deep x 53" high (depending on roof height) x 36" wide. The door opening shall be approximately 38" high x 26" wide.

The compartment shall be constructed of smooth aluminum and shall be equipped with a roll-up door. The compartment shall be painted with textured paint, matching the interior color of the cab.

The EMS compartment shall be equipped with two (2) ROM V4 brand LED interior track light(s). The lighting shall be wired to automatically activate when the compartment door is open and the master battery switch is in the "on" position.

**MAP BOOK STORAGE**

A map book compartment shall be provided for vertical storage of three (3) 3" 3-ring binders, which shall be top loaded. The storage compartment shall be equipped with a hinged lid and shall be constructed from 1/8" aluminum which shall be painted with textured paint, matching the interior color of the cab.

**CAB DOGHOUSE STORAGE MODULE**

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

**ANTENNA INSTALLATION**

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

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

**LAPTOP COMPUTER SLIDE OUT TRAY**

A slide out tray shall be installed for the officer to provide an area for laptop computer usage. In the closed position this area will be nest forward to allow access in and out of the vehicle.

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

**DASH & CENTER CONSOLE**

The driver and officer side dash, along with the center dash, shall be covered with a custom formed ABS vinyl overlay to create an ergonomically designed interior to be user friendly and functional for the driver and officer.

The dash gauge panel shall be a custom formed ABS pewter gray wrap-around design for improved visibility. A full complement of gauges shall be provided in custom formed bezels. The starter and ignition switches shall also be integrated into the upper left portion of the gauge panel for easier access.

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

The transmission gear selector and the spring brake control valve shall be located on an angled section of the center dash assembly toward the driver for easy access.

There shall be provisions for mounting a switch panel in the center of the dash between the driver and officer. The top center of the dash assembly shall contain one (1) removable panel to access the main chassis wiring circuits and breaker panels.

**DRIVERS DASHBOARD PANEL**

The main instrument panel shall be centered in front of the driver and shall be mechanically fastened to the main dash assembly. The panel shall be made of custom formed ABS that shall contain the primary gauges, an instrument warning light cluster and the ignition and engine start switches.

Each gauge shall have a raised glass lens with polished chrome trim ring and be backlit by integral blue LED's. Each gauge shall be designed with an integral red warning light with a pre-programmed warning point. Gauges monitoring drive-train component status shall be of the direct data bus type capable of displaying information broadcast on the J 1939 data-link. Each gauge warning indicator shall be capable of activating an audible alarm inside the dashboard.

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

The primary gauges shall consist of:

- Vehicle speedometer (0-80 mph)
- Engine tachometer (0-3000 rpm)
- Engine oil pressure (0-100 psi); low oil pressure warning
- Engine coolant temperature (100-250 °F); high engine temp warning (based on engine)
- Transmission oil temperature (100-350 °F); high transmission fluid temp warning
- Vehicle battery voltage (9-18 VDC); low voltage warning at 11.8 amps
- Front air system gauge (0-150 psi); low air pressure warning at 65 psi
- Rear air system gauge (0-150 psi); low air pressure warning at 65 psi
- Fuel level (E-1/2-F); low fuel level warning @ 1/8 tank
- Air cleaner restriction gauge (0 - 40), warning at 25" restriction.
- Inter axle lock control switch
- Diesel Exhaust Fluid level (E-1/2-F); low fuel level warning @ 1/8 tank

- Engine Compression Brake Controls

**CLASS ONE DISPLAY**

A Information Center display shall be provided on the dash for the electrical Class One ES-Key multiplex system. The exact location shall determined by the totality of instruments and switches on the cab dash. The display shall be in easy reach of the officer to view information.

**INDICATOR CLUSTER**

The driver's dashboard panel shall consist of Ametek gauges, an 18 item instrument warning light cluster and a 16 item, dead front type alarm panel.

This display shall contain the system control unit that collects data from the vehicle data bus (J1939), analog sensors, and switches throughout the vehicle. This data shall be presented using gauges, telltales and the two (2) display panels. The warning light display shall include a 2 x 20 dot matrix display, 18 telltales and 2 buttons to navigate through the screen menus.

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

This display contains a series of two (2) screens to provide information about the vehicle. To control the display of that information, the screens are divided into two (2) menus; one that can be displayed while the vehicle is in motion and one that can only be accessed when the parking brake is set.

On the Road displays include:

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

The displays that can be accessed when the parking brake is set include:

- Engine hours as maintained by the engine ECU
- Service Alarm screens to report miles to next service or miles past required service. These screens shall allow the operator to choose the length of the service interval and shall have the ability to reset it.
- Message screens with warning messages the display has collected during the current ignition cycle. These screens shall be divided into configured warnings such as "Low Air Pressure" and the data bus faults reported by ECU's on the vehicle. Both lists shall allow the operator to review the last 12 events that occurred on the vehicle for maintenance and troubleshooting purposes.
- Diagnostic screens shall test the instrumentation system to verify it is working correctly.
- Setup screens shall be used to select either English or metric display. They shall also allow the operator to choose the data that shall be displayed by the configurable on-the-road screens.

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

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

Listed below are indicators that may be included, depending upon the vehicle configuration:

- "Wait To Start" indicator (amber in color)
- "Exhaust System Fault" (amber in color)
- "Topps System Fault" (amber in color)
- "Lube System Active" (amber in color)
- "Jacks Not Stowed" (red in color)
- "PTO Engaged" (green in color)
- "Inter Axle Lock" (amber in color)
- "4x4" (green in color)
- "Driver Controlled Diff Lock" (green in color)
- "Ok to Pump" (green in color)
- "Auto Traction Control" (amber in color)
- "Retarder Active" (amber in color)
- "Auxiliary Brake Active" (amber in color).
- "Inter Axle Lock" indicator
- "ATC Disabled" indicator (red in color)
- "ATC Active" indicator (yellow in color)
- "Outrigger(s) Extended" indicator light

**LOWER LEFT AUXILIARY SWITCH PANEL**

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

**PUMP SHIFT CONTROL**

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

**AERIAL POWER CONTROLS**

There shall be an aerial device power and a PTO engagement switch located in the cab switch console. An aerial device PTO/hour meter shall be furnished adjacent to the power switches. See ladder description for details.

**OFFICER DASH**

There shall be a flat surface area in front of the officer for use with such items as a lap top computer.

**CENTER OVERHEAD PANEL**

An overhead console with a removable pewter panel shall be provided on the cab interior overhead between the driver and officer to permit installation of cab stereo, intercom systems, arrow stick controls, etc. The overhead console shall be approximately 27" wide x 4" high x 13" deep and shall be integrated into the ABS overhead center panel. The overhead console shall not obstruct the driver's vision through the officer's side window.

**CLIMATE CONTROL SYSTEM**

A climate-control system shall be provided for total cab environmental comfort. This system shall provide heat, cooling and defrost capabilities to various areas in the cab. The system shall consist of a single evaporator unit, mounted in the center overhead of the cab.

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

- Heavy-duty, high output blower.
- High efficiency coil that includes "rifled" tubing and oversized header tubes for maximum refrigerant distribution.
- Four (4) 3" diameter, adjustable louvers; two (2) each side of the cab overhead, facing the driver and officer seat positions.
- A large center mounted multi-vent defroster louver positioned above the windshield to provide adequate airflow for windshield defrost.
- Four (4) integral 3" diameter louvers, one (1) below the driver and officer seat positions and one (1) under each outboard rear facing crew seat.
- Damper controls shall be pneumatically operated to provide air discharge to the windshield, front overhead air discharge louvers or the seat riser/floor outlets as required.
- An adjustable electric water valve to control the amount of heat.
- Housing shall be fully insulated and enclosed.
- BTU: 53,500 A/C
- BTU: 69,300 Heat
- CFM: 590 Heat
- CFM: 590 A/C.

The ceiling mounted evaporator unit shall be designed to include a deep well condensate collection pan, which shall include an automatic air vacuum pump to ensure proper drainage.

The ceiling mounted evaporator unit shall be enclosed with an ergonomically designed, custom panel to provide maximum headroom and a pleasing appearance.

A serviceable foam intake filter shall be installed on the rear of the evaporator.

The controls panel shall actuate the air-distribution system with air cylinders, which are to be separated from the brake system by an 85-90 psi pressure protection valve.

All defrost/heating systems will be plumbed with one (1) seasonal shut-off valve mounted near the engine.

**ROOF MOUNT CONDENSERS**

Two (2) 12-volt, roof top, single condensers shall be mounted on the cab roof so as not to interfere with the aerial device or any emergency lighting systems. The condensers shall be designed with high performance, long life fan assemblies. The fan motors are to be equipped with sealed housings and shaft.

The condensers and coil design shall include rifled tubing for maximum efficiency. Each coil shall be painted black. The condenser unit will include a receiver drier with a high and low pressure switch. The wire harness shall include necessary wiring for the clutch circuit as well as a separate power relay circuit.

Mounting design shall enable easy servicing of all components and unit replacement if necessary.

**CLIMATE CONTROL SWITCHES**

The drivers overhead panel shall contain all controls for the cab climate control system. The following controls shall be provided: mode selector switch, front fan speed switch, rear fan speed switch, air conditioning on/off switch, and temperature control dial. All controls shall be clearly labeled, adequately backlit, and installed in an easily removable panel.

**CAB TILT ASSEMBLY**

A hydraulic cab lift system shall be provided, consisting of an electric-powered hydraulic pump, fluid reservoir, dual lift cylinders, remote cab lift controls and all necessary hoses and valves.

The cab tilt mechanism shall be custom designed for ease of maintenance and consist of two (2) hydraulic cylinders with a maximum lift capacity of 19,625 pounds. Hydraulic lines shall be rated at 20,000 PSI burst pressure. The hydraulic cylinders shall be equipped with a velocity fuse that protects the cab from accidentally descending when the cab is in the tilt position.

Hydraulic cylinders shall be detachable to allow removal of the engine for major service. A remote cable operated mechanical cylinder stay bar and release shall be provided to insure a positive lock in the tilted position.

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

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

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

**CHASSIS FRAME ASSEMBLY**

The chassis frame shall be fabricated in its entirety at the manufacturer's facility. This shall prevent any split responsibility in warranty or service.

The frame shall consist of two (2) channels fastened together by cross members. All structural fasteners used in the frame shall be Grade 8 hardware. Hardened steel washers shall be used under all bolt heads and nuts to avoid stress concentrations. Top flange shall be free of bolt heads. All spring hangers shall be machined steel castings. Weldment type chassis and the use of Huck bolts shall never be used.

Each main frame rail shall be 10-1/4" x 4" x 3/8", fabricated from 110,000 PSI minimum yield steel, with a minimum section modulus of 18.396 cu in and a resisting bending moment (RBM) of 2,023,560 inch pounds.

A full length inner frame liner shall be installed. Total section modulus of each rail, with liner, shall be 33.555 cu in and the total resisting bending moment (RBM) shall be 3,691,050 in-lbs, per rail.

A third inner frame liner shall be provided between the front and rear axle spring hangers. Total section modulus of each rail, with both liners, shall be 42.180 cu in and the total resisting bending moment (RBM) shall be 4,639,800 in-lbs, per rail.

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

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

**FRONT BUMPER**

A 12" high, 101" wide, two (2) ribbed, bright finish stainless steel front bumper shall be provided. The bumper shall be a wrapped design to match the contour of the front cab sheet.

**BUMPER EXTENSION**

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

The polished aluminum tread plate gravel shield shall terminate under the top bumper flange.

**STORAGE WELL - CENTER**

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

One (1) hinged, latched, aluminum tread plate cover shall be installed on the storage well located in the center of the bumper extension.

**FRONT TOW HOOKS**

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

**LICENSE PLATE BRACKET**

A chrome plated license plate bracket shall be provided on the front bumper of the apparatus.

**AERIAL TRAVEL SUPPORT**

An aerial travel support for the aerial device shall be provided and located as close to the front axle as possible.

**FRONT AXLE**

Front axle shall be a Dana I-220 W I beam type. Large diameter king pins and longer low friction bushings shall be provided to extend the service life of the kingpin knuckle joint.

The front axle shall be rated at 24,000 lbs.

**FRONT BRAKES**

Brakes shall be Bendix ES, Extended Service "S" series, S-Cam 16-1/2" x 7" and shall be full air actuated with automatic slack adjusters.

**FRONT SUSPENSION**

Front suspension shall be progressive rate front leaf springs. The spring shall be permanently pinned at the front and have a shackle double pinned mounting at the rear.

The front leaf springs shall have a minimum of 10 leaves, a minimum length of 51", and a minimum width of 3-1/2". The capacity at ground shall be 24,000 lbs. All springs shall be of center bolt design. All spring pins shall be positively restrained from rotating in brackets and shackles.

**FRONT SHOCK ABSORBERS**

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

**REAR AXLE**

Rear axle assembly shall be a tandem, Meritor RT-58-185 single reduction with a capacity of 60,000 lbs. Axles shall have a gear reduction as required.

A driver controlled Power Divider Lock (PDL), shall allow full driveshaft torque to be sent to both rear axles in low traction situations when a tire on one axle is slipping. This feature shall be disengaged during normal driving to prevent interaxle differential damage. An electric over air-operated switch shall be provided in the cab driver dash area.

Oil seals shall be provided as standard equipment.

**REAR BRAKES**

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

**REAR AXLE TOP SPEED**

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

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

**REAR SUSPENSION**

A Ridewell 202S, "Dynalastic" rubber block suspension shall be provided for the tandem rear axle assembly. The suspension shall have a weight rating equal to the rear axle weight rating up to 58,000 pounds.

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

**BRAKE SYSTEM**

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

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

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

**ABS SYSTEM**

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

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

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

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

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

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

**ELECTRONIC STABILITY CONTROL (ESC)**

Electronic Stability Control (4 or 6 Channel) shall be provided as part of the Standard ABS system. The Electronic Stability Control system shall be capable of recognizing and assisting in both rollover and vehicle-under and over-steer situations through advanced monitoring of vehicle parameters and automatic and selective application of the chassis brakes. The Electronic Stability system shall use lateral and yaw accelerometers, wheel speed sensors, ABS pressure modulator valves and an ECU to control the four corners of the vehicle. The controller shall monitor the vehicle response to turning and braking, and adjust or modulate the brake pressure at the wheel end to slow the vehicle in roll control, stabilize the vehicle when under or over steering, and modulate brake pressure when excessive wheel slip, or wheel lockup is detected. By these actions, the ESC system shall help to maintain vehicle lateral and roll stability, improve braking and steering during heavy brake applications and braking on slippery surfaces.

**AUTOMATIC TRACTION CONTROL (ATC)**

To further improve vehicle drive characteristics, the unit shall be fitted with automatic traction control (ATC). This system shall control drive wheel slip during acceleration from a resting point. An extra solenoid valve shall be added to the ABS system. The system shall control the engine and brakes to ensure efficient acceleration. The system shall be equipped with a dash-mounted light indicating the ATC is controlling drive wheel slip. The system shall also include an "off road traction" dash mounted switch that will allow the operator to momentarily allow for more wheel slip when the unit is in deep mud or snow.

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

**BRAKE AIR RESERVOIRS**

There shall be a minimum of four (4) air reservoirs and be installed in conformance with best automotive practices.

Reservoir capacity total shall be a minimum of 7100 cu. in.

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

- Wet Tank — Black
- Primary Tank — Green
- Secondary Tank — Blue
- Auxiliary Tank(s) — Yellow.

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

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

**AIR LINES**

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

**AIR COMPRESSOR**

Air compressor shall be a Wabco brand, minimum of 18.7 cubic feet per minute capacity. Air brake system shall be the quick build up type. The air compressor discharge line shall be stainless steel braid reinforced Teflon hose.

A pressure protection valve shall be installed to prevent the use of air horns or other air operated devices should the air system pressure drop below 80 psi (552 kPa).

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

**BRAKE TREADLE VALVE**

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

**PARKING BRAKE**

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

The parking brake shall be plumbed to provide all wheel lock-up when applied.

**FRONT WHEELS & TIRES**

The front wheels shall be 22.5" x 13" ten stud, hub piloted polished aluminum disc type.

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

The front tires shall be Goodyear 425/65R22.5 "20 Ply" tubeless radial G296 MSA on/off road tread. The tires shall be fire service rated up to 24,400 lbs and shall have a top speed of 68 mph when inflated to 120 psi.

Fire Service Rating defined as no more than 50 miles of continuous operation at maximum load, or without stopping for at least 20 minutes. Emergency vehicle will reduce its speed to no more than 50 mph after the first 50 miles of travel.

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

NOTE: NEVER EXCEED THE MAXIMUM AIR PRESSURE LIMITATION.

**REAR WHEELS & TIRES**

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

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

The rear tires shall be Goodyear 315/80R22.5 "18 Ply" tubeless radial Regional RHD II+ traction tread. The tires shall be fire service rated up to 64,000lbs and shall have a top speed of 75 mph when inflated to 125 psi.

Fire Service Rating defined as no more than 50 miles of continuous operation at maximum load, or without stopping for at least 20 minutes. Emergency vehicle will reduce its speed to no more than 50 mph after the first 50 miles of travel.

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

NOTE: NEVER EXCEED THE MAXIMUM AIR PRESSURE LIMITATION.

**TIRE PRESSURE MONITORING DEVICES**

Each tire shall be equipped with an LED tire alert pressure management system (Vecsafe equal) that shall monitor tire pressure. A chrome plated brass sensor shall be provided on the valve stem of each tire.

The sensor shall calibrate to the tire pressure when installed on the valve stem for pressures between 20 and 120 psi. The sensor shall activate an integral battery operated LED when the pressure of that tire drops 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 blinking.

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

**ENGINE**

Engine shall be a Cummins, Model ISX12 500, diesel, turbo-charged, per the following specifications.

- Max. Horsepower 500 HP @ 1800 RPM
- Governed Speed 2100 RPM
- Peak Torque 1645 lb. ft. @ 1100 RPM
- Cylinders Six (6)
- Operating Cycles Four (4)
- Bore & Stroke 5.11 x 5.91 in.
- Displacement 729 cu. in.
- Compression Ratio 16.6:1
- Governor Type Limiting Speed
- Drive line Size 1810 Series.

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

A fuel/water separator shall be provided.

**ENGINE EPQ CERTIFICATION**

The Cummins ISX 12 engine shall be certified by Cummins Power Systems for installation in the manufacturers custom chassis.

**ENGINE CHASSIS CERTIFICATION**

The engine shall be installed in accordance with engine manufacturer's instructions. KME shall be able to furnish proof of engine installation approval by the engine manufacturer.

**COOLING/RADIATOR**

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

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

The radiator core shall have a height of 35.92" x a width of 37.62". Supply and return tanks made of glass-reinforced nylon shall be crimped on to the core assembly using header tabs and a compression gasket to complete the radiator core assembly. The radiator shall be compatible with commercial antifreeze solutions.

There shall be a full steel frame around the entire radiator core assembly. The radiator core assembly shall be isolated within the steel frame by rubber inserts to enhance cooling system durability and reliability. The radiator shall be mounted in such a manner as to prevent the development of leaks caused by twisting or straining when the apparatus operates over uneven ground. The radiator assembly shall be isolated from the chassis frame rails with rubber isolators.

The cooling system shall include a surge tank mounted to the top of the radiator framework that shall remove air in the system. The surge tank shall be equipped with a sight glass to monitor the level of coolant. The radiator shall be equipped with a dual seal cap that shall allow for expansion and recovery of coolant into a separate integral chamber.

The cooling system shall be designed for a maximum of fifteen (15) PSI operation.

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.

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

The engine cooling system shall have an inline coolant filter that shall have a shut off valve for ease of maintenance.

The engine cooling system shall be certified by the engine manufacturer to meet cooling index requirements for a minimum ambient temperature or 110-degrees Fahrenheit.

**TRANSMISSION COOLER**

A shell and tube transmission oil cooler shall be provided using engine coolant to control the transmission oil temperature. The cooler shall have an aluminum shell and copper tubes. The cooler shall be assembled using pressed in rubber tube sheets to mechanically create a reliable seal between the coolant and the oil. No brazed, soldered, or welded connections shall be used to separate the coolant from the oil.

**RADIATOR SKID PLATE**

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

**CHARGE AIR COOLER**

The charge air cooler shall be constructed of aluminum with cast aluminum side tanks. To not restrict air flow to the radiator, the charge air cooler shall designed to be an integral part of the radiator assembly, mounted directly on top of the radiator. Rubber isolators shall be used at the mounting points to reduce transmission of vibrations.

Where applicable, the charge air cooler pipes shall be constructed of appropriately sized aluminized steel tubing with 0.06" wall thickness and formed hose barbs. The connections between these pipes, the engine and charged air cooler, shall be made using high temperature silicone hoses rated for use in temperature up to 500°F, and heavy duty constant tension T-Bolt spring hose clamps. These connections shall adequately allow for movement of the engine relative to the charged air cooler.

Charge air coolers that are located in front of the radiator, that block or restrict air flow into the engine radiator or introduce above ambient temperature air into the radiator in any way shall not be used.

**COOLING SYSTEM FAN**

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

The fan shall be equipped with an air operated clutch fan, which shall activate at a pre-determined temperature range.

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

**COOLANT HOSE AND PIPING**

All coolant piping shall be constructed of appropriately sized powder coated steel tubing with 0.06" wall thickness and formed hose barbs. All connections between coolant pipes and chassis components shall be made using appropriately sized silicone hoses or elbows, rated for use in temperatures ranging from -60°F to +350°F, and appropriately sized constant torque hose clamps. These connections shall be minimal in number to reduce the number potential leak points, and shall adequately allow for movement of the engine relative to chassis mounted components. All integral hoses supplied with the engine shall be as supplied by the engine manufacturer.

**HEATER HOSES**

Premium Goodyear Hi-Miler® blue heater hoses shall be furnished for the heater system. The Hi-Miler® hose shall have a core of black Versigard (EPDM) with spiral Flextan reinforcement and blue Versigard coating. All heater hoses shall be equipped with constant torque type hose clamps. All integral hoses supplied with the engine shall be as supplied by the engine manufacturer.

Two (2) mechanical shut off valves shall be installed on the engine to shut down the flow of coolant to the cab heating system.

**LOW COOLANT INDICATOR LIGHT AND ALARM**

A low engine coolant indicator light located in the dash instrument panel shall be provided. An audible alarm shall be provided to warn of the low coolant condition.

**ENGINE BRAKE**

An engine compression brake shall be furnished for increased braking capabilities. Controls shall be as provided by the engine manufacturer and shall be activated by releasing the throttle pedal to the idle position.

The engine compression brake shall have dash mounted control switches to turn the brake on or off as well as to control the operational level of the brake.

The engine brake shall be wired in such a manner so as to illuminate the chassis brake lights when the engine brake is engaged and operating.

The engine brake shall be interlocked with the PTO operation and shall automatically disengage any time the apparatus is operating with the PTO active.

**ENGINE FAST IDLE**

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

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

**AIR CLEANER**

An engine air cleaner shall be provided. The air cleaner shall include a dry type element and shall be installed in accordance with the engine manufacturer's recommendations. The air cleaner shall be located to the rear of the engine, with streamline air pipes and hump hose connections from the inlet to the air cleaner and from the air cleaner to the turbo. The air cleaner shall be easily accessible when the cab is tilted. The air cleaner shall be plumbed to the air intake system that shall include a self sealing connection between the cab and air cleaner assembly to allow the cab to be tilted.

**SPARK ARRESTOR**

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

**ACCELERATOR CONTROL**

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

**REMOTE THROTTLE CONTROL HARNESS**

An apparatus interface wiring harness for the engine shall be supplied with the chassis. The harness shall include a connector for connection to the chassis harness which shall terminate in the left frame rail behind the cab for reconnection to required throttle control harnesses. The harness shall contain necessary connectors for a pressure governor and a multiplexed gauge. Separate circuits shall be included for pump controls, "Pump Engaged" and "OK to Pump" indicator lights, open compartment ground, start signal, park brake ground, ignition signal, master power, customer ignition, air horn solenoid switch, high idle switch and high idle indication light.

An apparatus interface wiring harness shall also be included which shall be wired to the cab harness interface connectors and shall incorporate circuits with relays to control pump functions. This harness shall control the inputs for the transmission lock up circuits, governor/hand throttle controls and dash display which shall incorporate "Pump Engaged" and "OK to Pump" indicator lights. The harness shall contain circuits for the apparatus builder to wire in a pump switch.

**ENGINE PROGRAMMING REMOTE THROTTLE**

The engine ECM (Electronic Control Module) discreet wire remote throttle circuit shall be turned off for use with a J1939 based pump controller or when the discreet wire remote throttle controls are not required.

## TRANSMISSION

An Allison World Transmission, Model 4000 EVS electronically controlled, automatic transmission shall be provided. Transmission specifications shall be as follows:

- Max. Gross Input Power 600 HP
- Max. Gross Input Torque 1850 lb. ft.
- Input Speed (Range) 1700- 2300 RPM
- Direct Gear (Pumping) 4th (Lock-up)

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

One (1) PTO opening shall be provided on both the left and right side of the converter housing (positions one (1) o'clock and eight (8) o'clock).

The transmission shall be calibrated for five (5) forward gears and one (1) reverse gear. Each gear shall have the following ratios:

- First 3.51:1
- Second 1.91:1
- Third 1.43:1
- Fourth 1.00:1
- Fifth 0.74:1
- Reverse -4.80:1

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

## TRANSMISSION OIL LEVEL SENSOR

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

## PARK TO NEUTRAL

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

## PRESELECT PROGRAMMING

The transmission shall have Allison Preselect enabled to automatically downshift when the secondary engine brake is active.

The transmission shall be programmed at the factory to automatically downshift to 4th gear.

This feature shall be enabled/disabled with the main on/off switch for the engine brake.

## TRANSMISSION FLUID

TES-389 transmission fluid shall be utilized to fill the 4000 EVS transmission.

**DRIVE LINES**

Drive lines shall be Dana (Spicer) 1810 heavy duty series or equal, with "glide coat" splines on all slip shafts. The chassis manufacturer shall utilize an electronic type balancing machine to statically and dynamically balance all drive shafts. The manufacturer shall provide proof of compliance with all drive shaft manufacturer's standards and specifications.

**DIESEL EXHAUST FLUID TANK**

A five (5) gallon diesel exhaust fluid (DEF) tank shall be provided and installed. The tank shall be mounted in the area of the battery box and shall be accessible through a door in the crew area step well.

The tank shall include an internal heater that will be fed by engine coolant directly from the engine block to ensure it is always kept at the proper temperature per EPA requirements. The tank shall include a temperature sensor to control the flow of the engine coolant from the heater valve to the DEF tank.

A DEF fluid level senor shall be provided with the DEF tank and connected to the level gauge on the dashboard.

**EXHAUST SYSTEM**

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

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

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

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

Separate "regeneration" enable and prohibit switches shall be provided under the dash board on the driver's side. Each switch shall be provided with a spring loaded protective cover and shall be clearly marked as to function.

**SELECTIVE CATALYTIC REDUCTION (SCR)**

The vehicle shall be equipped with SCR technology that uses a urea based diesel exhaust fluid (DEF) and a catalytic converter to significantly reduce oxides of nitrogen (NOx) emissions.

The SCR system shall reduce levels of NOx (oxides of nitrogen emitted from engines) by injecting small quantities of diesel exhaust fluid (DEF) into the exhaust upstream of a catalyst, where it vaporizes and decomposes to form ammonia and carbon dioxide. The ammonia (NH3), in conjunction to the SCR catalyst, converts the NOx to harmless nitrogen (N2) and water (H2O).

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

****** FUEL SYSTEM ******

**FUEL TANK**

Fuel tank shall be a minimum of sixty-five (65) gallon capacity. It shall have a minimum fuel filler neck of 2" ID. A 1/2" minimum diameter drain plug shall be provided. The tank shall be fabricated from hot rolled, pickled and oiled steel. Provisions for an additional feed line and fuel level float shall be provided for future use.

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

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

The fuel tank shall be able to withstand a longitudinal acceleration of -23.0g at 0.166 seconds in accordance to SAE J211 standards using a channel frequency class 600 filter. Testing shall be performed at and verified by a third party testing and evaluation center.

The fuel lines shall be textile reinforced synthetic rubber or plastic hose that is approved for use with diesel fuel and has a minimum max temperature rating of 250° F. The lines shall be sized to meet engine manufacture's requirements, and shall be carefully routed and secured along the inside of the frame rails.

**FUEL FILTER/WATER SEPARATOR**

A fuel filter/water separator shall be provided in the fuel system. A "water in fuel" indicator shall be provided on the dash.

**SECONDARY ELECTRIC FUEL PUMP**

In addition to the primary fuel pump, a secondary electric fuel pump for re-priming shall be furnished in the main fuel line. A labeled control switch shall be provided on the main dash panel.

**FUEL POCKET**

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

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

## DUAL POWER STEERING

A dual power steering system shall be provided utilizing a Sheppard model #M110 main steering gear on the driver side of the chassis and a Sheppard model #M90 steering gear on the officer side of the chassis.

The power steering gear on the officer side of the chassis shall increase performance in turning the officer side wheel assembly, reducing loads and forces on the main gear and components.

The steering system shall be designed to maximize the turning capabilities of the front axle no matter the rating and tire size. The use of a power assist cylinder on the officer side of the chassis is NOT ACCEPTABLE on front axles of this capacity.

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

## STEERING COLUMN

The steering column shall be a "Douglas Autotech" tilt and telescope column. A lever mounted on the side of the column shall control the tilt and telescope features.

The steering shaft from the column to the miter box shall have a rubber boot to cover the shaft slip and a second rubber boot to seal the passage hole in the floor.

There shall be a self-canceling lever that shall control the following functions:

- Left and right turn signals
- High beam activation
- Hazard warning switch
- Windshield wiper control with Hi / Lo / Intermittent speed positions
- Windshield washer control

## STEERING WHEEL

The steering wheel shall be a two (2) spoke, vinyl padded, minimum 18" diameter, with a center hub mounted horn button.

## ROAD SAFETY KIT

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

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

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

## CHASSIS ELECTRICAL SYSTEM

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

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

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

## WIRING HARNESS DESCRIPTION

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

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

All harnesses will be securely installed in areas protected against heat, liquid contaminants and damage. The harness connections and terminations shall use a method that provides a positive mechanical and electrical connection and are in accordance with the device manufacturer's instructions. No connections within the harness may utilize wire nut, insulation displacement, or insulation piercing components.

All circuits shall conform to SAEJ1292. All circuits will be provided with low voltage over current protective devices. These devices shall be readily accessible and protected against heat in excess of component rating, mechanical damage, and water spray. Star washers shall not be used for ground connections.

## DIRECT GROUNDING STRAPS

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

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

**EMI/RFI PROTECTION**

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

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

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

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

**12 VOLT ELECTRICAL SYSTEM TESTING**

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

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

**TEST #1-RESERVE CAPACITY TEST**

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

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

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

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

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

**LOW VOLTAGE ALARM TEST**

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

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

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

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

**ELECTRICAL MANAGEMENT SYSTEM**

A Class 1 ES-Key Electrical Management System shall be utilized on the chassis for all functions applicable. The system shall consist of the following components:

A modem with a RS232 computer interface and standard telephone jack used to not only program the multiplex system but also serve as a factory direct gateway into the vehicle from any Class 1 multiplex authorized service facility.

A Universal System Manager (USM), which acts as the main controlling component of the multiplexing system shall be provided and factory programmed to DOT, NFPA, SAE, the manufacturer and City of Sunnyside specifications. The programming shall be done by the manufacturer's engineering department. The ES-Key system installation shall comply with SAE J 551 requirements regarding Electromagnetic and Radio Frequency interference (EMI, RFI), as well as utilize components and wiring practices that insure the system is protected against corrosion, excessive temperatures, water, excessive physical, and vibration damage by any equipment installed on the vehicle at the time of delivery.

A series of Multiplexing Input/Output Modules shall be installed. The Input/Output modules shall permit the multiplexing system to reduce the amount of wiring and components used as compared to non-multiplexed apparatus. These modules shall vary in I/O configuration, be waterproof allowing installation outside of enclosed areas and shall possess individual output internal circuit protection. The modules shall also have three status indicators visible from a service persons vantage point that shall indicate the status of the module. In the event a load requires more than 7.5 AMPS of operating current, the module shall activate a simple relay circuit integral to any of the 3 dillbox assemblies installed in the cab.

Diagnostic software shall be provided to download data from the on board ES-KEY system. This software shall have the ability to view system input/output (I/O) information, and include a connection from a computer to the vehicle.

A Class-1 four (4) line display shall serve as an informational, status and diagnostic view panel for the vehicles electrical system.

**INTERLOCK INTERFACE MODULE**

A Vocation Module, which is the interface between the multiplexing system and the pump system shall be provided. This module shall serve as the interface between the operator, engine, transmission and pumping system. The module shall be installed under the driver's side dash, in a sealed enclosure that shall possess green indicating LED's that shall indicate to service personnel the interlock state of the apparatus. In the event of a multiplexing error involving pump operation can be activated to ensure reliable pumping operations at ALL times. In addition to controlling pump function, this vocation module shall be able to provide automatic and/or manual activation of engine "Fast Idle", to maintain adequate alternator output and thus, chassis voltage.

**CHASSIS DIAGNOSTICS SYSTEM**

Diagnostic ports shall be accessible while standing on the ground and 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 engine and ABS systems to provide blink codes should a problem exist.

The diagnostic system shall include the following:

- A single port to monitor the engine, transmission and ABS system and diagnostics of the roll sensor (if applicable)
- Engine diagnostic switch (blink codes)
- ABS diagnostic switch (blink codes)
- Allison Transmission Codes (through touch pad shifter)

**VOLTAGE MONITOR SYSTEM**

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

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

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

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

**12 VOLT SEQUENCER**

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

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

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

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

## ELECTRICAL HARNESS REQUIREMENT

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

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

For increased reliability and harness integrity, harnesses shall be routed throughout the cab and chassis in a manner which allows the harnessing to be laid into its mounting location. Routing of harnessing which requires pulling of wires through tubes is never allowed at the manufacturer.

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

- All holes made in the roof shall be caulked with silicon. Large fender washers, liberally caulked, shall be used when fastening equipment to the underside of the cab roof.
- Any electrical component that is installed in an exposed area shall be mounted in a manner that shall not allow moisture to accumulate in it. Exposed area shall be defined as any location outside of the cab or body.
- For low cost of ownership, electrical components designed to be removed for maintenance shall be quickly accessible. For ease of use, a coil of wire shall be provided behind the appliance to allow them to be pulled away from the mounting area for inspection and service work.
- Corrosion preventative compound shall be applied to non-waterproof electrical connectors located outside of the cab or body. All non-waterproof connections shall require this compound in the plug to prevent corrosion and for easy separation of the plug.
- Any lights containing non-waterproof sockets in a weather-exposed area shall have corrosion preventative compound added to the socket terminal area.
- All electrical terminals in exposed areas shall have protective coating applied completely over the metal portion of the terminal.
- Rubber coated metal clamps shall be used to support wire harnessing and battery cables routed along the chassis frame rails.
- Heat shields shall be used to protect harnessing in areas where high temperatures exist. Harnessing passing near the engine exhaust shall be protected by a heat shield.

- Cab and crew cab harnessing shall not be routed through enclosed metal tubing. Dedicated wire routing channels shall be used to protect harnessing therefore improving the overall integrity of the vehicle electrical system. The design of the cab shall allow for easy routing of additional wiring and easy access to existing wiring.
- All standard wiring entering or exiting the cab shall be routed through sealed bulkhead connectors to protect against water intrusion into the cab.

**BATTERY CABLE INSTALLATION**

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

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

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

- Splices shall not be allowed on battery cables or battery cable harnesses.
- For ease of identification and simplified use, battery cables shall be color coded. All positive battery cables shall be marked red in color. All negative battery cables shall be black in color.
- For ease of identification, all positive battery cable isolated studs throughout the cab and chassis shall be red in color.
- For increased reliability and reduced maintenance, all electrical buss bars located on the exterior of the apparatus shall be coated to prevent corrosion.
- An operational test shall be conducted to ensure that any equipment that is permanently attached to the electrical system is properly connected and in working order.

**ALTERNATOR**

There shall be a Delco Remy Model 40SI, 320 amp brushless, serpentine belt driven alternator. The brushless design of the 40SI transfers magnetic fields between the rotor and stator air-gap without brushes.

The alternator installation shall be designed to provide maximum output at engine idle speed, by using "Remote Sense" in order to meet the minimum continuous electrical load of the apparatus as required.

The alternator shall carry a 3 Year/Unlimited Mile warranty.

**BATTERY SYSTEM**

Five (5) Exide #HP-31D, Group 31, maintenance free batteries shall be provided. Each battery shall be rated at 925 CCA at 0° F and shall have a reserve capacity of 180 minutes.

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

## BATTERY STORAGE

Batteries shall be securely mounted in fixed 3/16" GR50 steel trays located on each side of the chassis frame. Complete access shall be provided when the cab is fully tilted. Batteries shall be mounted on non-corrosive matting material.

The battery tray shall be able to withstand a longitudinal acceleration of -46.5g at 0.246 seconds in accordance to SAE J211 standards using a channel frequency class 600 filter. Testing shall be performed at and verified by a third party testing and evaluation center.

## BATTERY DISCONNECT SWITCH

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

## BATTERY JUMPER STUDS

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

## 12 VOLT BATTERY CHARGING RECEPTACLE

A 12 volt, polarized battery charging receptacle, with a weather tight cover, shall be provided. This receptacle shall allow a purchaser supplied external 12 volt battery charger to be utilized. A label shall be provided indicating voltage and amperage ratings.

## SHORELINE POWER INLET PLATE

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

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

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

## EMERGENCY SWITCHES

A switch control console shall be provided in the center dash panel between the driver's and officer's position. This console shall separate the emergency / auxiliary electrical functions from the regular chassis functions. Eight (8) Class One model # SPS programmable touch pad type switches with integral indicator lights shall be provided.

A master warning switch shall be provided, which shall allow pre-setting of emergency light switches and shall have a red integral indicator light. Next to the master switch, a total of six (6) load manageable emergency switches shall be provided. The last remaining switch shall be a ground light switch. All switches, (other than the master switch), shall have switch function labeling and an amber integral indicator light.

**"LED" CAB INTERIOR LIGHTING**

Four (4) Akron 8080-8000-13 interior LED combination red/white dome lights shall be furnished in the cab, two (2) in the forward section and two (2) in the rear crew section. Each dome light shall have an integral selector switch. Each dome light shall also activate when the respective, adjacent cab door is opened.

**"DO NOT MOVE APPARATUS" WARNING LIGHT WITH AUDIBLE ALARM**

A 1" round, red flashing warning light with an integral audible alarm, shall be functionally located in the cab to signal when an unsafe condition is present such as an open cab door or body compartment door, an extended ladder rack, a deployed stabilizer, an extended light tower or any other device which is opened, extended or deployed which may cause damage to the apparatus if it is moved.

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

**12 VOLT ACCESSORY CIRCUIT - CAB DASH**

One (1) dedicated circuit; 12 volt, 40 Amp, power and ground on 3/8 stud and fused at battery shall be provided in the cab dash. The circuit shall be for future installation of radios or accessories.

**HEADLIGHTS CLUSTER**

Two (2) quad, halogen headlight modules with a bright finish bezel shall be furnished, one (1) each side, on the front of the cab. Each head light module shall incorporate an individual low beam and a high beam headlight. High beam actuation shall be controlled on the turn signal lever.

**DAYTIME RUNNING LIGHTS**

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

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

**SECONDARY DUAL LIGHT MODULE**

Two (2) Whelen 60A00TAR arrow shaped, amber LED turn signals shall be provided, one (1) in each side of the dual light module above the headlights.

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

**DOT CAB MARKER LIGHTS AND REFLECTORS**

Five (5) DOT approved Weldon (or equal) model # 9186-1500-20 Light Emitting Diode (LED) cab marker lamps shall mounted on the front of the vehicle. The two (2) outer front marker/clearance lights shall be mounted, one (1) on each side on top of the cab, three (3) identification lights shall be mounted, horizontally spaced between 6" and 12" apart facing forward, centered on the front of the platform. The lights shall be amber in color.

Due to the roof notch for the aerial device, the three (3) specified center marker lights shall be mounted to a brushed stainless steel offset bracket to position the lights just above the windshield.

Amber LED marker lights with integral reflectors shall be provided on the side of the cab adjacent to the driver's door, one (1) each side.

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

Truck-Lite # 60115Y yellow LED side marker and turn lights shall be provided on the apparatus lower side, forward of rear axle, one (1) each side if the apparatus is 30' long or longer.

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

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

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

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

**LED LICENSE PLATE LIGHT - REAR**

One (1) Tecniq model #L10 LED license plate light shall be provided above the mounting position of the license plate. The light shall be clear in color and shall have a chrome finish.

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

Two (2) Whelen 600 series, 4-1/8" x 6-1/2", LED red combination tail and stop lights, shall be mounted one each side at the rear of the body.

Two (2) Whelen 600 series, 4-1/8" x 6-1/2", LED amber arrow turn signal lights, shall be mounted one each side, on a vertical plane with the tail/stop lights.

Two (2) Whelen 600 series, 4-1/8" x 6-1/2", LED white back-up lights, shall be mounted one each side on a vertical plane with the turn/tail/stop signals. These lights shall activate when the transmission is placed in reverse gear.

Two (2) Whelen PLAST4V mounting flanges, installed one (1) on each side, shall be provided to mount the lights described above in one common mounting flange. The fourth opening shall be for the lower rear warning lights.

The lights shall be mounted in order, from top to bottom, as described above.

**CAB STEP LIGHTS**

Chrome plated Innovative Lighting, 3-LED surface mounted, chassis step lights shall be provided and controlled with marker light actuation. Step lights shall be located to properly illuminate all chassis access steps and walkway areas.

**BODY STEP LIGHTS**

Chrome plated Innovative Lighting, 3-LED surface mounted, body step lights shall be provided and controlled with marker light actuation. Step lights shall be located to properly illuminate all body access steps and walkway areas.

**DUNNAGE AREA LIGHTING**

Two (2) chrome plated Innovative Lighting, 3-LED surface mounted lights shall be provided in the dunnage area to provide adequate illumination of this area.

**HOSE BED LIGHTS**

Two (2) 6" Unity model AG chrome plated LED deck lights shall be mounted on each side of the hose bed. The light shall illuminate the hose bed area. Control switches shall be provided on the light heads.

**AERIAL ACCESS LADDER ILLUMINATION**

Two (2) Whelen LED lights, #3SC0CDCR, with chrome housings, # 3FLANGEC, provided for each aerial turntable access ladder.

The step lights shall be actuated when the aerial access ladder is deployed.

**GROUND LIGHTS - CAB**

One (1) ROM V4 12" LED ground light shall be provided under each side cab door entrance step, four (4) total. The lights shall be mounted in ROM standalone aluminum mounting track with mounting slots at each end. The ground lights shall turn on automatically with each respective door jamb switch and also by a master ground light switch in the warning light switch console.

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

**GROUND LIGHT SWITCHING**

The cab and body ground lights shall be equipped with an activation switch in the cab.

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

**12 VOLT BODY ELECTRICAL SYSTEM**

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

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

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

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

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

**BODY ELECTRICAL JUNCTION COMPARTMENT**

A weather resistant electric junction compartment shall be provided within the body or pump enclosure, depending on vehicle configuration. This compartment shall provide an easily accessible enclosure to house all of the body wiring junction points, terminal strips, solenoids, etc. The design of this compartment shall not decrease the storage capacity area of the compartment or area in which it is located. A removable panel shall be provided for access to this compartment.

**AERIAL ELECTRICAL JUNCTION COMPARTMENT**

An electric junction compartment shall be provided within the aerial body. This compartment shall provide an easily accessible enclosure to house all of the aerial device wiring junction points, terminal strips, solenoids, etc. All wiring for the aerial device including outrigger, diverter valve, and swivel circuits shall be in this compartment.

**PUMP ENCLOSURE WORK LIGHTS**

Two (2) Grote model #61171 LED lights shall be provided inside the pump enclosure providing a minimum of 20 candlepower illumination. Each light shall have their own independent switch incorporated into the light head.

**ENGINE COMPARTMENT WORK LIGHTS**

Two (2) Grote model #61171 LED lights shall be provided inside the engine enclosure that will provide a minimum of 20 candlepower illumination. Each light shall have their own independent switch incorporated into the light head.

**ROM TRACK MOUNTED COMPARTMENT LIGHTS - LED**

Each individual, equipment storage compartment shall be equipped with the ROM LED V4 lights on the forward and rear edge of each body door opening. The lights shall be mounted in an anodized aluminum track provided by ROM either as a stand alone unit or an integrated part of the roll up shutter door track. The lights shall be designed and manufactured to be water proof meeting the IPX7 industry standard and shall include a streamline optic lens and a fixed lumen output across 9-16vdc. Each LED module shall be of interlocking design and shall be able to be serviced/replaced without the removal of light assembly or shutter door.

**NFPA AUDIBLE AND LIGHTING WARNING PACKAGE**

The following warning light package shall include all of the minimum warning light and actuation requirements for the current revision of the NFPA 1901 Fire Apparatus Standard. The lighting as specified shall meet the requirements for both "Clearing Right of Way" and "Blocking Right of Way" which includes disabling all white warning lights when the apparatus is in "Blocking Right of Way" mode.

**LIGHT PACKAGE ACTUATION CONTROLS**

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

**WARNING LIGHT FLASH PATTERN**

All of the perimeter warning lights shall be set to an NFPA compliant flash pattern by the apparatus manufacturer.

**UPPER LEVEL LIGHTING - WHELEN**

**NFPA ZONE A, UPPER**

A pair of Whelen #FNMINI "Mini Edge Freedom", 24" LED cab roof warning light bars shall be furnished and rigidly mounted on top of the cab roof.

Each light bar shall be equipped with the following:

- Clear Lenses
- Two Corner Red Linear LED's
- One End Red Linear LED
- One White Front Linear LED.

If equipped, the forward facing white lights shall be automatically disabled for the "Blocking Right of Way" mode.

**NFPA ZONE C, UPPER**

Two (2) Whelen L31H*FN super LED beacon lights shall be mounted one (1) each side at the rear of the body.

Each light shall have red LED's and a colored lens.

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

The lighting requirement for this area is covered by the lights noted in Zone "C" - Upper.

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

The lighting requirement for this area is covered by the lights noted in Zone "A" - Upper.

**LOWER LEVEL LIGHTING - WHELEN**

**NFPA ZONE A, LOWER**

Two (2) Whelen 60*02F*R 600 super LED light heads shall be provided and installed one (1) each side.

Each light head shall be equipped with red LED's and a colored lens.

The lights shall be installed with a chrome plated mounting flange.

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

**NFPA ZONE C, LOWER**

Two (2) Whelen 60*02F*R 600 super LED light heads shall be provided and installed one (1) each side directly below the DOT stop, tail, turn and backup lights.

Each light head shall be equipped with red LED's and a colored lens.

The lights shall be installed with a chrome plated mounting flange.

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

Two (2) Whelen 60*02F*R 600 super LED light heads shall be provided and installed one (1) each side.

Each light head shall be equipped with red LED's and a colored lens.

The lights shall be installed with a chrome plated mounting flange.

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

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

Two (2) Whelen 60*02F*R 600 super LED light heads shall be provided and installed one (1) each side.

Each light head shall be equipped with red LED's and a colored lens.

The lights shall be installed with a chrome plated mounting flange.

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

Two (2) Whelen 60*02F*R 600 super LED light heads shall be provided and installed one (1) each side.

Each light head shall be equipped with red LED's and a colored lens.

The lights shall be installed with a chrome plated mounting flange.

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

Two (2) Whelen 60*02F*R 600 super LED light heads shall be provided and installed one (1) each side.

Each light head shall be equipped with red LED's and a colored lens.

The lights shall be installed with a chrome plated mounting flange.

**WARNING LIGHT SYSTEM CERTIFICATION**

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

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

******* AUDIBLE WARNING EQUIPMENT *******

**ELECTRIC HORN**

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

**BACK-UP ALARM**

An ECCO # 505, 87dBA back-up alarm, shall be provided and installed at the rear of the apparatus under the tailboard. The back-up alarm shall activate automatically when the transmission is placed in reverse gear and the ignition is "on".

**AIR HORNS**

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

Both air horns shall be recessed in the front bumper.

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

**ELECTRONIC SIREN**

One (1) Whelen #295SLSA1, 200 watt electronic siren shall be provided featuring: bottom mount control head in cab, "Si-Test" self diagnostic feature, six (6) function siren, radio repeat and public address.

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

Two (2) Whelen, model # SA122FMP polished aluminum siren speakers shall be provided, recessed in the front bumper and wired to the electronic siren.

**FEDERAL Q2B MECHANICAL SIREN**

One (1) Federal Model #Q2B mechanical siren shall be provided to provide audible warning.

The Q2B siren shall be pedestal mounted on top of the extended bumper on the driver's side. The siren shall be equipped with a Federal model #P, chrome housing and pedestal.

Two (2) floor mounted foot switches shall be provided, one (1) for the officer and one (1) for the driver. A siren brake button shall be provided near the driver's position.

**FIRECOM MODEL #5100D DIGITAL INTERCOM SYSTEM**

A Firecom model # 5100D digital intercom system shall be provided in the front of the cab. The system shall be capable of interfacing with a two-way radio system (note: an authorized two-way radio installer shall be responsible for interfacing the intercom system with the two-way radio).

The 5100D master station shall have the following features:

- Single radio monitor and transmit selector switch
- Touch-pad adjustable volume and squelch
- Advanced digital signal processing noise-reduction
- Single auxiliary input/output connection
- Nominal 12v power supply
- Six (6) jacks for wireless base stations and/or wired headset connections; expandable up to twelve (12) daisy-chained wired headsets

The intercom system shall include:

**DRIVERS AND OFFICERS HEADSETS & BASE STATION FOR WIRELESS FIRECOM SYSTEM**

Two (2) UHW-51 wireless under helmet radio transmit headsets, each with their own paired base station, shall be furnished for the driver and officer seating locations in the cab. The headsets shall have adjustable volume, noise-canceling electric microphone, adjustable head strap, a flex-style boom which rotates for left or right dress and a charging port to connect the 12 volt charger when the headset is not in use. The sets shall also have comfortable ComLeather ear seals.

Two (2) wireless, single user, base stations shall be connected via a 6 conductor flat RJ-6 cable to any headset port on the Firecom 5100D series intercom. The base station will provide full duplex audio communication between the wireless headset and the intercom as well as PTT communication through the apparatus mobile radio.

Two (2) yellow, NFPA compliant, rubber coated steel headset hanger hooks shall be furnished in the front section of the cab to hold the driver and offer intercom headsets while not in use.

**FIRECOM REMOTE HEAD**

A 5100DRH remote head shall be surface mounted in the cab as directed by the fire department. The remote head shall have the same controls as the master base station.

**RADIO INTERFACE CABLE**

One (1) radio interface cable, model # 110-5101-30 and one (1) extension cable model # 108-0086-00 shall be provided and installed from the firecom base unit to the area of where the mobile radio base station shall be mounted. The end of the cable that connects to the mobile radio shall be un-terminated and shall be the responsibility of the radio installer to provide and install the correct adapter to connect the cable to the mobile radio.

**REAR JUMPSEAT HEADSETS**

Two (2) UHW-52 wireless under helmet intercom headsets shall be furnished for two (2) rear jump seat locations. The intercom headsets shall have adjustable volume, noise-canceling electric microphone, adjustable head strap, a flex-style boom which rotates for left or right dress and a charging port to connect the 12 volt charger when the headset is not in use. The sets shall also have comfortable ComLeather ear seals.

**WIRELESS BASE STATION**

One (1) wireless, multiple user, base station shall be provided and connected via a 6 conductor flat RJ-6 cable to any headset port on the main Firecom base station. The wireless base station shall provide full duplex audio communication between the wireless headset and the intercom.

Two (2) yellow, NFPA compliant, rubber coated steel headset hanger hooks shall be furnished to hold the intercom headsets while not in use.

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

**PUMP**

- **WATEROUS CSU-C20**
- **2000 G.P.M.**
- **SINGLE-STAGE**

The pump shall be of single-stage construction and shall comply with all applicable requirements of the latest standards for automotive fire apparatus of the National Fire Protection Association, NFPA-1901 and shall have a rated capacity of 2000 gpm.

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

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

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

**PUMP CONSTRUCTION**

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

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

**IMPELLER SHAFT**

The Impeller shaft shall be heat-treated stainless steel, ground at all critical areas, and polished under the packing. An exclusive two-piece impeller shaft shall allow separation of the transmission from the pump without disassembling either component. This simplifies repair procedures, resulting in less down time.

**PUMP IMPELLER**

The impeller shall be bronze, accurately balanced (mechanically and hydraulically), of mixed flow design with reverse flow labyrinth-type wear rings that resist water bypass and loss of efficiency due to wear. The impeller shall have flame plated hubs to assure maximum pump life and efficiency despite the presence of abrasive particles, such as fine sand, in the water being pumped.

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

**BEARINGS**

Three deep-groove, anti-friction ball bearings shall be located outside the pumping chamber, which shall give support and proper alignment to the impeller shaft assembly. The bearings shall be oil or grease lubricated, completely separated from the water being pumped, and shall be protected by seal housings, flinger rings and oil seals.

**MECHANICAL PUMP SEALS**

Stuffing boxes shall be integral with the pump body and be equipped with self-adjusting, maintenance free mechanical shaft seals.

**PUMP TRANSMISSION**

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

**PUMP RATIO**

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

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

**PUMP SHIFT**

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

**PUMP SHIFT INDICATORS LIGHT**

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

**TRANSMISSION LOCK**

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

**BRAKING SYSTEM**

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

**MAIN PUMP MOUNTS**

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

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

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

**CLASS ONE "CAPTAIN" PRESSURE GOVERNOR**

A Class 1 "Captain" engine/pump governor/throttle system that is connected directly to the Electronic Control Module (ECM) mounted on the engine shall be provided on the pump operator's panel. The "Captain" is to operate as a pressure sensor (regulating) governor (PSG) eliminating any need for a relief valve on the discharge side of the pump.

A special preset feature shall permit a predetermined pressure or RPM to be set. The preset pressure or RPM shall be displayed on the message display of the "Captain". The preset shall be easily adjustable by the operator.

When operating in "pressure" mode, the PSG system shall automatically maintain the discharge pressure set by the operator, regardless of flow. The pressure shall remain with the engine's and pump's operating capabilities.

When operating in "rpm" mode, the PSG system shall automatically maintain the set engine speed, regardless of engine load. The rpm shall remain with the engine's operating capabilities.

**INTAKE RELIEF VALVE**

An Task Force Tips A1860 Series relief valve shall be provided. The valve shall be adjustable from 50 to 200 psi (3 to 14 bar) with easy to see 25 psi (2 bar) increments. The aluminum casting shall be hardcoat anodized, and powder coat finished inside and out for maximum corrosion protection.

**PUMP CERTIFICATION**

The pump shall be third party performance tested to meet the requirements of NFPA-1901. To ensure top quality and integrity, the test company shall be Underwriters Laboratories (UL).

**PRIMING PUMP**

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

This priming system shall be capable of priming at up to four(4) locations.

**MASTER DRAIN VALVE**

A rotary type, 12 port master drain valve shall be provided and controlled at the lower portion of the side pump panel. The valve shall be located in pump compartment lower than the main body and connected in such a manner as to allow complete water drainage of the pump body and all required accessories. Water shall be drained below the apparatus body and away from the pump operator.

**MASTER DRAIN**

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

**INDIVIDUAL BLEEDERS AND DRAINS**

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

One (1) individual "Innovative Control" lift up drain valve shall be furnished for each 1-1/2" or larger discharge port and each 2-1/2" gated auxiliary suction.

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

All drains and bleeders shall discharge below the running boards.

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

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

**PUMP MODULE**

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

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

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

**SUCTION INLETS**

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

**MONARCH INTAKE BUTTERFLY VALVE - ELECTRICALLY OPERATED - DRIVER SIDE**

The fire pump shall be fitted with a Waterous "Monarch" valve, on the driver side main suction inlet. The valve shall be mounted between the suction tube extension and the suction tube, and shall be recessed behind the operator's panel. The valve body and all related components that are in contact with water shall be manufactured of fine grained, corrosion resistant bronze. The valve shall incorporate a pressure relief valve, set at the pump manufacturer's facility to a rating of 125 PSI. The pressure relief valve shall provide protection for the suction hose even with the valve in the closed position. The valve shall incorporate a NFPA compliant, large diameter hose air bleed valve, controlled at the operator's panel.

The valve shall be electrically operated by a toggle switch control, mounted near the suction inlet. The electric control shall incorporate a placard with status lights to indicate whether the valve is in the closed, open or throttled position. The valve shall not be able to move from fully open to fully closed in under three (3) seconds, in compliance with NFPA-1901.

**MONARCH INTAKE BUTTERFLY VALVE - ELECTRICALLY OPERATED - OFFICER SIDE**

The fire pump shall be fitted with a Waterous "Monarch" valve, on the officer side main suction inlet. The valve shall be mounted between the suction tube extension and the suction tube, and shall be recessed behind the operator's panel. The valve body and all related components that are in contact with water shall be manufactured of fine grained, corrosion resistant bronze. The valve shall incorporate a pressure relief valve, set at the pump manufacturer's facility to a rating of 125 PSI. The pressure relief valve shall provide protection for the suction hose even with the valve in the closed position. The valve shall incorporate a NFPA compliant, large diameter hose air bleed valve, controlled at the operator's panel.

The valve shall be electrically operated by a toggle switch control, mounted near the suction inlet. The electric control shall incorporate a placard with status lights to indicate whether the valve is in the closed, open or throttled position. The valve shall not be able to move from fully open to fully closed in under three (3) seconds, in compliance with NFPA-1901.

**PUMP SUCTION ENDS**

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

A 6" NST chrome plated long handle pressure vented cap shall be installed on each main inlet of the pump.

One (1) 6" NSTF x 5" Storz Kochek SKE-R 30° degree adapter and cap shall be provided for the driver side main suction inlet.

One (1) 6" NSTF x 5" Storz Kochek SKE-R 30° degree adapter and cap shall be provided for the officer side main suction inlet.

**AUXILIARY SIDE SUCTION(S)**

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

An EB25, 2 1/2" Elkhart Unibody valve, shall be provided for the driver side rear auxiliary suction.

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

All side gated inlet valves shall be recess mounted behind the side pump panels or body panels.

**TANK TO PUMP**

One (1) 4" tank to pump line shall be piped into the tank sump. This line shall be plumbed directly into the rear of the pump suction manifold for maximum efficiency.

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

An EB30, 3" Elkhart Unibody valve, shall be provided between the pump suction manifold and the water tank.

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

**TANK FILL**

One (1) 2" gated full flow pump to tank refill line controlled at the pump panel shall be provided. A deflector shield inside the tank shall be furnished. Tank fill plumbing shall utilize 2" high pressure hose for tank connection to accommodate flexing between components.

An EB20, 2" Elkhart Unibody valve, shall be provided between the pump discharge manifold and the water tank.

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

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

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

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

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

An EB25, 2 1/2" Elkhart Unibody valve, shall be provided for the driver's side # 1 discharge.

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

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

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

The driver's side # 1 discharge shall be equipped with a Thuemling 2 ½" diameter "BC" series pressure gauge with pulse and vibration dampening interlube to lubricate the internal mechanisms to prevent lens condensation and to ensure proper operation to minus 40 degrees F.

To prevent internal freezing and to keep contaminants from entering the gauge, the stem and Bourdon tube shall be filled with low temperature oil and be sealed from the water system using an isolating diaphragm located in the stem (no exceptions).

The cast brass cases shall be temperature compensated with a small bubble and have a rigid lens with distortion free viewing area. Gauges shall have white faces with black lettering and shall include an orange tip pointer for easy readability.

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

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

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

An EB25, 2 1/2" Elkhart Unibody valve, shall be provided for the driver's side # 2 discharge.

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

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

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

The driver's side # 2 discharge shall be equipped with a Thuemling 2 ½" diameter "BC" series pressure gauge with pulse and vibration dampening interlube to lubricate the internal mechanisms to prevent lens condensation and to ensure proper operation to minus 40 degrees F.

To prevent internal freezing and to keep contaminants from entering the gauge, the stem and Bourdon tube shall be filled with low temperature oil and be sealed from the water system using an isolating diaphragm located in the stem (no exceptions).

The cast brass cases shall be temperature compensated with a small bubble and have a rigid lens with distortion free viewing area. Gauges shall have white faces with black lettering and shall include an orange tip pointer for easy readability.

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

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

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

An EB30, 3" Elkhart Unibody valve, shall be provided for the officer's side # 1 discharge.

The discharge valve shall be equipped with a straight 3" NST adapter.

The officer's side # 1 discharge cap provided as standard equipment shall be deleted.

A 3" NSTF X 5" Storz Kochek SKE-R 30° adapter with cap shall be provided on the officer's side # 1 discharge.

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

The officer's side # 1 discharge shall be equipped with a Thuemling 2 ½" diameter "BC" series pressure gauge with pulse and vibration dampening interlube to lubricate the internal mechanisms to prevent lens condensation and to ensure proper operation to minus 40 degrees F.

To prevent internal freezing and to keep contaminants from entering the gauge, the stem and Bourdon tube shall be filled with low temperature oil and be sealed from the water system using an isolating diaphragm located in the stem (no exceptions).

The cast brass cases shall be temperature compensated with a small bubble and have a rigid lens with distortion free viewing area. Gauges shall have white faces with black lettering and shall include an orange tip pointer for easy readability.

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

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

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

An EB25, 2 1/2" Elkhart Unibody valve, shall be provided for the officer's side #2 discharge.

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

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

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

The officer's side #2 discharge shall be equipped with a Thuemling 2 ½" diameter "BC" series pressure gauge with pulse and vibration dampening interlube to lubricate the internal mechanisms to prevent lens condensation and to ensure proper operation to minus 40 degrees F.

To prevent internal freezing and to keep contaminants from entering the gauge, the stem and Bourdon tube shall be filled with low temperature oil and be sealed from the water system using an isolating diaphragm located in the stem (no exceptions).

The cast brass cases shall be temperature compensated with a small bubble and have a rigid lens with distortion free viewing area. Gauges shall have white faces with black lettering and shall include an orange tip pointer for easy readability.

**FRONT DISCHARGE**

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

The front #1 discharge shall terminate with a chrome 1 1/2" NST chicksan swivel adapter in a location on the front bumper as directed by engineering.

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

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

An EB20, 2" Elkhart Unibody valve, shall be provided for the front #1 discharge.

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

The front #1 discharge cap provided as standard equipment shall be deleted.

The front #1 discharge shall be equipped with a Thuemling 2 ½" diameter "BC" series pressure gauge with pulse and vibration dampening interlube to lubricate the internal mechanisms to prevent lens condensation and to ensure proper operation to minus 40 degrees F.

To prevent internal freezing and to keep contaminants from entering the gauge, the stem and Bourdon tube shall be filled with low temperature oil and be sealed from the water system using an isolating diaphragm located in the stem (no exceptions).

The cast brass cases shall be temperature compensated with a small bubble and have a rigid lens with distortion free viewing area. Gauge shall have white face with black lettering and shall include an orange tip pointer for easy readability.

**HORIZONTAL CROSSLAY #1**

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

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

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

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

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

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

An EB20, 2" Elkhart Unibody valve, shall be provided for the crosslay #1 discharge.

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

The crosslay #1 discharge shall be equipped with a Thuemling 2 ½" diameter "BC" series pressure gauge with pulse and vibration dampening interlube to lubricate the internal mechanisms to prevent lens condensation and to ensure proper operation to minus 40 degrees F.

To prevent internal freezing and to keep contaminants from entering the gauge, the stem and Bourdon tube shall be filled with low temperature oil and be sealed from the water system using an isolating diaphragm located in the stem (no exceptions).

The cast brass cases shall be temperature compensated with a small bubble and have a rigid lens with distortion free viewing area. Gauges shall have white faces with black lettering and shall include an orange tip pointer for easy readability.

**HORIZONTAL CROSSLAY #2**

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

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

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

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

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

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

An EB20, 2" Elkhart Unibody valve, shall be provided for the crosslay #2 discharge.

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

The crosslay #2 discharge shall be equipped with a Thuemling 2 ½" diameter "BC" series pressure gauge with pulse and vibration dampening interlube to lubricate the internal mechanisms to prevent lens condensation and to ensure proper operation to minus 40 degrees F.

To prevent internal freezing and to keep contaminants from entering the gauge, the stem and Bourdon tube shall be filled with low temperature oil and be sealed from the water system using an isolating diaphragm located in the stem (no exceptions).

The cast brass cases shall be temperature compensated with a small bubble and have a rigid lens with distortion free viewing area. Gauge shall have white face with black lettering and shall include an orange tip pointer for easy readability.

**HORIZONTAL CROSSLAY #3**

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

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

Crosslay #3 hosebed shall be designed to accommodate the fire hose in a single stack configuration.

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

The crosslay #3 discharge shall be plumbed utilizing 2 1/2" schedule 10 stainless steel piping and/or flexible hose, 45 degree elbows and a limited number of 90 degree sweep elbows in an assembly from the pump to crosslay hosebed.

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

An EB25, 2 1/2" Elkhart Unibody valve, shall be provided for the crosslay #3 discharge.

The crosslay #3 discharge valve shall be controlled by a push/pull handle located on the operator's panel.

The crosslay #3 discharge shall be equipped with a Thuemling 2 ½" diameter "BC" series pressure gauge with pulse and vibration dampening interlube to lubricate the internal mechanisms to prevent lens condensation and to ensure proper operation to minus 40 degrees F.

To prevent internal freezing and to keep contaminants from entering the gauge, the stem and Bourdon tube shall be filled with low temperature oil and be sealed from the water system using an isolating diaphragm located in the stem (no exceptions).

The cast brass cases shall be temperature compensated with a small bubble and have a rigid lens with distortion free viewing area. Gauge shall have white face with black lettering and shall include an orange tip pointer for easy readability.

**PUMP ENCLOSURE HOSEBED HOSE RETENTION**

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

The crosslay cover shall be red in color.

## AERIAL WATERWAY DISCHARGE

The 4" aerial waterway discharge shall be gated at the pump by a full flow ball valve.

The piping from the pump to the rear of the vehicle shall be 5" minimum schedule 10 stainless steel pipe. The pipe shall connect to the turntable waterway swivel and shall also extend through the rear panel of the vehicle and terminate in (NST) thread with a long handle chrome plated cap at the rear of the body. This connection shall serve as the rear waterway inlet. The piping shall be a minimum of heavy duty, schedule 10 piping which shall incorporate a minimum of two (2) grooved pipe clamps for easy removal.

An EB40, 4" Elkhart Unibody valve, shall be provided for the waterway discharge.

The waterway discharge shall be gated with an Elkhart Hand wheel controlled, inline valve. The valve shall be controlled at the pump operator's panel with a chrome plated hand wheel with a built in valve position indicator.

## CLASS ONE FLOWMINDER

The waterway discharge shall be equipped with a Class One model "FVS" Flowminder "Value System" which shall give the operator or engineer an indication of actual volume of water (in gallons) being discharged through the specified line. The Value System shall also incorporate a 2-1/2" analog pressure gauge in a Class One bezel, color coded to coincide with the specified discharge(s).

The display case shall be constructed on non-glare black anodized aluminum, with bright red LED digits, acrylic lens and totalizer feature. The totalizer has the ability to store and display the total gallons of water pumped through the discharge line since the last reset. The totalizer function shall automatically reset to zero anytime the vehicle's electrical system is shut down.

A flow sensor paddle wheel shall be installed on the discharge piping with a machined housing or clamp.

A set of connecting cables to connect the digital display to transmitter unit and to the apparatus power. Cable connections are to be waterproof, screw type with gold plated pins.

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

**FOAM PIPING - 1 INCH**

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

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

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

**FOAMPRO FOAM INJECTION SYSTEM**

A FoamPro model 2001, electronic, fully automatic, variable speed, direct injection, discharge side foam proportioning system shall be installed in the pumping system. The system shall be capable of handling Class "A" foam concentrates and most Class "B" foam concentrates. The foam proportioning operation shall be based on direct measurement of water flows, and remain consistent within the specified flows and pressures. System must be capable of delivering accuracy to within 3% of calibrated settings over the advertised operation range when installed according to factory standards. The system shall be equipped with a digital electronic control display suitable for installation on the pump panel. Incorporated within the control display shall be a microprocessor that receives input from the system flowmeter, while also monitoring foam concentrate pump output, comparing values to ensure that the operator preset proportional amount of foam concentrate is injected into the discharge side of the fire pump.

A paddlewheel-type flowmeter shall be installed in the discharge or manifold system specified to be "foam capable".

A Full flow check valve shall be provided to prevent foam contamination of fire pump and water tank or water contamination of foam tank.

A 12 or 24-volt electric motor drive positive displacement foam concentrate pump, rated up to 2.5 GPM (9.5 L/min) @ 150 psi with operating pressures up to 400 psi (27.6 BAR), shall be installed in a suitable, accessible location. The system shall draw a maximum of 40 amps @ 12 VDC or 21 amps @ 24 VDC. A pump motor electronic driver (mounted to the base of the pump) shall receive signals from the computer control display and power the 1/2 hp (0.40 Kw) electric motor directly coupled to the concentrate pump in a variable speed duty cycle to ensure that the correct proportion of concentrate preset by the pump operator is injected into the water stream.

The digital computer control display located on the pump operator's panel shall enable the pump operator to perform the following control and operation functions for the foam proportioning system:

- Provide push-button control of foam proportioning rates from 0.1% to 9.9%, in 0.1% increments
- Show current flow-per-minute of water
- Show total volume of water discharged during and after foam operations are completed
- Show total amount of foam concentrate consumed
- Simulate flow rates for manual operation
- Perform setup and diagnostic functions for the computer control microprocessor
- Flash a "low concentrate" warning when the foam concentrate tank(s) runs low
- Flash a "no concentrate" warning and shut the foam concentrate pump off, preventing damage to the pump, should the foam tank(s) empty

The digital computer control display shall interface with the options listed; provide dual foam calibration, and display separate totals for each foam concentrate used. If two foam tanks are required and piped to the foam concentrate pump, either an electric dual tank valve or the manual dual tank valve shall be provided.

Components of the complete proportioning system shall include:

- Operator control and display
- Paddlewheel flowmeter
- Pump and electric motor/motor driver
- Wiring harnesses
- Low-level tank switch (Switches)
- Electronic dual tank valve or manual dual tank valve (if more than one tank)
- Foam injection check valve
- Main waterway check valve

Accurate concentration proportioning can be achieved, based on the following water flows:

- 85 GPM water 3.0% concentration
- 260 GPM water 1.0%
- 520 GPM water 0.5%
- 1300 GPM water 0.2% concentration

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

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

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

Crosslay #1 discharge.
Crosslay #2 discharge.
Crosslay #3 discharge.
Front discharge.

The foam proportioning system shall be supplied from the foam concentrate storage tank/s. The tank/s shall be constructed of materials compatible with foam concentrates being used in the system. Tank capacity, venting, fill opening and foam outlet plumbing connections shall be in accordance with NFPA requirements. Foam tank lid shall be sealed and latched in accordance with NFPA standards. If required a provision shall be made for installation of low tank level sensors and routing of the wiring for the sensors.

**FOAM CONCENTRATE**

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

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

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

**PUMP PANEL - SIDE MOUNT**

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

**PUMP PANEL MATERIAL**

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

**HINGED GAUGE PANEL**

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

**VERTICALLY HINGED, SPLIT PUMP PANEL OFFICER SIDE**

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

**PANEL FASTENERS**

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

**CAPS AND ADAPTERS SAFETY TETHER**

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

**PUMP PANEL TRIM PLATES**

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

**DISCHARGE GAUGE TRIM BEZELS**

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

**COLOR CODED IDENTIFICATION TAGS**

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

**PUMP OPERATOR'S PANEL LIGHT SHIELD**

The pump operator's panel shall be equipped with a light shield that shall be full width of the control panel, and shall be positioned to cover the lights and prevent glare.

The light shield shall be equipped with the following lights:

- Two (2) 20" Amdor Luma Bar H2O super bright led strip lights.

One (1) light under the operator's panel light shield shall be actuated when fire pump is engaged in addition to the pump engaged light.

**OFFICER SIDE PANEL LIGHTING**

The officer's side pump panel and running board shall be illuminated by the following lights:

- Four (4) TecNiq Eon, 3-LED illumination lights mounted in horizontal stainless steel bezels and mounting gaskets.

The lights shall be switched with the main pump panel lights.

**PUMP OPERATOR'S PANEL**

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

- Hinged gauge panel
- Water tank fill valve
- Auxiliary suction valve control
- All discharge valve controls
- Auxiliary engine cooler controls
- Water tank suction control valve
- Pump primer valve
- Engine throttle control
- Master compound vacuum gauge
- Master pressure gauge
- Individual discharge gauges
- Pump shift engaged indicator light
- Water tank water level indicator
- Engine tachometer
- Engine oil pressure gauge with audible alarm
- Engine water temperature gauge with audible alarm
- Low voltage light and audible alarm
- Pump panel light switch
- Speed counter (Underwriters)
- Pump performance plate (Underwriters)
- Pump serial No. plate
- Master pump drain valve
- Individual drains
- Voltmeter
- Fuel Gauge
- Air inlet/outlet at lower driver side panel
- Aerial Communication System.

- Class One "Captain" pressure governor control

**PUMP TEST PORTS**

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

**MASTER PUMP GAUGES**

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

**PRESSURE & COMPOUND GAUGE RANGES**

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

**CLASS 1 ENFO IV ENGINE STATUS SYSTEM**

A Class 1 "ENFO IV" display head shall be provided for the SAE J1939 engine, to display the engine oil pressure, engine water temperature, engine RPM and chassis volt meter functions. The display head shall include the required NFPA warning lights and alarms.

**ENGINE COOLER**

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

**TANK LEVEL GAUGE**

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

The gauge shall use a pressure transducer #3030376-01 installed near the bottom of the water tank to determine the correct volume in the tank.

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

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

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

**OPERATOR'S PLATFORM**

A slide-out platform shall be located below the driver's side running board step. The platform shall be constructed from 2" aluminum tubing with Grip-Strut material inserts the step shall have a minimum weight rating of 500 pounds. Deployment of this platform shall be connected to the DO NOT MOVE TRUCK warning circuit. The step shall slide on stainless steel pins fitted in a machined frame which shall mount to the pump house frame. Drawer slides are not acceptable.

******** WATER TANK *********

**WATER TANK CAPACITY**

The water tank shall have a capacity of 300 gallons, constructed from UPF PolyIIE.

**FOAM TANK "A"**

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

**WATER TANK WARRANTY**

The UPF Poly IIE water tank shall be furnished with a lifetime warranty upon delivery.

**WATER TANK CONSTRUCTION**

The Poly water tank shall be constructed of PT3 polypropylene material. This material shall be a non-corrosive stress relieved thermoplastic and UV stabilized for maximum protection. Tank shell thickness may vary depending on the application and may range from 1/2 to 1" as required. Internal baffles are generally 3/8" in thickness.

The tank shall be of a specific configuration and is so designed to be completely independent of the body and compartments. Joints and seams shall be fused using nitrogen gas as required and tested for maximum strength and integrity. The tank construction shall include PolyProSeal technology wherein a sealant shall be installed between the plastic components prior to being fusion welded. This sealing method will provide a liquid barrier offering leak protection in the event of a weld compromise. The top of the booster tank is fitted with removable lifting assembly designed to facilitate tank removal. The transverse and longitudinal swash partitions shall be manufactured of a minimum of 3/8" PT3 polypropylene. All partitions shall be equipped with vent and air holes to permit movement of air and water between compartments. The partitions shall be designed to provide maximum water flow. All swash partitions interlock with one another and are completely fused to each other as well as to the walls of the tank. All partitions and spacing shall comply with NFPA 1901. The walls shall be welded to the floor of the tank providing maximum strength as part of the tank's unique Full Floor Design. Tolerances in design allow for a maximum variation of 1/8" on all dimensions.

**WATER TANK TANK LID**

The tank cover shall be constructed of 1/2" thick PT3 polypropylene and UV stabilized, to incorporate a multi-piece locking design, which allows for individual removal and inspection if necessary. The tank cover(s) shall be flush or recessed 3/8" from the top of the tank and shall be fused to the tank walls and longitudinal partitions for maximum integrity. Each one of the covers shall have hold downs consisting of 2" minimum polypropylene dowels spaced a maximum of 40" apart. These dowels shall extend through the covers and will assist in keeping the covers rigid under fast filling conditions. A minimum of two lifting dowers shall accommodate the necessary lifting hardware.

**WATER TANK FILL TOWER**

The tank shall have a combination vent and manual fill tower. The fill tower shall be constructed of 1/2" PT3 polypropylene and shall be a minimum dimension of 8" x 8" outer perimeter. The fill tower shall be blue in color indicating that it is a water-only fill tower. The tower shall be located in the left front corner of the tank unless otherwise specified by the tank manufacturer to the purchaser. The tower shall have a 1/4" thick removable polypropylene screen and a PT3 polypropylene hinged cover. The capacity of the tank shall be engraved on the top of the fill tower lid. Inside the fill tower there shall be a combination vent/overflow pipe. The vent overflow shall be a minimum of schedule 40 polypropylene pipe with a minimum I.D. of that is designed to run through the tank, and shall be piped to discharge water behind the rear wheels as required in NFPA 1901 so as to not interfere with rear tire traction.

**WATER TANK OVERFLOW AND VENT PIPE**

The fill tower shall be fitted with an integral 4" I.D. schedule 40 P.V.C. combination overflow/vent pipe running from the fill tower through the tank to the exterior to allow water to overflow below the aerial body.

**WATER TANK SUMP AND CONNECTIONS**

There shall be one (1) sump standard per tank. The sump is a minimum of 8" wide, 8" long with a 3/4" bottom, unless specified otherwise in special provisions. The sump shall have a threaded plug located at the bottom for a tank drain. An anti-swirl plate shall be mounted inside the sump approximately 1" off the floor of the sump.

**WATER TANK OUTLETS**

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

**WATER TANK CAPACITY CERTIFICATION**

All tanks shall be tested and certified as to capacity on a calibrated and certified tilting scale. Each tank shall be weighed empty and full to provide precise fluid capacity. Each Poly-Tank's III is delivered with a Certificate of Capacity delineating the weight empty and full and the resultant capacity based on weight.

**WATER TANKNOLOGY TAG**

A tag shall be installed on the apparatus in a convenient location and contain pertinent information including a QR code readable by commercially available smart phones. The information contained on the tag shall include the capacity of the water and foam (s), the maximum fill and pressure rates, the serial number of the tank, the date of manufacture, the tank manufacturer, and contact information. The QR code will allow the user to connect with the tank manufacturer for additional information and assistance.

**WATER TANK MOUNTING**

The tank shall be mounted within the body per NFPA and the manufacturers requirements. The tank mounting surface shall be insulated with a minimum of 3/8" nylon webbing or 1/2" rubber, 2-1/2" wide. The tank shall sit cradle-mounted using four (4) corner angles of 6 x 6 x 4 x 0.250 welded directly to the tank mounting surface. The angles shall keep the tank from shifting left to right or front to rear. The tank is designed on the free-floating suspension principle and shall not require the use of hold downs. The tank shall be completely removable without disturbing or dismantling the apparatus body structure. A tread plate enclosure on top of the tank the shall secure the tank in the mounts.

******* BODY AND COMPARTMENT SPECIFICATIONS *******

**GENERAL BODY DESCRIPTION**

It is the intention of the fire department to purchase a completely modular body consisting of independent body modules or subassemblies bolted to an independent heavy duty support framework. The following body portions of these specifications outline the minimum standards of construction required by the fire department to meet this need. Bidders shall supply satisfactory evidence of their ability to build such a unit, including proof of the necessary tooling and fixtures required to produce parts in quantity to exacting tolerances and evidence of a comprehensive body parts stocking program.

To ensure the customer of soul source manufacturing, the body must be built by the same manufacturer of the entire chassis and aerial device.

**COMPARTMENT FABRICATION 1/8" ALUMINUM**

All compartment panels and body side sheets shall be entirely 1/8" aluminum 5052-H32 alloy. Each side compartment assembly shall be both plug welded and stitch welded to ensure proper weld penetration on all panels while avoiding the distortion caused by a full seam weld. The side compartments shall be welded on a fixture to ensure true door and body dimensions. All compartments shall be of a modular design with sweep-out style floors.

The bottoms of each running board compartment shall be adequately braced to provide maximum loading without undue deflection. All seams shall be caulked prior to finish paint to ensure proper compartment seal.

Due to the ladder storage area and sweep out floors, the running board compartments of this style vehicle are of a split height, split depth, full width configuration. The referenced compartment sizes approximate the extreme outside compartment dimensions without deductions for the floor material thicknesses, flanges or ladder storage compartment headers. To assure proper vehicle weight distribution, the compartment dimensions may change in width with the final body shift and wheelbase.

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

Special attention shall be taken to minimize corrosion on all fabricated parts and structural members of the body. All bolt-on components shall be provided with a dissimilar metals isolation barrier to prevent electric corrosion.

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

## QUADRANT BODY SUPPORT SYSTEM

Due to the severe loading requirements of this aerial, a "quadrant" method of compartment body support suitable for the intended load will be provided. The structural component of the support system shall be the chassis frame rail, which is the strongest component of the chassis and is designed for supporting imposed loads.

A support system shall be used which will incorporate quadrant, under body support structures. This proven viability in vehicular applications, be of a failsafe design, and allow for all necessary movement in three (3) transitional and rotational modes. This shall result in a 500 pound equipment rating for each compartment of the body.

The compartments in front of the rear axle shall include a minimum of 3.00" steel support assemblies which are bolted to the chassis frame rails. A steel framework shall be mounted to the body above these support assemblies connected to the support assemblies with isolators. There shall be one support assembly mounted to each chassis frame rail.

The compartmentation behind the rear axle shall include a minimum of 3.00" steel support assemblies which are bolted to the chassis frame rails and extend underneath to the outside edge of the body. The support assembly shall be coated and a barrier tape installed to isolate the dissimilar metals before it is bolted to the body. There shall be one support assembly mounted to each chassis frame rail.

The body and support structure shall be created utilizing 3D modeling and be fully tested. Proven engineering and test techniques such as finite element analysis, model analysis, stress coating and strain gauging have been performed with special attention given to fatigue life and structural integrity of the compartment body and substructure.

The body compartments are an integral assembly with the rear fenders. Fully enclosed rear wheel housings will be provided to prevent rust pockets and for ease of maintenance.

## COATED FASTENERS - (NO EXCEPTIONS)

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

**NOTE: The use of aluminum pop rivets or self tapping screws as a trim fastener shall not be acceptable.**

**DRIVER SIDE COMPARTMENTATION**

One (1) compartment will be provided above the front outrigger measuring 29" Wide x 27-5/8" High x 14" Deep with a hinged door opening of 22-3/8" Wide x 23-3/16" High.

One (1) compartment behind the front outrigger will be provided measuring 42-3/4" Wide x 72-1/8" High x 26-13/16" Deep with a roll up door opening of 42-3/4" Wide x 68-3/8" High.

One (1) compartment above the rear wheels will be provided measuring 98-1/2" Wide x 41-7/16" High x 26-13/16" Deep with two (2) roll up door openings of 45-3/8" Wide x 37-7/8" High.

One (1) compartment below the aerial turntable will be provided measuring 18-7/8" Wide x 50-7/16" High x 14" Deep, with a hinged door opening of 13-1/4" Wide x 31" High.

One (1) compartment forward of the rear outrigger will be provided measuring 45" Wide x 66-3/16" High x 23" Deep, with a roll up door opening of 45" Wide x 62-7/16" High.

**OFFICER SIDE COMPARTMENTATION**

One (1) compartment will be provided above the front outrigger measuring 29" Wide x 27-5/8" High x 23" Deep with a hinged door opening of 22-3/8" Wide x 23-3/16" High.

One (1) compartment behind the front outrigger will be provided measuring 42-3/4" Wide x 72-1/8" High x 26-13/16" Deep with a roll up door opening of 42-3/4" Wide x 68-3/8" High.

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One (1) compartment below the aerial turntable will be provided measuring 18-7/8" Wide x 50-7/16" High x 23" Deep, with a hinged door opening of 13-1/4" Wide x 31" High.

One (1) compartment forward of the rear outrigger will be provided measuring 45" Wide x 66-3/16" High x 23" Deep, with a roll up door opening of 45" Wide x 62-7/16" High. The upper portion of the compartment will be 14" Deep split depth for the hosebed storage.

**REAR COMPARTMENT**

One (1) compartment on the driver's side of the apparatus will be provided measuring 12-3/4" Wide x 46-3/4" High x 17-7/8" Deep with a vertically hinged beveled overlapping door.

**ROLL-UP DOORS**

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

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

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

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

Roll-up doors shall be furnished in place of hinged door at the following locations:

All running board and high side compartments shall be equipped with roll-up doors. The compartments below the turntable on the left and right side shall be equipped with beveled overlapping type doors.

**TURNTABLE COMPARTMENT DOORS**

The compartment doors on the left and right side of the body shall be beveled overlapping type doors with the skin fabricated from 3/16" (5052 -H32) aluminum. The door skin shall have 2" reinforcing channels welded internally which accommodate the inner door pan mounting. The inner pan, made from 1/8" aluminum, shall be bolted to the reinforcing channels for accessibility to the latch mechanism and shall enclose the latch and reinforcements completely to provide a smooth and snag-free inner door configuration.

**COMPARTMENT DOOR LATCHES**

Door latches shall be Eberhard #206 automotive type mechanism or equal. Latches shall be stainless steel "D" ring style handles for ease of operation even with gloves on.

The blank door in a double door configuration shall be provided with an internal two point slam paddle latch. Dissimilar metals insulating gaskets shall be placed between the door handles and outer door panels to prevent any electrolytic reaction between dissimilar metals to protect paint.

**COMPARTMENT HINGES**

Hinges shall be full length polished stainless steel piano type, with 1/4" minimum stainless steel pin size. The hinges shall be mounted with stainless steel hardware.

**COMPARTMENT DOOR SEALS**

All enclosed storage compartment shall include a full gasket around the perimeter of the compartment edge with heat resistant, "closed cell neoprene sponge" weather stripping, to insure a water tight seal.

The horizontally hinged turntable compartment doors shall be furnished with two (2) Eberhard gas shock type door stay arms.

**ROBINSON ROLL-UP DOORS**

The roll-up doors shall be Robinson (ROM) brand roll-up doors, equipped with a brushed aluminum finish, with a PVC inner seal to prevent metal to metal contact and to repel moisture. The slats shall be double-wall extrusion 1.366" high by .315" thick with interlocking end shoes to prevent the slats from moving side-to-side and binding the door. All slats are to have interlocking joints to prevent penetration by sharp objects.

**COMPARTMENT FLOORS**

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

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

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

**COMPARTMENT TOPS**

Compartment tops shall be covered with 1/8" polished aluminum tread plate on both sides of the body. The aluminum tread plate shall have a flange downward, over the top of compartments to serve as a drip rail above the compartment doors.

**ACCESS PANELS**

Removable access panels shall be provided in the lower running board compartments to access hydraulic components, electrical harnesses and the rear body mounts.

All access panels shall be equipped with the same finish as the compartment interiors.

**COMPARTMENT LOUVERS**

Machine stamped ventilating louvers shall be furnished in each compartment, and so located that water cannot enter the compartment. A formed hat section shall be bolted over each louver on the inside body wall to further prevent moisture from entering through the louver.

**COMPARTMENT DRIP MOLDING**

Compartment tops over all side compartments shall be equipped with a flanged edge to provide protection against water run-off. A secondary polished extruded aluminum drip molding shall be provided between lower compartments and auxiliary high side compartments.

**BODY TRIM**

The body shall be protected and covered with bright finished polished aluminum treadplate. The treadplate shall be fastened with stainless steel hardware and shall be coated with rubber type undercoating between the body panel and tread plate to protect from moisture. All edges shall be sealed with silver, rubber caulking.

Polished aluminum tread plate shall be provided at the following areas:

- All surfaces over the compartments or on top of the body where personnel may walk or mount equipment
- Entire front of body
- Below aerial turntable decking
- Top of the pump enclosure (if applicable)
- Cover over the water tank
- Cover over hydraulic tank
- Top of mid-ship compartment (if applicable)

**PAINTED REAR BODY PANEL**

The entire rear of the body shall be overlaid with smooth aluminum painted job color, which shall extend the full width between body side compartments. The rear panel shall have an opening to access the ground ladder storage area. Each opening shall be equipped with roll-up or hinged doors as specified in the ground ladder storage section.

**OUTRIGGER COVER PANELS**

Each outrigger opening shall be covered by a panel mounted to the outrigger beam. The panels shall be fabricated from 14 gauge #8 finished stainless steel. Each panel shall be adjustable up and down to help match the panel to the body lines.

**BODY RUB RAILS**

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

**RUNNING BOARD STEPS**

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

**REAR BODY MODULE**

The rear of the body shall be designed to include structure/frame bolted to the rear of the body to support the rear turntable access steps, the rear compartments and the central outrigger control panel. The module shall be constructed from a minimum of 1/8" material.

## REAR "A" FRAME TURNTABLE ACCESS LADDER

Two (2) turntable access ladders, one on each side, shall be provided at the rear of the apparatus in an A-frame configuration. The access ladders shall be bolted to the rear body panel and the rear tailboard step, providing a sacrificial and completely replaceable rear body module. The framework for the steps shall be fabricated from 1/8" polished aluminum tread plate, providing a mounted surface for the rear light cluster and the outrigger controls. A minimum of three (3) steps shall be provided and shall be fabricated from cast open grate material providing a non-slip surface on each step. The steps shall provide access or egress to and from the aerial device turntable.

## REAR DROP DOWN STEP

A drop down step shall be provided at the bottom of each access ladder to keep stepping area to a minimum when the vehicle's outriggers are in operation. The step shall swing down into position and shall be fabricated from cast open grate material, which shall be bolted to framework fabricated from 1/2" aluminum. A safety pin shall be provided to secure the step in the stowed position. The dropdown steps shall be incorporated in the "DO NOT MOVE TRUCK" warning circuit.

## BODY HANDRAILS

All non-aerial device handrails are to be 1-1/4" diameter ribbed aluminum extruded tubing with chrome plated end brackets.

Locations shall be as follows:

- One pair of grab handles on each corner of the turntable walking deck to assist climbing to the turntable.

## REAR WHEEL WELL LINERS

Fully removable, bolt-in, 1/8" aluminum fender liners shall be provided. The wheel well liners shall extend from the outer wheel well body panel, into the truck frame. Removable vertical splash shields, inward of the wheels, shall be provided to give access to the hydraulic components. The completely washable fender liners shall be designed to protect the front and rear compartments and main body supports from road salts, dirt accumulation and corrosion.

## REAR FENDERETTES

The rear fenders shall be equipped with easily replaceable, polished extruded aluminum fenderettes. The fenderettes shall be equipped with a rubber gasket molding between the body panel and the fenderette.

***** BODY FENDER STORAGE COMPARTMENTS *****

**DRIVER FRONT FENDER STORAGE**

A storage compartment shall be inserted into the front driver side body fender. The compartment shall be sized large enough to store three (3) SCBA cylinders or fire extinguishers, with a maximum length of 26". The compartment shall have a non-abrasive lined floor area for the three (3) devices. The compartment shall be enclosed by a door painted to match the primary body color, with a single point latch and hinge. The back side of the door shall have a section of nylatron installed to protect the door surface from the items stored in the compartment. This compartment shall be tied into the "Do Not Move Apparatus" warning system.

**OFFICER FRONT FENDER STORAGE**

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

**REAR MUD FLAPS**

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

**REAR TOW EYES**

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

**HOSEBED**

A hose bed shall be provided in the upper section of the body forward of the turntable. All surfaces of the hose bed shall be free from all sharp objects such as bolts, nuts, etc., to avoid damage to fire hose.

**HOSE BED FLOORING**

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

**HOSE CHUTE**

The hose shall be removed through a stainless steel hose chute located at the rear of the vehicle. The hose chute shall discharge through the top portion of the compartments below the turntable on the right side of the vehicle.

The chute shall be designed with a slide-out extension which shall extend through the rear access ladder to allow the hose to cleanly discharge away from the rear of the vehicle.

The hose chute design shall accommodate 5" hose and couplings.

**HOSE BED COVER, VINYL WITH VELCRO**

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

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

The Hypalon material shall be red in color.

****** COMPARTMENT ACCESSORIES ******

**ADJUSTABLE SHELVING**

Compartment shelving shall be constructed of 3/16" brush finish aluminum with a 2" upward bend at front and rear, and side supports. Shelving shall be vertically adjustable with spring nuts in aluminum strut channel.

Adjustable shelves shall be located as follows:

Eight (8) adjustable shelf(s) shall be provided and mounted as directed by the fire department.

**500 POUND FLOOR MOUNTED ROLL OUT TRAYS**

Floor mounted roll-out trays shall consist of heavy duty, roller bearing slide tracks with an end load rating of 500 pounds, securely fastened to the compartment floor. The tray shall be fabricated from 3/16" brushed aluminum with a minimum 2" high flange on each of the four sides to assist in retaining the equipment stored on each tray. The slide tracks shall have a 100% extension, allowing the tray to extend out of the compartment completely.

The 500 pound floor mounted roll out trays shall be located as follows:

Two (2) roll out tray(s) shall be provided and mounted as directed by the fire department.

**ROLL-OUT/ DROP DOWN TRAYS**

The roll out/tilt tray shall consist of a 3/16" brushed aluminum finished aluminum tray with a minimum 2" lip on all four sides. Heavy duty aluminum Unistrut "C" channel tracking material shall be utilized to securely fasten the slide tracks to the compartment walls, while allowing height adjustment.

The slide mechanism shall consist of a low-weight high-strength plastic to create a robust front bracket to support the aluminum tray. The rear of the tip down tray shall be mounted on a slider with an integral pivot plate. This slider and pivot plate shall be mounted inside an aluminum rail for maximum strength. The tray shall be released from the stowed position with the use of a push button and shall be capable of auto latching to the stowed position. The front handle/latch shall be designed with a double hand hold to control the tray when deployed or stowed. The roll out/tilt tray shall be rated for 330# capacity.

Roll out/Tilt trays will be located as follows:

Two (2) adjustable rollout / drop down tray(s) shall be provided and mounted as directed by the fire department.

**VERTICAL PULL OUT TOOL BOARDS**

Vertical pull out tool boards shall be provided. Each tool board shall be constructed of 3/16" smooth aluminum allowing mounting of equipment on both sides of the tool boards. Each tool board shall be attached to #250 rated slides, one at the top and one at the bottom of the tool board. 3/16" aluminum angles shall attach the slides to tracking to allow horizontal adjustments. A gas shock shall be used to secure the tool board in the stored and deployed position.

Vertical pull out tool boards shall be located as follows:

Two (2) vertical pull out tool board(s) shall be provided and mounted as directed by the fire department.

**SPREADER HOLDER - HORIZONTAL MOUNTING**

One (1) Heavy Duty set(s) of Zico QM ET H , aluminum alloy castings, and a Velcro retaining strap(s) shall be installed for stability of the assembly.

One (1) ZICO, QUIC-MOUNT Multiversal Extrication Tool Holder(s) shall be provided for an adjustable upright extrication tool mounting solution. The heavy-duty, cast aluminum QM-ET-MV boasts ten independently adjustable components, including tilt angle, enabling it to safely and securely accommodate many popular makes and models of cutter, spreader, and combination tool. The QM-ET-MV is perfect in eliminating the need for expensive custom fabricated mounting boxes. Whether buying a new apparatus or replacing the tools on an existing one, a single Multiversal Extrication Tool Holder can be used over and over again with only a few minor adjustments.

**EXTRACTION TOOL VERTICAL HOLDER**

One (1) Vertical Extrication Tool Holder(s) Zico QM ET V shall be provided for Hang cutters, spreaders, and combination tools on the doors and walls of the compartment.

**POWER PACK HOLDER - HORIZONTAL**

One (1) power pack holder(s) two (2) piece rail guides with speed pin retainers shall be fabricated by the manufacturer. Due to configuration of each manufacturer's model, holders shall vary to accommodate each particular unit.

**RESCUE TOOL MOUNTING**

Custom brackets shall be fabricated for mounting the customer supplied hydraulic rams. The exact tool mounting orientation shall be determined during the pre-construction meeting.

******120/240 VOLT A.C. ELECTRICAL AND GENERATOR SECTION ******

**120/240 VOLT ELECTRICAL SYSTEM TESTING**

All line voltage wiring and permanently connected devices and equipment shall be subjected to a dielectric voltage withstand test of 900 volts for one 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 circuits closed. The test shall be conducted after all bodywork has been completed. The dielectric tester shall have a minimum 500 VA transformer with a sinusoidal output voltage that can be verified.

Electrical polarity verification shall be made of all permanently wired equipment and receptacles to determine that connections have been properly made.

**OPERATIONALTESTING**

The apparatus manufacturer shall perform the following operation test and shall certify that the power source and any devices that are attached to the line voltage electrical system are properly connected and in working order.

The generator shall be started from a cold start condition and the line voltage electrical system shall be loaded to 100 percent of the nameplate voltage rating.

The following items shall be monitored and documented every 15 minutes:

- The cranking time until the generator starts and runs.
- The voltage, frequency, and amperes at continuous full rated load.
- The generator oil pressure, water temperature, transmission temperature, hydraulic temperature, and the battery rate charge, as applicable.
- The ambient temperature and altitude.

The generator shall operate at 100 percent of its nameplate wattage for a minimum of two (2) hours.

**PTO DRIVEN HYDRAULIC GENERATOR**

A Fabco Model #HYDRO-7.5 KSC, self-contained, PTO driven, hydraulic generator shall be provided. The generator shall be 7500 watt capacity at 120/240 volt, 60 Hz, single phase and shall require a two-pole 35 amp main breaker to be installed in the load center. The generator components shall consist of a tray, reservoir, and a pump.

**SELF CONTAINED GENERATOR TRAY**

Consists of a wrap around fiberglass frame, an embossed aluminum deck plate cover, reservoir with oil level, oil filter, generator with patented CPU controller, oil cooler (heat exchanger) with 12-volt fan and related necessary hydraulic components.

**RESERVOIR**

The reservoir is constructed of stainless steel holding 2 to 3 gallons of hydraulic oil.

**HYDRAULIC PUMP**

A 45cc hydraulic load sensing piston pump shall be provided and mounted directly to the transmission mounted PTO. RPM range of the pump is 750 rpm to the governed engine speed.

**GENERATOR CONTROL PANEL**

A Fire Research FROG-D Quad meter shall be installed near the breaker panel box to monitor the generator output. The Quad meter consists of (1) voltmeter, (1) frequency meter, elapsed run time meter, oil temperature with alarm and (2) ammeters.

**120/240 VOLT WIRING**

The generator output conductors shall be 8 gauge and the output conductors shall be routed through non-metallic conduit 3/4" in diameter.

**GENERATOR PTO**

A hot shift PTO shall be provided on the transmission for the Fabco generator. The PTO shall be controlled from the cab. The control shall include a PTO engagement switch and a PTO engaged indicator light.

**GENERATOR LOCATION**

The generator shall be permanently mounted on top of the body.

Locating the generator greater than 144" from the main breaker panel may require the installation of an additional power disconnecting means.

**120/240 VOLT LOAD CENTER**

The generator output line conductors shall be wired from the generator output connections to a Square D, model #QO120L125G breaker panel. The breaker panel shall be equipped with a properly sized main breaker using two (2) of the twenty (20) spaces which leaves a total of eighteen (18) available spaces.

The generator output conductors shall be sized to 115% of the main breaker rating and shall be installed as indicated in the wiring section.

Eighteen (18) appropriately sized, 120 volt, circuit breakers shall be provided.

The breaker panel shall be located in an enclosed compartment as directed by the fire department.

**120 VOLT TRANSFER SWITCH**

An automatic power relay shall be installed to allow interior 120 volt accessories to be powered by the 120 volt shoreline or the generator. The transfer switch will be located in a separate box located next to the main power distribution panel. The interior accessories to be powered by the shoreline shall be wired through a separate sub-panel breaker box with individual circuit breakers as required. This shall allow for a continuous power supply to the interior accessories while the apparatus is parked in the station. The maximum load for the transfer / relay shall be 20 amps at 120 volts.

**120/240 VOLT WIRING METHODS**

Wiring/conduit shall not be attached to any chassis suspension components, water or fuel lines, air or air brake lines, fire pump piping, hydraulic lines, exhaust system components or low voltage wiring.

All wiring shall be installed at a minimum of 12 inches away from any exhaust piping and a minimum of 6 inches from any fuel lines.

All wiring shall be securely clamped within 6 inches of any junction box and at a minimum of every 24 inches of run. All supports shall be of nonmetallic material or corrosion protected metal. All supports shall not cut or abrade conduit or cable and shall be mechanically fastened to the vehicle.

All power supply assembly conductors, including neutral and grounding conductors, shall have an equivalent amperage rating and shall be sized to carry not less than 115% of the main breaker rating.

All Type SO or Type SEO cable not installed in a compartment shall be installed in wire loom. Where Type SO or Type SEO cable penetrates a metal surface, a rubber or plastic grommet or bushing shall be provided.

The installation of all 120/240 wiring shall meet the current NFPA-1901 Standards .

**120/240 VOLT WIRING IDENTIFICATION**

All line voltage conductors located inside the main breaker panel box shall be individually and permanently identified. When pre-wiring for future power wiring installations, the non-terminated ends shall be labeled showing function and wire size.

**120/240 VOLT GROUNDING**

The neutral conductor of the power source shall be bonded to the vehicle fame only at the power source.

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 addition to the bonding required for the lower voltage return current, each body and driving/crew compartment enclosure shall be bonded to the vehicle frame by a copper conductor. The conductor shall have a minimum amperage rating of 115 percent of the name plate current rating of the power source specification label.

**120/240 VOLT CIRCUIT BREAKER / RECEPTACLE INSTALLATION**

The system shall be installed by highly qualified electrical technicians to assure the required level of safety and protection to the fire apparatus operators. When multiple circuit are required, the circuits shall be wired to the breaker panel in a staggered configuration to minimize electrical loads on each breaker or generator (leg) circuit. 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.

**120/240 VOLT RECEPTACLE INSTALLATIONS**

Any receptacle installed in a wet location must be a minimum of 24 inches above the ground and provided with an approved wet location cover. Wet receptacles may not be mounted at more than 45 degrees from vertical, nor can they be mounted in a face-up position.

Two (2) 120 volt, NEMA L5-20, 20 amp, Single twist-lock receptacle with a grey thermoplastic, corrosion resistant, weatherproof cover shall be installed as directed by the fire department.

The receptacle(s) shall require 20 amp, 120 volt circuit breaker(s) to be installed in the load center to properly protect the two (2) receptacle(s).

**ELECTRIC CABLE REEL**

One (1) Akron Brass Model #ERWC-15-10, 120 volt, electric rewind cord reel (able to accommodate 200 feet of 10 gauge or 250 feet of 12 gauge electric cable). The reel shall be provided and wired to the breaker panel. The reel has a factory installed Rear Mount motor and shall be equipped with a universal frame that allows the 12 volt motor to be re-positioned either to the left or right side of the frame. The customer shall have the ability to move the motor to either side without having to purchase extra parts. The reel shall be securely mounted and equipped with a rewind control adjacent to the reel.

The cord reel shall be mounted as directed by the fire department.

The circuit breaker used to protect any device attached to the cord reel shall be sized to the smallest electrical connection used.

One (1) reel rewind switch(s) shall be provided on the compartment wall

One (1) Hannay 4-way stainless steel roller assembly shall be provided. The roller assembly opening shall be the full width of the reel drum.

One (1) cable ball stop(s) shall be installed on the cable to keep the end from passing through the roller assembly.

**ELECTRIC CABLE**

Two hundred-fifty (250) feet of Type SO black 12/3 heavy duty electric cable shall be provided on the reel.

One (1) NEMA L5-20R, 20 amp, three prong twist-lock receptacle shall be provided on the end of the cable.

**CAB BROW LIGHTING**

One (1) Akron SceneStar, model ELSS-XLAC, 220 watt 120V LED brow light shall be provided. The light head shall produce 20,000 lumens of lighting. The entire assembly shall be UL listed as Scene light for Fire Service Use, manufactured by Akron.

The light shall be mounted using an Akron brow mounting bracket on the upper forward face of the cab. Wiring used for the lighting shall be a minimum of 16 gauge three (3) wire cable that is properly supported and protected from damage.

The front brow lights shall be controlled from the following location(s):

- Cab dash, with 12 volt switch

**TELESCOPING LIGHTS - TOP OF BODY AS DIRECTED**

Two (2) Akron SceneStar, model ELSS-XLAC 220 watt LED telescoping lights shall be provided. Each light shall have an output of 20,000 lumens and shall be mounted to an Extenda-Lite, top mounted, push up pole, deployable in a full 360 degree rotation. The tightening mechanism shall be of a twist lock design, the use of a knob or latch to release the pole in order to raise and lower the telescoping portion of the pole shall not be accepted.

The lights shall be mounted on top of the body as directed by the fire department, one (1) each side. Wiring used for the lighting shall be a minimum of 16 gauge three (3) wire cable that is properly supported and protected from damage.

Two (2) model ELSS-XLAC 220 watt light heads shall require one (1) 120 V, 15 amp circuit breaker.

The top of body telescoping lights shall be controlled from the following location(s):

- At breaker panel, with breaker

**TELESCOPING LIGHTS - REAR OF BODY**

Two (2) Akron SceneStar, model ELSS-XLAC 220 watt LED telescoping lights shall be provided. Each light shall have an output of 20,000 lumens and shall be mounted to an Extenda-Lite, side mounted, push up pole, deployable in a full 360 degree rotation. The tightening mechanism shall be of a twist lock design, the use of a knob or latch to release the pole in order to raise and lower the telescoping portion of the pole shall not be accepted.

The lights shall be mounted on the front face of the body, one (1) each side. Wiring used for the lighting shall be a minimum of 16 gauge three (3) wire cable that is properly supported and protected from damage.

Two (2) model ELSS-XLAC 220 watt light heads shall require one (1) 120 V, 15 amp circuit breaker.

The rear of body lights shall be controlled from the following location(s):

- At breaker panel, with breaker

****** GROUND LADDERS AND ACCESSORIES ******

**GROUND LADDER STORAGE AREA**

All ground ladders (except as noted) shall be stored in the center of the aerial body. The ladders stored in the center of the body shall be fully enclosed.

A brushed or mill finish roll-up door shall be provided for the ladders at the rear of the vehicle. If the body compartments are equipped with roll-up doors, the ladder storage door shall be the same brand.

**GROUND LADDERS**

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

- One (1) Alco-Lite model PEL-35; 35', aluminum, two (2) section extension ladder shall be provided.
- One (1) Alco-Lite model PEL-24; 24', aluminum, two (2) section extension ladder shall be provided.
- Two (2) Alco-Lite model PRL-16; 16', aluminum, straight roof ladder with folding hooks shall be provided.
- One (1) Alco-Lite model AEL-14; 14', extending, aluminum, attic ladder shall be provided.
- One (1) Alco-Lite model FL-10; 10', folding, aluminum, attic ladder shall be provided.
- One (1) Little Giant model 22 ladder system with mounting hardware shall be provided. This ladder has an extension height ranging from 11'-0" to 19'-0"

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

**PIKE POLE STORAGE**

Four (4) pike pole tube(s) shall be provided. Each shall be an individual tube type holder, mounted in the ladder storage area (if space allows). Each pike pole holder shall be labeled to indicate the pike pole length.

- One (1) 6' Fire Hooks Unlimited fiberglass handled pike pole(s) shall be provided.
- One (1) 8' Fire Hooks Unlimited fiberglass handled pike pole(s) shall be provided.
- One (1) 10' Fire Hooks Unlimited fiberglass handled pike pole(s) shall be provided.
- One (1) 12' Fire Hooks Unlimited fiberglass handled pike pole(s) shall be provided.

**ADDITIONAL ITEMS SUPPLIED WITH THE VEHICLE**

- 1 - Pint of touch up paint for each color
- 1 -Bag of assorted stainless steel nuts and bolts
- 1 - Complete set of hydraulic filters for the pressure filter and the return line filter
- 2 - Complete sets of aerial override keys

**LOOSE EQUIPMENT**

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

- Six (6) Milwaukee spanner belt(s)/strap(s)

**WHEEL CHOCKS**

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

****** 102' AERIAL LADDER/PLATFORM ******

**GENERAL AERIAL INFORMATION**

The aerial ladder/platform assembly shall be a three (3) section telescoping ladder and platform structure constructed from 100,000 PSI yield high strength steel alloy, modular aluminum platform, pre-piped waterway, steel turntable, torque box and outriggers.

**INTENT OF AERIAL SPECIFICATIONS**

The intent of these specifications is to describe a telescoping elevating ladder. It shall consist of the true steel truss ladder type. The aerial platform consists of a 100,000 psi yield high strength steel platform support structure with modular aluminum handrail assemblies, three (3) 100,000 psi yield high strength steel ladder sections, a steel turntable, torque box and four outriggers. The height of the unit is 102' and the horizontal reach is 94'.

The device will meet all the requirements of the National Fire Protection Association's (NFPA) 1901 standard, in effect at time of purchase. This is a fire service proven piece of apparatus that shall be manufactured in the U.S.A.

It is not the intent of the City of Sunnyside to deviate from this requirement; therefore, ladders attached to booms, whether solid or lattice, or articulating arms shall not be considered as meeting these specifications or the intent of these specifications.

**AERIAL DESIGN STANDARDS**

The design criteria of the unit shall be to create a structure and system that emphasizes safety, product reliability, and ease of operation.

These criteria are:

- The hydraulic system shall be designed so that if a failure of any component or assembly within the system occurs, a single point failure of the entire system shall not occur.
- The minimum ultimate design condition at the ladder base shall be 11.1 million inch pounds.
- All structural load supporting elements of the aerial ladder made from ductile materials shall have a design stress of not more than 40% of the minimum yield strength of the material based on the combination of the live load, specifically 1000# in the platform, and the dead load. This 2.5:1 structural safety factor exceeds the American National Standards Institute (ANSI) and the current National Fire Protection Association (NFPA) 1901 standard.
- The aerial device shall be capable of sustaining a static load one and one-half times it's rated platform capacity (live load), in every position in which the aerial device can be placed when the vehicle is on a firm and level surface.
- The aerial device shall be capable of sustaining a static load one and one-third times it's rated platform capacity (live load) in every position in which the aerial devices can be placed when the vehicle is on a slope of five degrees downward in the direction most likely to cause overturning.
- All welds in the aerial device shall be designed per the static and fatigue criteria of the American Welding Society No. D1.1-97. All aluminum welds shall be designed per the static and fatigue criteria of the American Welding Society Standard No. D1.2-97.
- The aerial truss will be constructed from high strength 100,000 PSI yield steel.

The aerial device shall be capable of operating with a rated platform load and the following conditions:

- Conditions of high wind up to 50 mph.
- Conditions of icing, up to a coating of .25" over the entire aerial structure.

All of the design criteria will be supported by the following test data:

- Strain gauge testing of the complete aerial device.
- Analysis of deflection data taken while the aerial device was under test load.
- Accelerometer test to determine dynamic response during ladder operation.
- Accelerometer test to determine dynamic response during road travel.
- Hydraulic component operating and burst strength testing.

**AERIAL LADDER MOUNTING**

The elevating aerial ladder turntable shall be rear mounted thus providing the following vehicle benefits:

- Improved mobility vs. Midship mounted units.
- Greater position ability of the turntable for optimum reach at fire ground operations.
- Increased compartmentation, hose load, water capacity in body, resulting from ladder being raised to clear the cab.
- Shorter vehicle wheelbase.
- Shorter overall length of vehicle.

**HEIGHT AND REACH**

The height of the unit shall be a minimum of 102' as measured by NFPA-1901 requirements. The rated vertical height of the elevating platform assembly shall be measured in a vertical plane from the top surface of the platform handrail to the ground, with the platform raised to its position of maximum elevation.

The horizontal reach of the unit shall be a minimum of 94' as measured by NFPA-1901 requirements. The rated horizontal reach of the elevating platform shall be measured in a horizontal plane from the centerline of the turntable rotation to the outer edge of the platform handrail, with the elevating platform extended to its maximum horizontal reach.

**WELDMENT FIXTURES**

To ensure exact tolerances between parts and part interchangeability, all weldment shall be manufactured in fixtures. To further insure weld integrity in all weldment, the fixtures must be able to rotate to enable the weldment to be welded in the number 1 flat welding position resulting in maximum weld penetration in the welded material.

**LASER BEAM**

Prior to final welding, a laser beam shall be utilized to assist in alignment of device components secured in the weldment fixtures. The laser shall provide an exact line between components to ensure exact alignment of components before and after the final welding process.

## AERIAL MATERIAL STANDARD

The following standards for materials are to be used in the design of the aerial device. Materials are to be certified by the mill that manufactured the material. Materials that are certified or recertified by vendors other than the mill shall not be accepted. Material testing that is performed after the mill test shall be only for verification and not with the intent of "paper changing" the material classification.

## HYDRAULIC SYSTEM

The hydraulic system shall provide power to the entire aerial device as efficient as possible without the use of a hydraulic cooler.

A hydraulic system relief valve as well as individual circuit relief valves shall be provided to prevent damage to any function or circuit. The relief valve shall have a stainless steel relief spring to ensure proper function and product reliability.

## HYDRAULIC HOSE, TUBING AND FITTINGS

All hydraulic steel tubing, hydraulic rubber covered wire braided hoses, and hydraulic fittings/adapters shall have a minimum burst pressure rating of four times the operating pressure. Hoses and tubing shall be properly sized to minimize heat buildup during extended periods of operation. Hoses and tubing shall be properly sized to minimize flow restrictions.

All hydraulic hose shall have a tube and cover constructed of synthetic rubber and shall have a braided/spiral wire reinforcement capable of maintaining a 4:1 safety factor in all areas of the hydraulic system. The hose shall meet the appropriate SAE performance specifications: 100R2, 100R19, J517, J1942, ISO 3862-1, USCG HF, DNV,ABS or 100R12.

KME has implemented the most efficient, leak-free, fluid connector design in the industry. The manufacturers entire aerial line has been certified as a Parker Genuine Parts design.

The connector system was jointly designed by engineers from both the manufacturer and Parker Hannifin and incorporate the following design upgrades and advantages to the City of Sunnyside:

- All hydraulic ports (manifolds, pumps, tank, etc) to elastomeric sealing technology;
- No pipe threads in the hydraulic system
- Sealing to be done by O-rings with the mechanical holding power of straight threads.
- All tube and hose connections to Parker Seal-Lok, O-ring face seal technology.
- Sealing to be done by o-ring with the mechanical holding power of straight thread.
- Fittings rated up to 6000 psi.
- Drop-in design of Seal-Lok connectors to allow easier maintenance and assembly.
- Fitting resist 200% over torque, with optimum vibration resistance.
- Shaped fittings machined from forged bodies for compact design and strength.
- Fittings meet/exceed the performance and dimensional requirements of SAE J1453 and J1926.
- Minimized unnecessary fittings and adapters, streamlining the system.
- Increased connector accessibility, making assembly and maintenance easier.
- Standardized the connector system on the AERIAL unit.
- Incorporated pressure diagnostic system with Parker PD diagnostic test points into the connector design

**PARKER FACTORY TRAINING**

All fluid connector assemblers have been trained and certified in Dry Technology.

This training included: proper handling, installation, torque requirements, troubleshooting, and quality control procedures of the fluid connector products.

**LEAK-FREE GUARANTEE**

An exclusive three-year leak free guarantee shall warrant the Seal-Lok, O-ring face seal connections to be leak-free for a period of three (3) years.

**HYDRAULIC PUMP**

A load sense pressure compensated hydraulic axial piston pump shall be provided which shall be capable of operating under any rated aerial load condition and aerial device position at normal engine idle or governor controlled fast idle. The hydraulic pump shall be capable of generating sufficient flows to allow multiple aerial functions without significant loss of speed.

**HYDRAULIC OIL RESERVOIR**

A 67 gallon hydraulic oil reservoir shall be provided to supply the needs of the hydraulic system. A 2" gated suction line shall be provided between the oil reservoir and the hydraulic pump. The tank fill shall be provided with a strainer screen and vent cap. Located near the fill cap shall be a dip-stick for checking fluid levels. The tank shall be mounted in the top, front portion of the body. The tank shall be constructed from 10 gauge steel, which shall be welded at all interior and exterior seams. Before adding fluid the tank must be cleaned and free from all contaminants.

Suction and return ports will be designed to SAE Straight Thread O-ring Specifications. These ports will incorporate an o-ring seal rather than pipe threads.

**HYDRAULIC OIL - REGULAR - A / W 46**

The hydraulic oil reservoir shall be filled with A / W 46 grade Hydraulic Oil. This oil provides superior antiwear properties, and is specially formulated with improved thermally stable additives. These oils offer outstanding resistance to sludge formation, are chemically stable and exhibit excellent antiwear protection.

**AUTOMATIC DIVERTER VALVE**

There shall be an automatic electric over hydraulic three (3) position diverter valve located at the center rear of the apparatus. This diverter valve shall divert hydraulic fluid to either the aerial ladder controls or the outrigger controls.

To prevent accidental operation of the ladder prior to the outriggers being properly set, the diverter valve shall only allow hydraulic fluid to the outriggers until the outriggers are set properly.

To prevent accidental operation of the outrigger system during the aerial ladder operation the diverter valve shall only allow hydraulic fluid to the ladder controls, when the aerial device is raised from the aerial travel support.

In the event of electrical failure the operator shall be able to manually move the diverter valve to the ladder or outrigger position for continuous uninterrupted operation.

**NOTE:** All safety controls are displaced when vehicle is in manual mode of operation.

**OUTRIGGER SYSTEM HYDRAULIC CONTROL VALVES**

The outrigger cylinder system shall be controlled by a pressure compensated, proportional control valve that is designed for parallel hydraulic circuit operations. The valve will be proportional type to provide the smoothest, precise operation of the outriggers. Devices utilizing on/off type outrigger control valves in lieu of proportional valve shall not be acceptable!

This valve shall be modular in design so that individual sections can be replaced in the field, rather than complete valve assemblies, thus reducing maintenance costs. The valve housings shall be made of high tensile cast iron for durability and the individual spools shall be hard, chrome plated for long life and resistance to corrosion. Each valve shall be equipped with a heavy-duty electric solenoid for electric control of the outrigger from the remote operator's station and mechanical handles of ease in override operations. The mechanical handles shall be equipped with large knobs with integral labels inside each knob indicating the function of the handle.

**LIFT, EXTENSION AND ROTATION HYDRAULIC CONTROL VALVE - ELECTRIC**

Three (3) ladder directional controllers shall be mounted on the turntable control console. They shall control extend/retract, rotation, and elevation. These controllers are part of the computer operated IQAN motion control system allowing safe operation of the ladder.

The main control valve shall be positioned inside the heel pin step for direct manual over ride control of each aerial function.

The controllers shall incorporate ICB; J-1939 can bus signaling, transmitted through two (2) J-1939 communication wires to reduce the chance of electrical failures since fewer wires and terminals shall be utilized. Additionally, voltage sensitivity is eliminated thus providing superior motion control.

**PRESSURE FILTER**

The pressure filter shall be made of a micro glass medium, which has the highest capture efficiency, dirt holding capacity and life expectancy over other media such as cellulose and synthetic. The pressure filter shall have a bypass circuit protected by a check valve, which shall be installed around the pressure filter. The pressure line filter shall be required even if a suction line filter is provided in the reservoir due to the suction line filter's inability to trap contaminates entering the system.

The pressure filter cartridge shall have a sensor, which shall indicate the condition of the filter and provide a warning.

The pressure filter shall have an absolute rating of five (5) microns.

**RETURN FILTER**

The return filter shall be made of a micro glass medium, which has the highest capture efficiency, dirt holding capacity and life expectancy over other media such as cellulose and synthetic. The return filter shall have a bypass circuit protected by a check valve, which shall be installed around the return filter. The return filter shall have a bypass circuit protected by a check valve, which shall be installed around the return filter.

The return filter cartridge shall have a sensor, which shall indicate the condition of the filter and provide a warning.

The return filter shall have an absolute rating of five (5) microns.

**COMPUTER OPERATED IQAN MOTION CONTROL SYSTEM**

The ladder, outrigger system and interlock systems shall be controlled with the computer operated and monitored hydraulic motion control system. The motion control system shall provide state of the art controls for the ladder, outriggers, auto-level and interlock systems as required. The motion control system must be an electro-hydraulic management system that monitors operator inputs from the control station(s) and converts this data to a usable electronic signal that controls hydraulic valve functions.

The turntable control station shall be equipped with a Master Display Module MD3. The Master Display Module MD3 shall be a completely weather proof and shock resistant micro processor which includes a 3" x 4.5" LCD screen (referenced above). The MD3 shall contain programmed parameters for each aerial device function, which provide for proper machine operation and reduce the possibility of abusive operation. The number of wires required to connect the MD3 module and control hardware shall be kept to a minimum through the use of serial CAN-bus data transmission technology. The CAN-bus modules shall be attached to each other using just two communication wires.

Each component of the IQAN motion control system shall be proven, off the shelf modules and parts, which are available throughout the world. Proprietary hardware designs are not acceptable at KME due to the lack of parts availability and support.

The MD3 display will have built-in troubleshooting and shall allow troubleshooting and function history monitoring for the entire motion control system. The memory function will allow a service technician to identify if these warnings were ignored or overridden.

The IQAN motion control system shall receive rotation information from an absolute encoder located on the rotation swivel. The encoder shall provide absolute position of the turntable at any given position from 0 degrees to 360 degrees of rotation.

An MD3 information center shall be provided at the turntable and the platform. The MD3 display shall allow the system to be diagnosed and calibrated without the need for separate controllers or computers.

The turntable MD3 display shall indicate the following information from on-demand screen:

- Hydraulic pump pressure.
- Elevation angle of the ladder.
- Continuous ladder extension percentage.
- Degree of rotation from centerline of vehicle.
- E-Zone™ short jack warning.
- Cradle alignment message.
- Breathing air level monitoring.
- Device tip moment load monitoring.
- E-Speed™ ladder tip speed control.
- E-Cush™ function ramping control for elevation.
- E-Cush™ function ramping control for extension and retraction.

The MD3 screens at the turntable and the platform will also display warning/message screens to alert the operator to a potentially unsafe condition of the aerial device.

## EMERGENCY HYDRAULIC PUMP SYSTEM

In the event of failure of the main hydraulic pump or vehicle engine, the unit shall be equipped with **two (2) emergency hydraulic pumps** which shall be parallel plumbed into the hydraulic system and be electrically driven from the chassis batteries. The emergency pump system shall be capable of limited functions of the ladder and outriggers to stow the unit. The pumps shall be controlled from the outrigger control box and turntable control stations with spring loaded momentary contact switches.

Each pump shall have a separate hydraulic oil supply line, from the main supply line attached directly to the hydraulic oil reservoir. A shutoff valve for each line shall be provided and check valves shall be incorporated on the pressure side of both pumps to ensure that one shall continue to operate the ladder in the event the other fails.

Each pump shall have high tensile steel shafts and gears with the shafts supported by needle bearings. The cylinder plate and gears shall be ground as a set to ensure exacting tolerances. Clearance shall be maintained by a Mylar shim.

## POWER TAKE OFF (PTO) 12 VOLT SWITCH

The apparatus shall be equipped with a power shift PTO driven by the chassis transmission. An indicator light shall be located in the cab next to the PTO switch to show when the PTO is engaged. The PTO shall only engage with the parking brake applied and the transmission in neutral. If the unit is equipped with a pump, the PTO shall be active if the transmission is in "Drive", only if the fire pump is engaged. The PTO shall be a heavy duty pressure lubricated and cooled unit for extended operations.

A master 12 volt "Ladder Power" switch shall be provided adjacent to the PTO switch for control of all ladder 12 volt power, with the exception of the emergency pump circuits.

## AERIAL HOUR METER

An aerial hour meter shall be installed in the cab adjacent to the ladder power and PTO control switches. The hour meter shall be wired to the aerial PTO circuit to record hours of operation for the aerial. The hour meter shall aid in scheduling preventative maintenance as outlined in the operator's manual.

## ENGINE FAST IDLE ACTUATOR

The fast idle actuator shall be used to raise the engine RPM to a preset level for proper aerial operation. The fast idle switches shall be located at the main outrigger control station and the aerial control station/s.

For the safety of personnel and equipment, the fast idle system shall not activate unless the transmission is in neutral.

## TORQUE BOX

A torque box shall be provided to transfer all aerial loads and torque into the four outriggers, thus preventing the loads from being transferred through the chassis . The torque box shall be constructed of .375" steel plate with the exception of the turntable area which shall be .50" steel plate. The torque box sub frame assembly shall be capable of withstanding all torsional and horizontal loads when the unit is on the stabilizers. An open base shall be designed to accommodate the storage of ground ladders as specified in the body portion of these specifications. The torque box shall be bolted to the chassis frame rails with forty two (42), 3/4" SAE grade 8 bolts and nuts.

This type of construction shall be required for the following reasons:

- Replacement of the chassis in the event of vehicle damage to this chassis.
- Replacement of the chassis due to age.

## OUTRIGGERS

Four (4) double box beam type out and down outriggers shall be provided. The side to side spread of the outriggers shall be 18' from centerline of the vertical jack beams. The outrigger system will be capable of leveling the vehicle, fore/aft and side to side.

The horizontal outrigger beam shall be fabricated from 1/2" steel side plates and 1" steel top and bottom plates.

Each outrigger assembly shall have 2 Nylatron slide pads with a total area of 24 sq. in. to provide smooth operation and to extend the life of the outrigger.

The vertical jack cylinder rods shall be fully enclosed by a telescopic inner steel jack box that shall do the following:

- Protect the cylinder rods against damage which may occur while on the fire ground.
- Add lateral stability to the outrigger structure.

The extension of the horizontal outrigger beam shall be accomplished by a hydraulic cylinder which shall have a 3" bore and 2" rod and 62" stroke. This cylinder shall have cushion porting to reduce shocks in stopping the cylinder at full extension and retraction.

For ease in maintenance, outrigger extension cylinder shall be equipped with end connections, which do not require removal of body panels to remove pins or the extension cylinders.

Each jack cylinder shall have a 5" bore with a 3-3/4" rod and a 33" stroke. The jack cylinders shall be equipped with integral (on the cylinder) holding valves, which shall hold the jack cylinder in either the stowed position or the deployed position should a hydraulic line be severed at any point within the hydraulic system. Each jack cylinder shall also have a thermal relief system that shall prevent the cylinder fluid pressure from rising due to fluid temperature increase.

## OUTRIGGER PENETRATION

The outrigger design shall allow for the aerial device to be capable of operating safely, on any slope up to 11-degrees at full capacities. (Operation beyond this limit will be at the operator's discretion.)

**OUTRIGGER EXTENSION STRING POTENTIOMETER**

An extension string potentiometer shall be provided on each outrigger to measure the relative extension of the outrigger. The potentiometer shall sense and provide a signal for full outrigger extension.

**JACK FOOT PADS**

A permanently attached self-centering steel foot pad, 1/2" x 13.5" x 15.5" (209 sq. in.) shall be provided on each vertical jack beam. Each foot pad shall swivel longitudinal and require no adjustment during outrigger set-up.

The outrigger pad shall be attached without the use of a bearing type swivel due to maintenance required on this design.

**AUXILIARY STABILIZER PADS**

Four (4) auxiliary pads with handles shall be provided for additional load distribution on soft surfaces. Their size shall be 24.00" x 24.00" and they will be constructed of a composite material. The ground contact area for each stabilizer shall be such that a unit pressure not greater than 75 psi (500 kPa) shall be exerted over the ground contact area when the apparatus is loaded to its maximum in-service weight and the aerial device is carrying its rated capacity in every position permitted by KME.

The auxiliary pads shall be secured in mounts located below the body compartments.

**OUTRIGGER/LADDER INTERLOCK SYSTEM**

An interlock system shall be provided between the outriggers and ladder that prevents the operation of the ladder until the operator places all jacks in the load supporting configuration. Each outrigger shall be equipped with a pressure sensitive switch that closes only when the jack is firmly in contact with the ground. Until all jack switches close, electrical power shall not be transmitted to the turntable (hence preventing ladder operation). A key controlled override switch shall be provided at the central outrigger control station for emergency override of the interlock system. A green indicator light shall be provided on the outrigger control panel to indicate the position of the foot pad. Illumination of the indicator light indicates firm ground contact.

**OUTRIGGER DEPLOYMENT WARNING ALARM**

An outrigger deployment warning device shall be provided to warn personnel in the vicinity of the apparatus that the outriggers are in motion. Whenever an outrigger control is utilized, the device shall produce a pulsing tone, separate and distinctive from that of other audible warning systems provided on the apparatus. When the outrigger control is released to its neutral position, the signal shall cease.

**OUTRIGGER LIGHTING**

Each outrigger shall be equipped with the following light package:

One (1) adjustable, Grote 63611 WhiteLight, LED ground flood light mounted under the body, to illuminate each outrigger foot pad area.

Both the flashing lights and the foot pad illumination lights shall be energized by the ladder power circuit.

**OUTRIGGER WARNING LIGHTS**

The outrigger warning lights are included in the warning light package previously mentioned.

The outrigger warning lights shall be energized by the ladder power circuit.

The outrigger warning lights shall also be energized by the primary warning light switch.

**OUTRIGGER SCOTCHLITE**

White ScotchLite material shall be furnished on both sides of the horizontal and vertical beams of the rear outriggers.

**OUTRIGGER CONTROLS**

Two (2) illuminated electronic outrigger control stations shall be provided on the rear of the apparatus, one on each side of the body. The controls shall be located such that the operator can see the outrigger he is operating. The control stations will include the following:

- Four (4) outrigger fully extended indicator lights
- Four (4) outrigger set indicator lights
- Four (4) outrigger control toggle switches
- One (1) Fast idle control
- One (1) Ladder Operation indicator light

Out and down outrigger control functions for each outrigger shall be operated independently, so that vehicle may be set up in restricted areas or on uneven terrain. The diverter valve override control shall be mounted at the center rear hydraulic area behind the hinged outrigger control panel.

The diverter valve override control shall be mounted at the center rear hydraulic area behind the hinged outrigger control panel along with the override key and EPU actuator switch.

A hinged panel shall be provided at the rear center of the body and shall allow the operator to access the diverter valve manual override control, outrigger manual override controls, the electrical system back-up switch, override key switch and EPU controls and hydraulic filter indicator lights.

**OUTRIGGER LEVEL**

One (1) bubble type side to side leveling device shall be provided at the rear of the apparatus to assist in the aerial device setup. This device shall be mounted in the center of the rear body panel and shall be at eye level to the operator. The leveling device shall be color coded indicating the following conditions:

- Green Safe operating zone.
- Yellow Caution operating zone.

Since use of this leveling device is of a critical nature, it shall have a serialized number from its manufacturer to indicate documented quality control.

**TURNTABLE/TURNTABLE DECK**

The turntable shall be a fabricated steel weldment designed for the rotation and elevation of the ladder sections and platform. It shall consist of the following:

- A 50-1/2" x 61" x 1.75" steel bearing plate and matching top plate that shall be machined to insure proper fit to the rotation bearing.

**TURNTABLE DECK - ALUMINUM TREADPLATE**

The turntable deck shall cover the entire turntable frame, providing a safe walking surface around the ladder. It shall have a 1.5" downward flange on all sides. The deck shall be constructed from aluminum treadplate to provide an anti-slip walking surface.

**HEEL PIN STEP**

A two (2) step aluminum tread plate access step shall be mounted near the heel of the ladder to provide easy access to the ladder from the turntable deck. The step shall cover the rotation motor and brake assembly and shall easily removable for access to the drive assembly.

**TURNTABLE HANDRAILS**

Turntable safety handrails mounted at the rear and sides of the turntable. The handrails shall be knurled aluminum extrusions and the joining fittings shall be polished chrome plated tees and ells. The handrails shall secure to the turntable deck with heavy duty coated steel stanchions. All rails shall be a minimum of 42" high.

**HEEL PINS**

The turntable and ladder shall be designed with dual heel pins at the turntable/ladder pivot point. The pins shall be solid steel extending the full width of the turntable vertical supports. The heel pins shall be a minimum of 3.5" in diameter and is to be equipped with large pin journals in the ladder and turntable supports, which will reduce wear and distribute loads.

Due to the high load and wear on the ladder pivot points, the pin journals in the ladder base rail shall be designed to provide bearing surfaces utilizing ToughMet® 3 AT110 Temper Plate high strength alloy bearing material. The journals shall have minimum yield strength of 110,000 psi. Grease fittings shall be provided in bearing at the rear of the ladder section.

**CRADLE ALIGNMENT INDICATOR ARROWS**

Stainless steel arrows shall be provided on the turntable surface in view of the operator when standing at the turntable control station. The arrows shall assist the operator in indicating the alignment of the aerial ladder with the ladder travel cradle. The indicators shall be overlaid with ScotchLite material.

**TURNTABLE SAFETY CHAINS**

Each turntable handrail opening shall be equipped with safety chains at the rear of the turntable.

**HYDRAULIC, ELECTRIC AND WATER SWIVEL**

Hydraulic power to the turntable hydraulic circuits shall be provided through a two (4) port, high pressure, hydraulic swivel that permits 360 degrees of continuous turntable rotation.

Electrical power to the turntable electric circuits shall be provided by a collector ring assembly. The collector rings shall be used for electrical ground, ladder control functions, and a 120 volt A.C. system during 360 degrees of continuous turntable rotation. The collector ring assembly shall have a minimum of **36** circuits.

Water shall be transferred to the aerial waterway by means of a five (5) inch water swivel enabling 360 degree continuous rotation of the turntable.

**ROTATION ENCODER**

The swivel shall be designed with an integral absolute encoder to provide a continuous output indicating the position of the turntable at any given time. The encoder shall be designed to indicate position of the turntable even if power interruption occurs. The number of degrees of rotation shall be shown in a digital readout on the MD3 display.

**LADDER SECTION CONSTRUCTION**

The elevating ladder shall consist of three (3) steel ladder sections referred to as the base section, lower mid section, upper mid section and fly section. Each section will be fabricated from 100,000 psi yield ultra high strength steel.

The design and construction criteria for these ladder sections shall be:

- Each section shall be fabricated using high strength steel, welded together to form a structural unit.
- All welding shall be done by welders that have been certified in accordance with the American Welding Society Standard specifications #D.1-97.
- Each ladder section shall be constructed in an assembly fixture to ensure uniformity and interchangeability.
- K-bracing at each rung shall be utilized to minimize side deflection of the ladder.
- All rungs shall be 1-1/8" in diameter, spaced at 14" centers. Rungs will be round.
- All rungs, K-braces, and diagonals shall be positioned so that they are continuously welded to the ladder section.
- All side rails shall be protected from interior corrosion by coating the interior of the rail with a corrosion preventative film.

Ladder handrails and diagonal material are to be constructed from square or rectangular tubing, which provide a larger welding surface area where the materials are attached to each other.

**BASE SECTION**

Due to forces created by elevation and rotation, torsional or twisting moment is present in all aerial device designs. The base section shall be constructed utilizing a high strength 100,000 psi steel 6" x 3" base rail tubes with a .5" x 4.25" steel top plate for load transfer. The handrail shall be constructed utilizing a combination of high strength 100,000 psi steel 5" x 2" handrail tube. The two (2) rails shall be welded together with diagonal sections, creating a truss structure which shall support all weight and forces imposed by the mid and fly sections.

**MID SECTION**

The mid section shall be constructed utilizing a combination of high strength 100,000 psi steel 6" x 3" and a 3" x 2" base rail tube with a .375" x 4.25" wide top plate for load transfer. The handrail shall be constructed utilizing an high strength 100,000 psi steel 4 " x 2" handrail tube. The base rail tube and handrail tubes shall be welded together with diagonal sections, creating a truss structure which shall support all weight and forces imposed by the fly section.

**FLY SECTION**

The fly section shall be constructed utilizing a combination of high strength 100,000 psi steel 5" x 2" base rail tube. The handrail shall be constructed utilizing an ultra-high strength 100,000 psi steel 3" x 2" handrail tube. The base rail tube and handrail tubes shall be welded together with diagonal sections, creating a truss structure which shall support all weight and forces imposed by the tip loads.

The fly section shall be designed specifically for the purpose of supporting the platform. This support structure shall be in the form of a solid and integral weldment designed to support the leveling system and platform pivot points. The support shall be designed to structurally support the platform, platform movements, and loads in aerial operation and in over the road travel.

**LADDER SECTION DIMENSIONS**

All bidders shall state in the space provided below their dimensions on the unit proposed. Dimensions proposed must equal or exceed those specified.

| | Handrail Height | Handrail Width |
|---|---|---|
| Base Section | 30" | 42.5" |
| Mid Section | 26.5" | 33.25" |
| Fly Section | 24" | 24" |

OVERLAP SURFACES BETWEEN SECTIONS

| | |
|---|---|
| Base to Mid Section | 105” |
| Mid to Fly Section | 105" |

**LUMINESCENT RUNG COVERS**

Each rung shall be covered with a secure, heavy-duty, fiberglass pultrusion that incorporates an aggressive, non-slip coating. The rung covers shall be secured to each rung utilizing a Silyl Modified Polymer (SMP) based adhesive and shall be easily replaceable should the rung cover become damaged. Each rung shall have a minimum of 4" of photo luminescent coating in the center of the rung, two (2) 5" black sections on each side of the center photo luminescent and additional photo luminescent sections on the outside edge of each cover. The covers shall provide an aggressive, non-slip coating and assist in providing a light source for each rung during low light conditions. The photo luminescent coating shall remain visible for up to 20 hours after exposure to light.

The rung covers shall be covered by a ten (10) year warranty. A copy of the written warranty shall be provided.

**RESCUE STRETCHER MOUNT**

A rescue stretcher mount shall be provided on the base section for storing a rescue stretcher. The design of the stretcher mount shall be as follows:

Two (2) open top mounts shall be constructed from aluminum which shall be painted ladder color and fastened to the ladder base section. Each mount shall be equipped with a Velcro strap to restrain the rescue stretcher. The rescue stretcher shall be easily accessible from the inside the ladder section or from the top of the body.

The specified rescue stretcher shall be located on the right side of the base section.

**AERIAL TRAVEL SUPPORT**

A heavy duty rest shall be provided to support the aerial in the travel position. Stainless steel bedding plates shall be attached to the aerial base section to protect the aerial when the unit is in the travel position.

**CRADLE ILLUMINATION LIGHTS**

Two (2) 12 volt Grote WhiteLight 63611 LED flood lights shall be mounted near the ladder travel support to illuminate this area during night time operation. The lights shall be wired and activated by the ladder power circuit.

## ELEVATION SYSTEM

Two (2) double-actinq lift cylinders shall provide smooth, precise elevation of the ladder. Lift cylinders located on the base ladder section shall be attached to a triangulated lifting configuration which distributes equal force to each side of the ladder base section. The triangulated lifting configuration shall apply all lifting forces in a plane parallel to the vertical center line of the base and side rails. This arrangement shall consist of front and rear cross tubes, forward triangle tube, rear triangle fube, lift cylinder outboard support tube and steel plating welded into place where the lifting
cylinders attach to the aerial ladder base section. The lift cylinder rods shall be attached to the base section with self aligning swivel bearings which prevent side loading on the lift cylinders resulting in longer cylinder seal life. They shall provide smooth precise elevation from -12 degrees below horizontal to +80 degrees above horizontal. The lift cylinders shall have a 7.5" internal bore, a 4" diameter rod and 44.5" stroke.

The lift cylinders shall be equipped with integral (on the cylinder) holding valves which prevents the ladder from lowering should a hydraulic line be ruptured at any point within the hydraulic system. They shall also have a manifold line with velocity fuses between the cylinders to prevent uneven cylinder lift and they shall have both rod and piston hydraulic cushions. These cushions shall decelerate the cylinder near the end of its stroke creating a smooth stop at full stroke.

## LADDER INTERLOCK SYSTEM

A limit switch at the aerial travel support shall be provided to prevent operation of the outriggers once the aerial has been elevated from the nested position. This system will prevent operation of the outriggers once the ladder has been elevated from the nested position.

## INCLINOMETER

An inclinometer shall be provided on the base section of the aerial device to measure the relative angle of the ladder.

## MOMENT LOAD INDICATOR

A pressure switch shall be installed on the lift cylinder to indicate the amount of lifting force being imparted onto the aerial device.

## ELEVATION FEATHERING

Controlled by the IQAN motion control system, the elevation system shall be design utilizing computer control technology to provide ramped, feathering cushioning for the elevation system at the end of cylinder stroke. The system shall automatically feather the movement of the ladder when the ladder approaches full elevation, regardless of the input speed from the platform or turntable controllers.

## LOAD METER

The IQAN motion control system shall incorporate an integral load meter, which shall display load level on the aerial ladder and platform proportionate to the maximum-rated low elevation load of the device. The load meter shall calculate the current load and display it on the MD3 displays located at the turntable and the platform control console. The display instantly adjusts to changes in ladder angles, extension or live load.

The load meter system shall include:

- A pressure transducer installed in the hydraulic system. The pressure transducer is to have an accuracy of ± 1%.
- Bar Graph indicating moment load range.
- Actual percentage of moment load range.
- An audible horn mounted near the display.

## ROTATION SYSTEM

A minimum 50.625" external tooth monorace bearing shall be provided for smooth 360 degree continuous rotation of the aerial device. The upper inside half of the bearing shall be bolted to the turntable base plate plate with thirty (30) 1" diameter grade 8 bolts. the lower outside half of the bearing shall be bolted to the open base bearing support structure with thirty (30) 1" diameter grade 8 bolts.

Both upper and lower bearing surfaces shall be milled to ensure a true mounting surface for the rotation bearing.

## ROTATION MOTOR AND BRAKE

A planetary drive speed reduction gear box powered by a hydraulic motor shall provide precise rotation control throughout 360 degrees of rotation. An automatic spring applied hydraulically released disc type brake shall be incorporated into the gear box to provide positive braking and holding the turntable/ladder against reactionary forces such as water and gravity.

## SWING DRIVE ADJUSTMENT

The swing drive shall be designed with an adjustable mount. This shall allow the back lash to be set at assemble and provide the ability to re-adjust as components wear. This shall prevent the need to replace rotation components that may exceed manufacturer's allowable back lash in later aerial inspections. Units that do not allow adjustment shall not be acceptable.

## E-SPEED™ SAFETY SYSTEM

The rotation system shall be controlled from the platform utilizing E-Speed™ technology, which shall automatically control platform rotation speed, proportional to the extension and elevation of the ladder. The E-Speed™ safety system shall automatically maintain the rotation angular speed regardless of the degrees of elevation or extension of the ladder, providing safer low angle operation and precise positioning control. The E-Speed™ safety system shall be controlled by the IQAN control system.

## E-ZONE™ ROTATION SAFETY SYSTEM

The E-Zone™ Rotation Safety System has been designed to aid the aerial device operator who has primary operational responsibility in preventing the rotation of the aerial device into an over turning mode. Controlled by the IQAN system, the E-Zone™ Rotation Safety System senses outrigger extension and outrigger jack positioning in conjunction with the aerial device movement.

If the aerial device operator attempts to move the aerial device off vehicle center, and the outriggers are not fully extended on the direction of the rotation side, and all jacks in firm ground contact, the E-Zone™ Rotation Safety System shall sense this fault and shall audibly and visually warn the operator to return the aerial device to the center line position. If the operator continues rotation into the short-jacked zone, the aerial device rotation shall stop. When rotation is stopped, the E-Zone™ Rotation Safety System shall allow the operator to only rotate back to the fully jacked side of the vehicle.

## EXTENSION/RETRACTION SYSTEM

A full hydraulic powered extension and retraction system of the ladder shall be provided through dual hydraulic cylinders and cables, each capable of operating the ladder in the event of failure of one of the systems.

The extension cylinders shall have a 4.5" internal diameter (bore) with 2.5" diameter rod. The extension/retraction cylinders shall be equipped with integral (on the cylinder) holding valves to prevent the unit from falling should the charge lines be severed at any point within the hydraulic system.

The extension cylinder shall be provided with "hydraulic cushions". The cushions shall serve to decelerate the cylinder near the end of its stroke resulting in a smooth stop at full cylinder stroke. Cables attached to the base and mid ladder section shall be routed over sheave wheels on the base section and cylinder rod. This cabling arrangement shall act as a stroke multiplier to provide full-power ladder extension and retraction.

The extension/retraction cables shall have a minimum safety factor of 5:1 and shall be of the following diameters: Section: Base/Mid Section: 5/8" and Mid/Fly Section 1/2”.

In order to minimize the obstruction to the ladders climbing area, the extension and retraction sheave wheel assemblies and cables shall be located between the aerial ladder section handrails.

The extension cylinders shall be painted to match the color of the ladder.

## EXTENSION SYSTEM STRING POTENTIOMETER

An extension string potentiometer shall be provided on the aerial device to measure the relative extension of the aerial device.

## E-CUSH™ EXTENSION/RETRACTION FEATHERING

Controlled by the IQAN system, extension/retraction system shall be designed utilizing E-Cush™ technology to provide feathering cushion for the extension and retraction at the end of cylinder stroke. The E-Cush™ system shall automatically feather the movement of the ladder when the ladder approaches full extension or full retraction, regardless of the input speed from the operator.

## LADDER SLIDE MECHANISM

Nylatron slide pads with a sliding coefficient of friction of .15 shall be used between the telescoping ladder sections. Slides are required because of greater surface area for load transfer between the telescoping sections. Slide pads shall also be used to control side play between the ladder sections.

The rear slide pads shall be held into place by a machined receiver, which is welded into the base rail of the extending sections. Each slide pad shall be held into place with an easily removable keeper, allowing the pad to be removed from the rear of the ladder section. To control movement side to side the receiver shall allow for adjustment of each pad.

## LADDER EXTENSION NUMBERS

ScotchLite numerals shall be furnished on the inside of the ladder base section handrail, each side, to help the operator determine the distance the ladder is extended. The numbers shall read in five foot increments.

## LADDER ANGLE INDICATOR

One (1) Rieker 12 volt lighted, ladder angle indicator shall be provided on the base section of the ladder, near the turntable control console. The integrated light shall be activated with ladder power.

## AIR/ELECTRIC/HYDRAULIC LADDER TRACK

All air, electric and hydraulic line routing shall be accomplished using a flexible conduit system. Routing shall be such that cables shall be fully enclosed except at points of transition between sections. The conduit shall run through the handrail uprights, so the conduit does not decrease the interior width of the ladder.

## PLATFORM CONSTRUCTION

The aerial platform will be designed for modular construction. The handrails, floor and support structure will be assembled to enable each component to be unbolted from each other for ease of replacement should a component of the platform be damaged.

The platform will be constructed of five assembly groups:

- Platform support structure
- Handrails
- Corner gates
- Floor extrusion
- Rear access gate

## PLATFORM SUPPORT STRUCTURE

The support structure of the platform shall be a steel weldment consisting of 100,000 psi steel tubing for strength and rigidity. The slave leveling cylinders shall attach to this structure from the ladder fly section, thus keeping the platform level at all times.

## PLATFORM HANDRAIL ASSEMBLY

A continuous, unbroken handrail shall be provided on all four sides of the platform. The handrail shall enclose an area of the floor to provide 22.8 square feet. The handrails on the front corners shall be mounted at the same angle as the platform floor for a uniform front and side step area.

A 4" kick plate shall be provided near the floor at perimeter of the handrail assembly.

## PLATFORM STRUCTURE FINISH

The sub structure components of the platform, listed below, shall have an aluminum finish.

- Handrails
- Corner gate sub frame
- Rear access sub frame

The platform support structureshall be painted black

## PLATFORM ACCESS GATES

Two (2) self-closing access gates shall be provided for entry into the platform. They shall be provided at the front corners of the platform and shall not interrupt the top safety rail. Both gates shall be hinged at the rear and shall swing inward. Each gate shall include automotive type safety latches. Each gate shall be designed utilizing 2" X 2" tubing, which shall incorporate an integral handrail in the top section of the door. The integral handrail shall be constructed from 1-1/4” round aluminum tubing that shall be knurled anti-slip material. The gate hinges shall be a two-point type hinge to eliminate binding associated with a piano type hinge.

## PLATFORM ACCESS LADDER AND HANDRAILS

Handrails shall be provided off the rear of the platform to bridge the gap between the platform and the ladder for safe transfer when the ladder is raised to high elevations.

The main entrance between the ladder and platform shall be located at the rear. The rear gate shall be 2.25" diameter round tubing, mounted to a two position spring loaded hinged, which shall give the gate the capabilities of being lifted up 90° or up and in 90° into the platform. When the rear gate is in the closed position, it shall rest in a socket type receptacle located on the rear main handrail structure of the platform. The rear gate shall be equipped with a mechanical pin to secure the gate in a fixed position.

## PLATFORM FLOOR

The floor of the platform shall have a total internal (inside handrail) area of 22.80 square feet, with a 9" external step for a combined total area of 29.00 square feet. The floor shall be an open-type non-slip grating, thus preventing the accumulation of water on the platform floor.

The floor shall be a one-piece assembly which extends out past the platform handrail structure 8.00" on each side and 9.00" at the forward gate corners, making transfer in and out of the platform easier.

For safety of transfer to or from the platform, the platform floor and outside platform step shall be on the same level. The two (2) front corners of the floor shall be cut at a 27 degree angle, allowing the platform to be maneuvered closer to buildings.

The underside of the platform shall be protected by the solid aluminum tread plate with the exception of the four (4) drain holes. By having a floor with solid construction, protection against direct contact with heat radiation shall be provided.

## PLATFORM MOUNTING

The platform shall be suspended from the tip of the fly section in a manner that provides a cushioning effect when the vehicle encounters road irregularities. The steel platform support weldment shall be pinned to the end of the fly; and the hydraulic cylinders shall be attached at a point below the pinning point and to the fly section behind the pinning point to create a load absorbing triangle which utilizes the cushioning effect of the cylinders in the design. This support assembly shall not hang below the top of the windshield and shall not obstruct the driver's view.

The support structure shall be designed to withstand the forces created by the vehicle when it encounters road irregularities.

Two (2) heavy duty poly landing skis shall be installed under the platform to prevent damage to the platform when the unit is placed on the ground or on the edge of a building. The landing skis shall be positioned so it is the only component touching the building or ground depending on ladder position.

## PLATFORM LEVELING SYSTEM

A platform leveling system shall be provided and so designed that the platform, together with its rated payload, can be supported and maintained level in relation to the turntable, regardless of the elevation of the ladder.

Platform leveling shall be accomplished by hydraulic circuitry that is independent from the main hydraulic system with an interconnecting control valve.

The leveling of the platform shall be accomplished by the following two (2) systems working together.

Dual master/slave hydraulic cylinder - The leveling of the platform shall feature a dual master/slave system with each side capable of maintaining the platform level. Two (2) 3.5" bore master cylinders shall be mounted between the turntable and the ladder base section; and two (2) 3.5" bore slave cylinders shall be mounted between the ladder fly section and the platform. Master/slave cylinders shall be equipped with spherical swivel bushings to extend cylinder seal life and provide a non-rigid, cushioned suspension of the platform.

To maximize turntable stepping area, the master leveling cylinders shall be mounted inside the turntable.

As the platform is raised or lowered, hydraulic fluid shall be transferred between the master and slave cylinders, thus maintaining the platform level. The slave cylinder shall be mounted outside of the platform for maximum platform space utilization.

Auto-leveling system - An automatic level sensing device, located in the platform, shall be provided to ensure that the platform is always level. The leveling system shall provide the following safety features:

- The leveling system shall be so designed that with the platform raised to its maximum elevation, the platform slave cylinders shall be fully retracted, thus making tipping of the platform impossible should a hydraulic failure occur.
- Leveling cylinders shall have hydraulic holding valves to prevent the platform from tipping should the hydraulic lines be severed.
- The slave cylinders shall be mounted outside the platform for maximum utilization of space and for safety of personnel from moving cylinders.

The following safety features shall be provided in the leveling system:

- The slave cylinders shall be mounted outside of the platform for maximum platform space utilization and safety for personnel from moving cylinders.
- Holding valves shall be provided on the slave cylinders to prevent the platform from tipping should any hydraulic leveling line be severed.
- Heat resistant flexible hydraulic lines and steel tubing shall be provided between the master and slave cylinders.
- The platform and platform loads shall be directly supported by the ladder section.

## PLATFORM FLOOR HEAT SHIELD

The underside of the platform floor shall be covered with 0.090" polished aluminum tread plate. The heat shield shall be designed to enclose the platform waterway pipes, electrical junction boxes and any hoses or wires. The heat shields shall also provide mounting surfaces for quartz lights and warning lights. The heat shield shall allow easy access to the components mounted under the platform floor.

**PLATFORM COVERING**

The front, sides and doors of the platform shall be covered with 0.090" polished aluminum tread plate.

**SAFETY BELT LOOPS**

Four (4) forged steel eyebolts shall be provided in the platform. The eyebolts shall be located as follows; two (2) shall be located in the rear of the platform – one (1) each side and two (2) shall be located on the front of the platform.

**LIFTING POINTS**

Two (2) 3" diameter lifting points shall be provided under the platform, which shall be attached directly to the platform support arms. This design shall ensure the loads implied on the lifting points shall be directly supported by the ladder structure and not transferred to the platform framework or the platform leveling system.

**RESCUE LADDER BRACKETS**

Brackets shalll be provided for use each side of the platform, capable of holding up to a 16 foot roof ladder securely in place. The ladder shall be secured by the ladder rungs. The roof ladder or the mounting brackets shall not restrict operations of the platform monitors or platform interior space.

The complete system shall withstand a 500 pound load while maintaining a minimum two to one (2:1) safety factor. There shall be a latching arrangement to secure the ladder in a angled vertical position at all times.

******* PLATFORM 120 VOLT ELECTRICAL SYSTEM & ACCESSORIES *******

**PLATFORM 120 VOLT SYSTEM**

Two (2) 120 volt 20 amp electrical circuits utilizing 12 gauge five strand electrical cable shall be provided to the platform. Circuits shall be wired from the platform to the turntable through the collector ring assembly.

**PLATFORM 120 VOLT RECEPTACLES**

Two (2) 120 volt, NEMA L5-20R, 20 amp, twist lock type receptacle with weatherproof covers shall be provided. They shall be installed one (1) on each side near the rear of the platform on the vertical supports.

Both receptacles shall require one (1) 20 amp, 120 volt circuit breaker to be installed in the load center.

**REAR OF PLATFORM TELESCOPING LIGHTS**

Two (2) Akron Scenestar, 220 watt, 120 volt telescoping LED lights shall be mounted on the rear of the platform. Each light shall be provided with a pull up, telescoping pole and shall be switched at the light head. Two (2), 200 watt light heads shall require one (1) 120V, 15 amp circuit breaker. Each light will have an output of 20,000 lumens.

**FRONT OF PLATFORM RECESSED LED LIGHT**

One (1) 220 watt Akron SceneStar, 220 watt, 120 volt LED light shall be recessed on the front center of the of the platform. The light shall be adjusted to illuminate the front of the platform without blinding the operator. The light will be capble of producing 20,000 lumens.

The light shall be wired to the breaker panel and shall be switched from the following location(s):

- Platform Console

******* PLATFORM 12 VOLT ELECTRICAL SYSTEM & ACCESSORIES *******

**PLATFORM 12 VOLT CIRCUIT**

All 12 volt electrical lines to the platform shall be enclosed and protected from the turntable to the platform. All 12 volt electrical lines shall be routed through the base section rails and then through flexible aluminum conduits the travel under and over the mid section(s) and end at the base of the fly section.

Platform designs where electrical, air, or hydraulic lines are exposed on the interiors of the ladder handrails shall not be acceptable.

**TURNTABLE HEEL PIN STEP LIGHTS**

Seven (7) polished stainless steel, TecNiq Eon 3-LED horizontal surface mounted lights shall be provided and installed with a gasket at the base of the ladder in the turntable heel pin step area.

**TURNTABLE CONSOLE STEP LIGHT**

One (1) polished stainless steel, TecNiq Eon 3-LED horizontal surface mounted lights shall be provided and installed with a gasket at the front face of the turntable console facing the operator, to illuminate the step area in front of the control console. The light shall be mounted no lower than 18" from the step deck.

**PLATFORM CONSOLE STEP LIGHT**

One (1) polished stainless steel, TecNiq Eon 3-LED horizontal surface mounted lights shall be provided and installed with a gasket at the front face of the platform control console facing the operator, to illuminate the step area in front of the control console.

**PLATFORM AND TURNTABLE CONSOLE LIGHTING**

A sealed 12" Amdor Lumabar LED H2O light shall be used to illuminate the platform and turntable control consoles. The light shall be mounted across the top of the control panel to assure proper illumination of all controls.

The light shall be wired to the ladder power circuit.

**MARKER LIGHTS**

Five (5) amber LED marker lights shall be mounted on the front of the platform.

**BASE SECTION LIGHTS - 12 VOLT**

Two (2) Unity LED spotlights shall be mounted at the rear of the base ladder section, one on each handrail. The lights shall be equipped with a swivel base and an on/off switch on the light head itself.

**PLATFORM LIGHTS - 12 VOLT**

Two (2) Unity LED spotlights shall be mounted on the front of the platform handrail, one on each side. The lights shall be equipped with a swivel base and an on/off switch on the light head itself.

## LUMA BAR PATHFINDER™ AERIAL ILLUMINATION SYSTEM

The ladder sections shall be equipped with the Luma Bar Pathfinder™ aerial illumination system. This system shall illuminate the rungs of the ladder to support night time operations

The Luma Bar Pathfinder™ system shall consist of a continuous path of red SMD LED lights spaced every ¾" which shall offer a minimum viewing angle of 120 degrees. The assembly shall be encapsulated within an enclosure which is resistant to UV and ozone and shall be terminated using sealed end caps with RTV silicone. The complete assembly shall offer a minimum water proof rating of IP68. This sealed enclosure shall be mounted within a clear anodized aluminum C-channel on the inside of the rung base rail, on each ladder section.

The Luma Bar Pathfinder™ assembly shall incorporate a UV stabilized high impact polycarbonate shield which is integral to the supplied aluminum C-channel. The Luma Bar Pathfinder™ system shall be wired to the ladder power circuit with a disabling switch at the turntable control console.

## PLATFORM WARNING LIGHTS

Four (4) Whelen 60*02F*R super LED lights shall be provided on the platform in order to comply with NFPA-1901 Optical Warning Devices when the platform is cradled. Two (2) of the lights shall be located on the front face of the platform floor structure and two (2) lights shall be located on the side of the platform, one (1) each side. The lights shall be activated with the warning light and ladder power circuit.

Each light head shall be equipped with red LED's and a colored lens.

The lights shall be installed with a chrome plated mounting flange.

## PLATFORM HOSE STORAGE COMPARTMENT (RH SIDE)

A hose storage compartment shall be provided on the right side of the platform. The compartment shall be fabricated from 1/8" aluminum tread plate and shall be mounted on the outside of the platform. The compartment shall be capable of holding a minimum of 100' of 1-3/4" light weight hose.

## PLATFORM AXE MOUNT

An 8 lb. pick head axe shall be provided and mounted in the platform. The axe location shall be in the left rear of the platform within the framework of the platform structure. The axe shall in no way obstruct the interior of the platform.

## CONTROL STATIONS

There shall be two (2) control stations. One shall be known as the platform control station and the other shall be known as the turntable control station. All elevation, extension and rotation operational controls shall operate from both of these positions. These controls shall be arranged to permit the operator to regulate the speed of these operations within the safe limits as determined by the manufacturer. The control devices shall be grouped in an identical manner at both stations for similarity of operation and to meet NFPA-1901.

Platform load instruction plates shall be located at both control stations to indicate the recommended safe load of the platform. The control devices shall be clearly marked and suitably lighted.

The controls shall be so designed to allow the turntable control station to override the platform controls even if the ladder is being operated by the platform controls.

The turntable control station shall be located on the left side of the turntable such that the operator can easily observe the platform while operating the controls.

**TURNTABLE CONTROL STATION**

The lower part of the console shall be angled away from the operator, to provide as much foot room as possible for the operator.

An access door shall be provided on the front of the console to provide complete access to the electrical and hydraulic components mounted inside the console.

The console shall be illuminated for night operations, and shall have the following controls/indicators:

The following items shall be clearly marked:

- IQAN, MD3 display
- Three (3) ladder/platform control levers.
- A foot operated "dead man switch". That electrically opens the aerial control valve shall protect against accidental movement of the control handles.
- Master electrical power switch with emergency shutdown capabilities.
- Rung alignment indicator light for ladder climbing operations.
- Cradle alignment indicator light.
- Engine fast idle control switch.
- Emergency pump power switch.
- Keyed platform leveling switch.
- 5,000 psi hydraulic oil pressure gauge (Liquid filled).
- Intercom controls
- Illuminated load chart on front of console.

**AERIAL FLOWMINDER**

The apparatus shall be equipped with a Class 1 Flowminder, model #FMS at the turntable control console to give the operator an indication of actual volume of water (in gallons per minute) being discharged through the aerial waterway.

The Flowminder system shall consist of:

- A digital display that shall be weatherproof with super-bright digits at least 1/2" high. The display shall be wired to the flow transmitter to show flow.
- A flow transmitter mounted in the discharge line piping between the pump and the discharge outlet. The transmitter shall consist of a weather resistant black composite housing with a stainless steel, durable paddle wheel. The only part inserted into the water flow path shall be the paddle wheel.
- A set of weather resistant connectors to connect the digital displays to the flow transmitter and to the apparatus power.

The flowmeter shall be checked and calibrated prior to delivery of the apparatus.

**TURNTABLE CONSOLE COVER**

The turntable control console shall be designed with an aluminum cover to match the console. The cover shall be designed with a radius shape that pivots over the top of the control panel and does not obstruct viability for the operator when the ladder is operated at low angles.

## PLATFORM LADDER CONTROLLERS

Three (3) ladder directional controllers shall be mounted on the platform control console. They shall control extend/retract, rotation, and elevation. These controllers are part of the motion control system allowing safe operation of the ladder from the platform.

The controllers shall incorporate ICB; J-1939 can bus signaling, transmitted through two (2) J-1939 communication wires to reduce the chance of electrical failures since fewer wires and terminals shall be utilized. Additionally, voltage sensitivity is eliminated thus providing superior motion control.

## PLATFORM CONTROL CONSOLE

The platform control console shall be located at the right side rear of the platform to provide maximum room on the platform and to allow the operator to see around the platform and the ladder sections at the same time.

An access door shall be provided on the front of the console to provide complete access to the electrical and air system components mounted inside the console.

The following controls shall be located on or near the illuminated console:

- Motion Control MD3 display
- Operator "dead man" switch. That electrically opens the aerial control valve shall protect against accidental movement of the controls handles.
- Extend/Retract Control Lever
- Elevation Control Lever
- Left/Right Control Lever
- Cradle Alignment Indicator Light
- Fast Idle Control Switch
- Rung Alignment Indicator
- Panel Light/Power Switch
- Illuminated Load Chart
- Painted Aluminum Console Cover

## COMMUNICATION SYSTEM

A Fire Research communication system shall be furnished between the pump operator's panel, platform and the turntable operator's position. A master control at the turntable operator's console shall be provided, with a push-to-talk button and a volume control.

A self-contained, hands-free speaker microphone shall be located in the platform. No operator action shall be required to transmit or receive messages at this speaker microphone.

## LADDER ANGLE INDICATOR

One (1) Rieker model # 4120, 12 volt lighted, ladder angle indicator shall be provided on the fly section of the ladder, visible from the platform control console. The integrated light shall be activated with ladder power.

**BREATHING AIR SYSTEM**

A breathing air system shall be furnished which shall include two (2) 4500 psi, 444 (total 888) cubic foot DOT air cylinders, mounted on the side of the ladder base section in accordance with federal DOT practices. The cylinders shall be on the opposite side from the turntable control console.

The breathing air system shall be "prepiped" from the turntable to the platform using a Kevlar reinforced synthetic air hose. Air from the cylinders shall be routed through the lower regulator to be reduced from cylinder pressure to airline pressure and then travels up and through the ladder sections to the platform control console. The air is then routed through an inline air filter and regulator located in the platform.

Four (4) quick disconnects with plugs and retaining chains shall be located in the platform. The air couplings shall be matched to the type required by the Fire Department.

There shall be a quick coupling at the turntable console for easy refilling of the breathing air system without disturbing the air bottles.

A one hundred (100') refill hose shall be provided as loose equipment with this system for recharging the air cylinder.

The breathing air couplings shall be Schrader or Hansen type coupling to match the Fire Department's air system.

The motion control system shall monitor the breathing air level and display a massage indicating air level on the MD3 displays. A low breathing air alarm shall be provided in the air line downstream from the high pressure regulator, which shall activate a 95 DB fast pulse alarm mounted at the turntable and platform control stations if the breathing air pressure falls to or below the set percentages of the system capacity.

## AERIAL WATER SYSTEM

The aerial waterway system shall be capable of being supplied by both a midship mounted pump (if required) and an external water source with the inlet on the rear of the apparatus.

The piping from the aerial discharge valve and the rear inlet to the turntable swivel shall be 5" stainless steel pipe. A 5" tee shall join the pump discharge line and the rear inlet line. A 5" water swivel shall be located in the riser pipe from the tee permitting 360 degree continuous rotation of the ladder.

An anodized aluminum telescopic waterway shall be mounted beneath the center of the aerial ladder. The waterway shall have a 5" base section tube, 4-1/2" mid-fly section tube, and a 4" fly section tube.

The waterway shall be secured to the ladder sections with cradle type mounts to provide a minimum of 2" of up and down movement in the waterway. This design shall protect the waterway from bending if the ladder comes in contact with a building or a water hammer is imposed to the waterway discharge.

A 5" double swivel piped waterway with 5" flex tube connection between the ladder waterway and the turntable swivel permitting water tower operations from -10 to +80 degrees.

An automatic drain shall be provided in aerial water way to automatically drain the system for freezing conditions. This valve shall also act as a vacuum relief valve for the waterway when extending the aerial device with the discharges in the closed position.

A 2-1/2" relief valve preset at 225 psi shall be located beneath the turntable to protect the water system from excessive pressures.

A 1-1/2" drain valve shall be installed and operated from the rear of the apparatus.

## WATERWAY REAR INLET ADAPTER

The rear aerial inlet shall be equipped with a 4" NST adapter with long handle cap.

A Kochek 4" NSTF X 5" Storz SKE-R 30° adapter with cap shall be provided for the rear inlet.

**NOTE:** A 2 1/2" Thuemling pressure gauge shall be provided at the rear outrigger control panel of the vehicle to indicate waterway pressure.

The "FA" series pressure gauge, with pulse and vibration dampening, shall have interlube to lubricate the internal mechanisms to prevent lens condensation and to ensure proper operation to minus 40 degrees F.

The Zytel nylon cases shall be temperature compensated with an internal breathing diaphragm to permit fully filled cases and to allow a rigid lens with a distortion free viewing area. Gauges shall have white faces with black lettering and shall include an orange tip pointer for easy readability.

**PLATFORM WATER SYSTEM - DUAL MONITORS**

A 4" water swivel located under the platform shall connect from fly waterway to the platform waterway. The water swivel shall permit full operation at any elevation of the aerial device. Two (2) 4" pipes shall be provided to transfer water from the swivel to the deck guns. The platform waterway pipes shall be formed tubing to reduce friction loss in the waterway.

All platform waterway piping shall be completely removable for service or replacement. Platform designs in which the waterway is welded or utilized for structural integrity of the platform shall not be acceptable.

One (1) 100 GPM shower nozzle shall be located beneath the platform for heat protection for platform personnel. A direct linkage control shall be provided inside the platform.

**PLATFORM MANUAL TFT VALVE UNDER MONITOR, LEFT SIDE**

Task Force Tips VUM, model # AKP131 _ _ 1D manually controlled monitor valve shall be provided under the monitor. The valve shall be controlled with an NFPA compliant slow-close crank handle gear operator. A position indicator shall be provided to allow for quick visualization of the status of the valve in the open, closed or partial positions. For maximum corrosion protection the aluminum casting shall be hardcoat anodized, with a silver powder coat internal and external finish. The valve ball shall be stainless steel and have an automatic drain for draining waterway when valve is closed and unpressurized.

The valve shall be configured with a 4" ANSI 150 flange inlet and 4" ANSI 150 flange outlet.

The manifold of the valve shall be equipped with the following hardware;

- Port C1 and C4 shall be terminated with a blind plug, Port C2, and C3 shall be as stated below.

- A 2.5" NH male thread shall be installed on C2 port.
- A 2-1/2" x 1-1/2" reducer with cap and lanyard shall be provided for the discharge on C2 port.
- A 2.5" NH male thread shall be installed on C3 port.
- A 2-1/2" x 1-1/2" reducer with cap and lanyard shall be provided for the discharge on C3 port.

**PLATFORM MANUAL VALVE UNDER MONITOR, RIGHT SIDE**

Task Force Tips VUM, model # AKP131 _ _ 1D manually controlled monitor valve shall be provided under the monitor. The valve shall be controlled with an NFPA compliant slow-close crank handle gear operator. A position indicator shall be provided to allow for quick visualization of the status of the valve in the open, closed or partial positions. For maximum corrosion protection the aluminum casting shall be hardcoat anodized, with a silver powder coat internal and external finish. The valve ball shall be stainless steel and have an automatic drain for draining waterway when valve is closed and unpressurized.

The valve shall be configured with a 4" ANSI 150 flange inlet and 4" ANSI 150 flange outlet.

The manifold of the valve shall be equipped with the following hardware;

- Port C1 and C4 shall be terminated with a blind plug, Port C2, and C3 shall be as stated below.

- A 2.5" NH male thread shall be installed on C2 port.
- A 2-1/2" x 1-1/2" reducer with cap and lanyard shall be provided for the discharge on C2 port.
- A 2.5" NH male thread shall be installed on C3 port.
- A 2-1/2" x 1-1/2" reducer with cap and lanyard shall be provided for the discharge on C3 port.

**AERIAL FLOWMINDER**

The apparatus shall be equipped with a Class 1 Flowminder, model #FMS at the platform control console to give the operator an indication of actual volume of water (in gallons per minute) being discharged through the aerial waterway.

The Flowminder system shall consist of:

- A digital display that shall be weatherproof with super-bright digits at least 1/2" high. The display shall be wired to the flow transmitter to show flow.
- A flow transmitter mounted in the discharge line piping between the pump and the discharge outlet. The transmitter shall consist of a weather resistant black composite housing with a stainless steel, durable paddle wheel. The only part inserted into the water flow path shall be the paddle wheel.
- A set of weather resistant connectors to connect the digital displays to the flow transmitter and to the apparatus power.

The flowmeter shall be checked and calibrated prior to delivery of the apparatus.

**LEFT PLATFORM MONITOR AND NOZZLE**

An Akron model #3481 "StreamMaster II" double hand wheel controlled monitor shall be installed on the left side front of the platform.

- The monitor shall be equipped with a 3-1/2" outlet and a 4" inlet.
- The monitor shall have a vertical sweep of 135°, and a horizontal sweep of 360°.

An Akron model #5160 "Akronmatic" manually controlled master stream nozzle shall be installed on the end of the left monitor. The model #5160 shall allow a maximum flow rate of 1250 gpm @ 80 psi.

**RIGHT PLATFORM MONITOR AND NOZZLE**

An Akron model #3481 "StreamMaster II" double hand wheel controlled monitor shall be installed on the right side front of the platform.

- The monitor shall be equipped with a 3-1/2" outlet and a 4" inlet.
- The monitor shall have a vertical sweep of 135°, and a horizontal sweep of 360°.

**STACKED TIPS**

One(1) Akron model #3499 triple stacked Pyrolite finished tips shall be provided. The inlet size shall be 3-1/2" and the outlet size shall be 2-1/4".

**STREAM SHAPER**

One (1) Akron model #3485 Pyrolite finished stream shaper(s) shall be provided. The stream shaper shall be 4" in length and shall have an inlet size of 3-1/2" and an outlet size of 3-1/2".

## LADDER/PLATFORM CAPACITIES

The following ladder/platform load capacities shall be established with the truck level and the outriggers fully extended and lowered to relieve the chassis weight from the axles. Capacities are based upon full extension and 360 degree rotation.

LADDER/PLATFORM CAPACITIES IN POUNDS
(50 MPH WIND CONDITIONS / UNCHARGED WATERWAY)

DEGREES OF ELEVATION

| | -10 to 20 | 20 to 30 | 30 to 40 | 40 to 50 | 50 to 60 | 60 to 80 |
|---|---|---|---|---|---|---|
| Base Section | 250 | 250 | 500 | 500 | 500 | 1000 |
| Mid Section | --- | 250 | 250 | 500 | 500 | 500 |
| Fly Section | --- | --- | 250 | 250 | 500 | 500 |
| Platform | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |

LADDER/PLATFORM CAPACITIES IN POUNDS
(50 MPH WIND CONDITIONS / CHARGED WATERWAY)

DEGREES OF ELEVATION

| | -10 to 20 | 20 to 40 | 40 to 60 | 60 to 80 |
|---|---|---|---|---|
| Base Section | --- | 250 | 250 | 500 |
| Mid Section | --- | 250 | 250 | 500 |
| Fly Section | --- | --- | 250 | 500 |
| Platform | 500 | 500 | 500 | 500 |

## OPERATIONS ON GRADES

The aerial unit can be operated in any plane up to 3.5 degrees out of level at full platform capacities. Operation beyond this limit shall be at operator's discretion.

## WATER TOWER OPERATION

The ladder/platform and water system shall be designed to permit the following total flows of dual monitors:

- 2000 GPM at 45 degrees to ladder centerline either side.
- 2000 GPM parallel to ladder centerline and as far below horizontal as the design allows.
- 1500 GPM above ladder centerline as far as deck gun design allows.

## PREVENTATIVE MAINTENANCE & OPERATIONAL FAMILIARIZATION PROGRAM

An on-site program for familiarization of Fire Department personnel shall be provided. This program shall be designed to assure complete understanding of all aspects of the aerial device in the operating environment.

After the unit has been accepted, a factory qualified Field Service Technician shall be provided for a minimum of three (3) days of familiarization.

The familiarization program shall be designed to instruct the individual who has never utilized an aerial device of this type before. The individual shall be thoroughly demonstrated the operating systems of the aerial device, including emergency operation. Introductory service skills utilizing the vehicle shall also be demonstrated.

## FAMILIARIZATION PROGRAM

To instruct Fire Department personnel in the operation, preventative maintenance and care of the aerial device, this familiarization program shall be oriented towards a hands-on approach utilizing the new apparatus.

- Review personnel level and determine specific familiarization requirements.
- Explain operations of the entire aerial device. Each participant shall actually use the aerial and be shown the necessary steps of safe operation.
- Troubleshooting shall be emphasized and reinforced continually throughout the familiarization period.
- Preventative maintenance procedures shall be setup and definite schedules developed to assure proper maintenance of the aerial device.
- Familiarization in the use of tools and how to replace minor assemblies, as applicable. Equally important in this familiarization shall be when to call appropriate personnel for assistance.
- How to order parts through the local service center by utilizing parts manual.

## SERVICE

Due to the importance of keeping this vital piece of firefighting apparatus in service with a minimum of downtime, KME maintains a network of service centers with factory trained personnel.

The bidder shall have a separate facility for service of units so they do not conflict with production units. The service facility carries an inventory of parts, separate from production parts.

## WARNING DECALS

Warning decals shall be provided in appropriate locations to alert the operator of potential hazards and operating instructions. All warning labels shall be in general compliance with A.N.S.I. Z34.1 recommendations.

**MANUALS**

The aerial manufacturer shall provide the following manuals pertaining to the aerial device:

- Two (2) Operator's manuals
- Two (2) Parts manuals
- Two (2) Complete Electrical and Hydraulic Diagrams

**AERIAL APPARATUS CERTIFICATIONS (TYPE 1)**

The aerial device shall be tested in compliance with the National Fire Protection Association's Standard #1911 (latest edition). Ongoing structural and physical property testing during construction shall also be done.

The following tests shall be conducted by personnel holding a Level II certification to detect defects and improperly secured components:

- Three (3) random samples of each lot or shipment of raw material (plate, tubing, bar, etc.) and fabricated parts from outside vendors shall have a mechanical (tensile, yield, and elongation) and chemical (material content) analysis performed.
- Welds for all load supporting elements of the aerial device shall be examined in accordance with AWS publications referenced in NFPA 1901. These tests shall be performed prior to paint or assembly.
- Dye penetrant testing shall be conducted on all structural aluminum welds.
- Ultrasonic inspection shall be used to detect any flaws in pins, bolts and other critical mounting components. The bolts shall be tested after any torquing to ensure the bolt was not damaged.
- All extension/retraction cables shall be proof load tested, serialized, and certified by the cable vendor. All cable ends shall be dye penetrant tested to find any cracks, imperfections, etc.
- Functional tests, load tests, stability tests and visual structural examination shall be performed. These tests shall determine any unusual deflection, vibration, or instability characteristic of the unit.
- Hydraulic oil sample test prior to delivery.

Additionally, a waterway pressure test shall be performed.

Upon completion of the preceding inspections, the independent testing company shall issue a Certificate of Inspection indicating that all specified standards have been satisfied. The Type I certification shall be provided by Underwriters Laboratories Inc. (UL). Aerial manufacturers not utilizing third party, independent testing companies shall not be acceptable.

**TESTS**

The following test shall be conducted to the aerial device prior to delivery. All listed tests shall be witnessed and certified by Underwriters Laboratories Inc. (UL) to ensure the device meets all requirements of NFPA-1901.

As the manufacturer of the aerial device, KME is required to provide a written statement signed by the Chief Engineer certifying the aerial's ability to perform the following tests:

- 1-1/2:1 DYNAMIC STABILITY AND LIFT TEST - A test of the apparatus shall be performed that the ladder sections and platform are so designed and powered to support a load representing 150% of the manufacturer's rated payload capacity at maximum horizontal reach on level ground. Since this is a dynamic test, the load will be raised, lowered and rotated without evidence of instability. Specifically, 1500 pounds in the platform with the ladder fully extended at zero degrees shall be rotated 360°.
- 1-1/3:1 DYNAMIC STABILITY AND LIFT TEST - A test of the apparatus shall be performed that the tip and ladder sections and platform are so designed and powered to support a load representing 133% of the manufacturer's rated payload capacity at maximum horizontal reach on a five (5) degree slope. Since this is a dynamic test, the load will be raised, lowered and rotated without evidence of instability. Specifically, 1333 pounds in the platform with the ladder fully extended at zero degrees shall be rotated 360°.
- TIME TEST - A test of the apparatus shall be performed to raise the platform from a bedded position extended to full height and rotated through a 90° turn smoothly and without undue vibration in not over 150 seconds.
- WATER TOWER TEST #1 - A test of the apparatus shall be performed to test its ability to discharge 1000 gallons per minute parallel to the ladder with the unit at full extension and zero degree elevation and through a 360° rotation. The unit shall be capable of performing this test with a payload of 500 pounds at the platform.
- WATER TOWER TEST #2 - A test of the apparatus shall be performed to test the ability to discharge 1000 gallons per minute, 90° to the ladder with the ladder at full extension, zero degree elevation and through 360° of rotation. The unit shall be capable of performing this test with a payload of 500 pounds at the platform.
- WATER TEST #3 - A test of the apparatus shall be performed to test the ability to discharge 1000 GPM above the ladder centerline and as many degrees above 0° as the deck gun design allows. This test shall also be performed with the ladder fully extended at 0° elevation and through 360° of rotation with a platform payload of 500 pounds.

Bidders must state their ability to comply with all of the above tests. Failure to do so shall be grounds for rejection of their bid.

****** PAINT SECTION ******

**PAINT, PREPARATION AND FINISH**

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

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

**BODY PRIMER & PREPARATION**

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

**BODY FINISH PAINT**

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

The entire body shall be buffed and detailed.

**BODY PAINT**

The inside and underside of the complete body assembly shall be painted job color using a PPG Delta System, prior to installation of the body on the chassis or torque box.

**COMPARTMENT PAINT**

The interior of the compartments shall be finish painted job color with a scuff resistant webbing type paint of a contrasting color applied over the painted surfaces.

**BODY PAINT**

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

**PUMP / PIPING PAINT**

The pump enclosure and pump/plumbing within the pump enclosure shall be painted job color to match the primary color of the body.

**CAB PRIMER & PREPARATION**

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

**CAB FINISH PAINT**

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

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

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

**CAB INTERIOR PAINT**

The interior metal surfaces of the cab shall be finish painted with a textured gray paint.

**CHASSIS PAINT**

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

**WHEEL PAINT**

The chassis wheels, (except aluminum wheels) shall be painted job color with silver trim around the perimeter.

**AERIAL DEVICE PAINTING**

Prior to any painting, all weldments such as the outrigger beams, torque box, turntable, and ladder sections shall be sand blasted, cleaned and inspected to insure the removal of any surface imperfections and to insure superior paint adhesion to the metal.

The entire painting system shall utilize a single manufacturer's paint for compatibility between primers and finished coats. All painting shall be done in atmosphere controlled spray booths. The weldments shall then be primed with Ditzler (PPG) Epoxy Primer. All seams between adjoining pieces that are not continuously welded shall be caulked to inhibit corrosion.

Before assembly, in preparation for final painting, the aerial unit shall be thoroughly cleaned, conforming to good painting practices.

The aerial components shall then be sprayed with Ditzler (PPG) Polyurethane primer sealer. Finished paint used on the turntable, lift cylinder, and ladder sections shall be painted Ditzler (PPG) Durethane Polyurethane #91528 white. The rung rails of the ladder shall be painted with Silver Urethabond 104 non-leafing aluminum urethane primer/finish.

The extension cylinders shall be painted to match the color of the ladder.

The torque box shall be painted black, allowing easy touch-up after extended use.

The outrigger beams and the vertical jack shall be painted with Silver Urethabond 104 non-leafing aluminum urethane primer/finish, allowing easy touch-up after extended use.

## LADDER CORROSION INHIBITOR

All internal surfaces of the ladder exposed to the atmosphere, i.e., inside base, mid and fly section side rails shall be undercoated prior to ladder assembly using Procyon Corrosion Inhibitor to prevent internal corrosion. The corrosion inhibitor will meet the Boeing BMS-3-29 specification and meet a 1500-hour salt spray test. Manufactures that do not rustproof the interiors of the ladder sections shall not be considered.

## PAINT CODES

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

- **PRIMARY PAINT COLOR**

  *Single Color: TBD Paint Code# TBD*

- **AERIAL DEVICE PAINT COLOR**

  *Device Color: WHITE Paint Code# 91528*

## TOUCH-UP PAINT

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

## FINALIZATION & DETAILING

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

## RUST PROOFING

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

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

**COMPUTER GENERATED LETTERING**

The lettering and striping shall be custom designed utilizing state of the art computer software and computerized cutting machines. The manufacturer shall employ a full time artist / designer to generate all lettering, decals, and striping to meet the requirements of the Fire Department. The artwork for the lettering and striping shall be kept on record by the apparatus manufacturer to allow for ease in duplication for the Fire Department.

**FRONT CAB DOOR LETTERING**

Scotch-Cal without drop shadow lettering shall be provided on the cab driver's and officer's doors per the fire department requirements. The design of the lettering on the cab doors shall be designed to fit in the 496 sq. inches available.

Lettering provided on the driver's and officer's cab doors shall be 3" high.

**LETTERING FONT**

The lettering shall be designed and cut with a basic block type font:

"BLOCK TYPE FONT"

**CUSTOM FIRE DEPARTMENT LOGO**

A pair of custom fire department logos shall be computer generated and will be no larger than the 496 sq. inches available.

The custom logo shall be printed on Scotch-Cal with two computer generated printed colors.

The custom logo shall be located as directed by the Fire Department.

**AERIAL LETTERING PANELS**

Painted aluminum panels shall be furnished on each side of the aerial device base section. The panels shall be approximately 19" high X 144" long.

The sign panels shall be painted to match the aerial ladder paint color.

Scotch-Cal without drop shadow lettering shall be provided on the signboard per the fire department requirements. The design of the lettering on the signboard shall be designed with a maximum text height of 12" and fit in the available area.

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

**SCOTCH-LITE STRIPE**

An eight (8) inch high "Scotch-Lite" stripe shall be provided. The stripe shall be applied on a minimum of 60 percent of each side of the unit, 60 percent on the rear of the unit and 40 percent on the front of the unit. The Scotch-Lite stripe layout shall be determined by the Fire Department.

The Scotch-Lite shall be white in color.

**PLATFORM STRIPING**

An eight (8) inch Scotch-Lite stripe shall be applied to the platform. The stripe shall match the stripe that is provided on the body of the apparatus.

**REAR CHEVRON STRIPING**

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

The striping shall be 6" Scotch-Lite.

The Scotch-Lite shall be Ruby Red and Lemon Yellow in color.

***** PROPOSED DESIGN FEATURES & BENEFITS OF THE AERIALCAT DEVICE *****

## GENERAL

Listed below are just a few design features that are offered that set the proposed KME Aerialcat™ ladder/platform apart from any other aerial device in the industry. These features yield great benefits that prove the Aerialcat™ ladder is the most reliable, strongest, most functional, and lowest maintenance aerial device available.

## KOVATCH HISTORY

Kovatch brings to the fire and specialty vehicle market over five decades of broad-based experience in vehicle manufacturing, sales and service. The company was founded in 1946 as a car and truck repair business in Nesquehoning. Through the success of the car and truck repair business, various automobile and truck franchises were eventually acquired and continue to this day.

In the mid 1960's, Kovatch won its first rebuild contract for the US military. By the 1970's, the company had a string of successful rebuild and new manufacture contracts for various branches of the Defense Department. To this day, Kovatch is still known as a premier supplier of specialty apparatus to the federal government and is currently working on several contracts.

In the mid 1980's, Kovatch began a commercial fire apparatus division, now known as KME Fire Apparatus. By combining decades of specialty vehicle experience with acquisitions of other manufacturers, Kovatch offers unparalleled products and services. Today, Kovatch manufactures upward of 500 vehicles per year for municipal and private fire and rescue service providers as well as the government. Our apparatus can be found across the country and increasingly around the world.

The Kovatch headquarters complex consists of over one-half million square feet and is a totally integrated manufacturing facility for emergency and specialty vehicles. The facilities include state of the art fabrication, machining, welding, painting and finishing departments. We also have a technical manual publication department for our vast line of products. Our knowledgeable workforce, including marketing, engineering, and manufacturing personnel, work as a team to provide world-class quality. Other factory locations include Ontario, California; Roanoke, Virginia; Latham, New York.

KME Fire Apparatus has a national distribution network in place for sales and service of fire apparatus, as well as an international representative. Service and warranty matters are handled through our network as well as our locations in Virginia, New York, and California.

Quality is very important to Kovatch. There is an in-house Quality Assurance department that is monitored by the Defense Contract Management Command (DCMC). Kovatch also has UL inspectors on site. For out of house testing, we utilize the US Army's facility at Aberdeen Proving Ground as well as private testing agencies. We offer training at the factory or at the customers' premises.

Kovatch and KME offer a broad line of apparatus known worldwide for their quality and reliability. The line includes commercial fuel transport trucks, aircraft refuelers, snowplows, and fire apparatus consisting of pumpers, rescue trucks, airport crash rescue trucks, rapid intervention vehicles, tankers, elliptical tankers, wildland units, and a full line of aerial devices.

## SINGLE-LINE RESPONSIBILITY

In order to protect the Purchaser from divided warranty responsibility between chassis, aerial, device and body manufacturers, KME is proposing a vehicle, which is designed, fabricated, and assembled by KME personnel in KME owned facilities. This will include the cab shell, chassis assembly, aerial device, and complete body structure.

**HIGHEST PRODUCT LIABILITY INSURANCE**

KME is offering $30,000,000.00 in Product Liability Insurance for the entire vehicle. This coverage is the highest available in the fire industry, proving KME's product confidence and stability as a fire apparatus manufacturer.

**1/4" ICE RATING**

All KME Aerialcat™ ladders and platforms are designed to withstand a 1/4" of ice build up on the entire structure, which could be equivalent up to 4600 lbs. of additional weight on the entire device. This rating was developed due to real life operation possibilities associated with an aerial ladder when in water tower operation in cold weather environments.

**50 MPH WIND RATING**

All KME Aerialcat™ ladders and platforms are designed to withstand a 50 MPH wind gust, which add dynamic loads to the aerial structure. This rating was also developed due to real life operation possibilities associated with an aerial ladder when operating in bad weather conditions.

**PARKER HANNIFIN COMPONENTS & LEAK FREE WARRANTY**

The Aerialcat™ hydraulic system is designed to provide the most efficient, leak-free system in the industry. The KME Fire Apparatus aerial line has been certified as a Parker Genuine Parts design. The connector systems have been jointly designed by engineers from both KME and Parker Hannifin and incorporate the following design upgrades and advantages to the customer:

- All hydraulic ports (manifolds, pumps, tank, etc) to elastomeric sealing technology;
  - No pipe threads in the entire hydraulic system
  - Sealing is done by O-rings with the mechanical holding power of straight threads.
- All tube and hose connections to Parker Seal-Lok, O-ring face seal technology.
- Sealing is done by o-ring with the mechanical holding power of straight thread.
- Fittings are rated up to 6000 psi.
- Drop-in design of Seal-Lok connectors allows for easier maintenance and assembly.
- Fitting resist 200% over torque, with optimum vibration resistance.
- Shaped fittings are machined from forged bodies for compact design and strength.
- Fittings meet/exceed the performance and dimensional requirements of SAE J1453.
- Minimized unnecessary fittings and adapters, streamlining the system.
- Increased connector accessibility, making assembly and maintenance easier.
- Standardized the connector system on the Aerialcat™ unit.
- Incorporated pressure diagnostic system with Parker PD diagnostic test points into the connector design.

KME is providing a Parker Hannifin three-year leak free guarantee, which warrants the Seal-Lok, O-ring face seal connections to be leak-free for a period of three (3) year. This design assures the fire department the device is equipped with the best components available and reliability when needed!

## UNDERWRITERS LABORATORY CERTIFICATION

All KME Aerialcat™ ladder and platforms are Type I tested and certified by Underwriters Laboratories Inc. Type I testing is a higher quality test, which means every weld is tested in the weld shop, prior to paint and assembly, so every weld is exposed, accessible and tested.

Underwriters Laboratories Inc. (UL) is known and recognized worldwide as a leading third party product safety certification organization for over 100 years. UL has served on National Fire Protection Association (NFPA) technical committees for over thirty years.

- UL is a nationally recognized testing laboratory recognized by OSHA.
- UL complies with the American Society for Testing and Materials (ASTM) Standard ASTM E543 "Determining the Qualifications for Nondestructive Testing Agencies."
- UL has more than 40 years of automotive fire apparatus safety testing experience and 16 years of factory aerial device testing and Certification experience. UL has more than 100 years of experience developing and implementing product safety standards.
- UL does not represent, is not associated with, nor is in the manufacture or repair of Automotive fire apparatus.
- All work outlined in NFPA 1911, current edition, including nondestructive testing, will be conducted at the manufacturer's facility.
- All test work for fire pumps outlined in Section 16-13 of NFPA 1901, current edition will be conducted.
- UL has included a list of all factory aerial device manufacturers for whom testing is currently being conducted on a regular basis.
- UL carries ten million dollars in excess liability insurance for bodily injury and properly damage combined.

In addition, the following test work outlined in Section 20-24, Certification Tests, of NFPA 1901, current edition will be conducted:

- 1-1/2 Times Rated Capacity on Level Ground Stability Test: A load of 1-1/2 times rated capacity (as specified by the manufacturer) will be suspended from the tip of the aerial ladder, or the platform of the elevating platform, when it is in the position of least stability. If the manufacturer specifies a rated capacity while flowing water, then one times the water load and the worst-case nozzle reaction will be added to the stability test weights. The apparatus will show no signs of instability. For a water tower, the stability test includes 1-1/2 times the weight of the water in the system and 1-1/2 times the maximum nozzle reaction force when it is in the position of least stability.
- 1-1/3 Times Rated Capacity on a 5 degree Slope Stability Test: A load of 1-1/3 times rated capacity will be suspended from the tip of the aerial ladder, the platform of the elevating platform, or the tip of the water tower when it is in the position of least stability. The apparatus will show no signs of instability.
- Aerial Device Water System Tests: A friction loss test will be conducted for an aerial device equipped with a permanent water system and has a rated vertical height of 110 ft. or less. The standard model flow test results will be provided to the manufacturer. If the water system has been modified from the standard model configuration, a new flow test will be conducted to determine that the friction loss in the water system between the base of the swivel and the monitor outlet does not exceed 100 psi with 1000 GPM flowing and the water system at full extension.
- A maximum vertical height flow test will be conducted to determine that the water system is capable of flowing 1000 GPM at 100-psi nozzle pressure with the aerial device at full elevation and extension. If the apparatus is equipped with a fire pump designed to supply the water system, the test will be conducted using the onboard fire pump. The intake pressure to the fire pump will not exceed 20 psi.

- UL provides the manufacturer a complete written Examination and Test Report for each aerial device inspection performed at the manufacturer's facility. This Report specifies the points of inspection and results of such examinations and tests.

The test report, as required by NFPA 1911, will include the following test results:

- Torque verification of all mounting bolts including bolt size, grade, and torque specification.
- The following NDT methods and results will be recorded: All ferrous welds will be magnetic particle inspected for defects. All nonferrous welds will be visually inspected, and if questionable defects are identified, dye penetrant will be used to further evaluate the quality of the weld. All bolts and pins will be ultrasonically inspected for internal flaws.
- The following measurements will be taken and recorded in the examination and test record: bearing clearance and backlash, elevation cylinder drift, engine speed operating rpm, relief pressure, stabilizer extension cylinder drift, ladder section twist, hardness readings, base rail thickness, winch drift, extension brake drift, and extension cylinder drift.

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

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

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

When the unit successfully meets all the requirements outlined in NFPA 1901, current edition, UL will issue a Certificate of Automotive Fire Apparatus Examination and Test stating the unit's compliance with Section 20-24.

When the unit successfully meets all the requirements outlined in NFPA 1901, current edition, UL will issue a Certificate of Automotive Fire Apparatus Examination and Test stating the unit's compliance with Section 16-13.

**DEEP PENETRATING OUTRIGGERS**

The outrigger vertical stroke design will allow for the aerial device to be capable of leveling and operating safely, on any slope up to 11-degrees at full capacities.

**SANDBLASTED DEVICE COMPONENTS**

All Aerialcat™ ladder and platform weldments are sandblasted prior to the paint process, only after Underwriters Laboratory tested and inspect the components. Sandblasting the components removes mill slag, oils, rust, etc., ensuring greater paint adhesion to the metal.

Testing prior to paint increases the capability of UL to find all discrepancies, which can be hidden by paint. Sandblasting is one step many manufacturers skip due to its added cost and company restricted capabilities. Every component on an Aerialcat™ ladder incorporates this process!

**FLOATING WATERWAY MOUNT**

All Aerialcat™ ladders and platforms utilize a floating waterway mount design. This allows the waterway sections to move up and down under the ladder sections in the event the waterway contacts a parapet, awning or building. Each mounting point on the waterway is designed with ears that set on heavy-duty supports attached to the ladder sections, these supports are equipped with 1/2" x 3” bolts that extend through the water mounts, providing a minimum of 2" of movement up and down. This design reduces the possibility of the waterway and waterway seals from being damaged.

**WATER ROTATION SWIVEL**

The waterway rotation swivel in an Aerialcat™ ladder or platform is design with 32 individual collector ring circuits as a standard feature. This design allows the customer to upgrade their desired components at the ladder tip in platform, without the need to worry if enough circuit are available. In the event of a collector ring circuit failure, the additional circuits give a technician added circuit to switch channels, minimizing vehicle downtime.

**+80° ELEVATION CAPABILITY**

All Aerialcat™ ladders and platforms are designed to have the capability of elevating to +80°. Although this is not recommend for climbing, this capability gives the fire department the ability to setup the vehicle in tight or restrictive area, because when the ladder is elevated to maximum elevation, the end of the ladder or platform are within the width of the outriggers. This is very important when on a mid-mount the ladder must be positioned over the cab or on a rear mount the ladder must be positioned over the rear, this capacity allows the operator to rotate the aerial past obstruction like trees, wires, buildings, etc. Remember if the outrigger can be set, the ladder will be capable of rotating within the width of the outriggers, another great advantage.

**-12° ELEVATION CAPABILITY**

The 102' rear-mount Aerialcat™ platform is designed to have the capability of elevating to -12 degrees below horizontal. This capability gives the fire department the ability to setup the vehicle in tight or restrictive area, because the platform can be placed on the ground with the ladder fully retracted. This is very important on a mid-mount when in rescue mode, allowing the platform to be set on the ground with victims in the platform, without the need to have the ladder extended, requiring large amounts of area. This is another great advantage, because the platform can be quickly positioned from the roof or window, directly to the ground next to the vehicle.

**1000 POUND TIP LOAD RATING**

All Aerialcat™ platforms are rated for 1000 pound platform capacity. This is unrestricted through any range of elevation while not flowing water.

**DEEPER COMPARTMENTS**

The Aerial body is design to provide the maximum amount of compartmentation possible, yielding 27" deep lower compartments and 14" high air pack type compartments. This is a critical feature when trying to store PPV fans, saw boxes, etc in body compartments.

## ROTATION SWING DRIVE ADJUSTMENT

The proposed Aerialcat™ ladder is equipped with a unique rotation swing drive that is designed with an adjustable mount. This feature allows the back lash to be set at assemble and provide the ability to re-adjust as components wear. This helps prevent the need to replace rotation components that may exceed manufacturer's allowable back lash in later aerial inspections.

## 2.5 TO 1 STRUCTURAL SAFETY FACTOR

The proposed Aerialcat™ ladder is designed with an unmatched 2.5:1 structural safety factor base on an NFPA-1901 rated tip load.

## LADDER SLIDE MECHANISM

The proposed Aerialcat™ ladder is designed with rear slide pads that are held into place by a machined receiver, which is welded into the base rail of the extending sections. This machined receiver provided tight tolerances between each ladder section to minimize movement side to side and section drop at each overlap area. Each slide pad is held into place with an easily removable keeper, allowing the pad to be removed from the rear of the ladder section. To control movement side to side the receiver allows for adjustment of each pad.

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

**KME WARRANTY, STARTING ON DELIVERY DATE**

Warranty coverage by KME will begin on the date of delivery to the customer.

**WARRANTY - KME CHASSIS**

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

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

**OVERALL UNIT AND CUSTOM CHASSIS**

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

**WARRANTY - ENGINE**

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

**WARRANTY - TRANSMISSION**

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

**WARRANTY - COOLING SYSTEM - CUSTOM CHASSIS**

Kovatch Mobile Equipment (KME) warrants all Cooling System Equipment components used in the construction of KME Fire Apparatus against defects and workmanship provided the apparatus is used in a normal and reasonable manner. This warranty is extended only to the original user-purchaser for a period of three (3) years from the date of delivery / acceptance to the original user-purchaser, which ever occurs first.

This warranty applies to both purchased and fabricated, manufacturer supplied, coolant system components, and is not provided in lieu of any Vendor provided warranties. All coolant system components provided by the engine manufacturer are covered by the engine manufacturer's warranty only.

**WARRANTY - CUSTOM CHASSIS FRAME RAILS**

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

**WARRANTY - STEERING UNIT**

The proposed Sheppard steering gear will be warranted for a period of three(3) years from the first date of service or 150,000 miles (241,401 kilometers), whichever occurs first. The product will be free from defects in material and workmanship under normal use in applications approved in advance by Sheppard.

**WARRANTY - FRONT AXLE**

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

**WARRANTY - REAR AXLE**

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

**WARRANTY - ABS**

The Meritor ABS will be provided with a three (3) year warranty, parts and labor. A copy of Meritor's warranty will be supplied to define additional details of the warranty provisions. Vehicles that operate full or part time outside the United States and Canada will have a one (1) year, parts only warranty.

**WARRANTY - CAB STRUCTURE**

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

**WARRANTY - BODY STRUCTURE**

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

**WARRANTY - CORROSION**

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

**WARRANTY - PAINT**

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

**WARRANTY - LETTERING**

Kovatch Mobile Equipment Corporation shall provide a five (5) year warranty against defects in material and workmanship for all graphic processes. Any valid claims must be made in writing with in 15 days of the determination of any defects to KME Fire Apparatus. KME Fire Apparatus will at its option make any necessary repairs either at a local authorized service center or at the factory, if required. KME Fire Apparatus will make the final decision as to where the
repairs are to be made and any transportation cost are the owners responsibility, KME will at its option repair or replace any verified defects in workmanship or materials at no cost to the owner provided all the requirements of this warranty have been met.

KME shall not be liable to the original purchaser or anyone else for consequential, incidental, special or direct damages, including, but not limited to, any claims for loss of profits, down time, loss of use or inconvenience. THE COMPANY MAKES NO OTHER WARRANTY, EXPRESSED OF IMPLIED, AND SPECIFICALLY, DISCLAIMS ANY IMPLIED WARRANTY INCLUDING THE WARRANTY OF MERCHANTABILITY.

KME continually strives to improve its products and therefore, reserves the right to make improvements or changes without incurring any obligations to make such changes or additions on equipment previously sold.

**WARRANTY - BRIGHTWORK**

Kovatch Mobile Equipment (KME) warrants all bright finish components used in the construction of KME Fire Apparatus against defects and workmanship provided the apparatus is used in a normal and reasonable manner. This warranty is extended only to the original user-purchaser for a period of one (1) year from the date of delivery / acceptance to the original user-purchaser, whichever occurs first.

The expressed warranty excludes corrosion or degradation of bright finished components caused by damage to the component.

**WARRANTY - STAINLESS STEEL PLUMBING WARRANTY**

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

**WARRANTY - REAR SUSPENSION**

KME hereby warrants to the original Buyer, that leaf spring products installed will be free of defects in material and workmanship for one (1) year. The "Warranty Period" commences on the date the original Buyer takes delivery of the product from the manufacturer.

**WARRANTY - RUNG COVERS**

The proposed composite fiberglass rung covers will be free from defects in material and workmanship for a period of 10 years.

The warranty above will apply to the products being subjected to foot traffic, for which they were designed. It will not apply when they are being subjected to heavy machinery, steel or plastic wheeled dollies, or to solvent cleaning.

**WARRANTY - AERIAL DEVICE STRUCTURE**

The proposed aerial device weldment, including outriggers, torque box, turntable and ladder sections will be warranted against loss of integrity or failure due to defects in material or workmanship for a period of twenty (20) years from the date of acceptance of the unit.

**WARRANTY - FIVE (5) YEAR AERIAL WATERWAY SWIVEL**

The proposed aerial waterway will be covered by a five (5) year warranty to cover the waterway seals and individual tube assemblies. A copy of this warranty will be provided to the end user.

**WARRANTY - AERIAL WATERWAY**

The proposed aerial waterway will be covered by a ten (10) year warranty to cover the waterway seals and individual tube assemblies. A copy of this warranty will be provided to the end user.

**WARRANTY - WATER TANK**

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

**WARRANTY - FIRE PUMP**

Hale Products, Incorporated ("Hale") hereby warrants to the original buyer that products manufactured by Hale will be free of defects in material and workmanship for a period of five (5) years from the date product is first placed into service or five and one-half (5 1/2) years from date of shipment by Hale, whichever period will be first to expire. Within this warranty period Hale will cover parts and labor for the first two (2) years and parts only for years three (3) through five (5).

**WARRANTY - FOAM SYSTEM**

The liability of FoamPro under the foregoing warranty will be limited to the repair or replacement at FoamPro's option without charge for labor or materials of any parts upon return of the entire pump, system or other product or of the particular part to the FoamPro factory within the warranty period, at the sole expense of the purchaser, which part will upon examination appear to FoamPro's satisfaction to have been defective in material and workmanship.

**WARRANTY - CLASS 1 - PRODUCTS**

Class 1 warrants that any equipment of our own manufacture (or manufactured for us pursuant to our specifications) found to have defects in material or workmanship during normal use and service, will be repaired or replaced (at our opinion) free of charge, provided that written notice of such defect is received by us within two (2) years, (three 3 years on liquid filled gauges) after initial shipment.

**WARRANTY - AKRON PRODUCTS**

The limited warranty set forth here against defective materials or workmanship for a period of five (5) years will be given by Akron Brass Co. with respect to Akron Brass Co. products purchased and used in the United States and Canada respectively. All Akron valves are warranted for 10 years.

**WARRANTY - HEAVY DUTY VALVES**

Elkhart Brass warrants Heavy Duty Swing-Out Valves for a period of ten (10) years after purchase against defects in material or workmanship. Elkhart Brass will repair or replace any Heavy Duty Swing Out Valve which fails to satisfy this warranty.

**WARRANTY - SEATING**

HO Bostrom will warrant each new seat manufactured, to be free from defects in materials and workmanship when delivered to the original purchaser for a period of five (5) years.

Labor to remove or reinstall and transportation of defective items will not be covered by, or any allowance made for said cost under this warranty.

**WARRANTY - HYDRAULIC GENERATOR**

Each Fire Power / Fabco, self contained hydraulic generator system will be warranted to the original owner to be free from defects in material or workmanship under normal use and service for Life.

## NFPA REQUIRED LOOSE EQUIPMENT, PROVIDED BY FIRE DEPARTMENT

The following loose equipment as outlined in NFPA 1901, 2009 edition in accordance with the applicable requirements, will be provided by the fire department. All loose equipment will be installed on the apparatus before placed in emergency service, unless the fire department waives NFPA section 4.21.

Section 8.7 Ground Ladders.

It is the responsibility of the purchaser to ensure that all required equipment has been supplied and installed on the apparatus in order to achieve compliance with the standard prior to placing it in service.

8.7.1 A minimum of 115 ft (35 m) of fire department ground ladders shall be supplied and installed.

8.7.2 As a minimum, the following fire department ground ladders shall be carried on the apparatus:

(1) One folding ladder
(2) Two straight ladders (with folding roof hooks)
(3) Two extension ladders

8.7.4 All fire department ground ladders carried on the apparatus shall meet the requirements of NFPA 1931, Standard for Manufacturer's Design of Fire Department Ground Ladders, except as permitted by 8.7.5 and 8.7.6.

8.7.5 Stepladders and other types of multipurpose ladders meeting ANSI AI4.2, Ladders - Portable Metal- Safety Requirements, or ANSI A14.5, Ladders - Portable Reinforced Plastic Safely Requirements, with duty ratings of Type IA or lAA shall be permitted to be substituted for the folding ladder required in 8.7.2(1).

8.7.6 Stepladders and other types of multipurpose ladders shall be permitted to be carried in addition to the minimum fire department ground ladders specified in 8.7.2 provided they meet either ANSI AI4.2 or ANSI A14.5 with duty ratings of Type 1A or 1AA.

Section 8.8 Minor Equipment

It is the responsibility of the purchaser to ensure that all required equipment has been supplied and installed on the apparatus in order to achieve compliance with the standard prior to placing it in service.

8.8.2 Miscellaneous Equipment. The following additional equipment shall be carried on the apparatus:

(1) Two 6 lb (2.7 kg) flathead axe mounted in a bracket fastened to the apparatus
(2) Three 6 lb (2.7 kg) pickhead axe mounted in a bracket fastened to the apparatus
(3) Four pike poles mounted in a bracket fastened to the apparatus
(4) Two 3 ft to 4 ft (1m to 1.2 m) plaster hooks with D handles mounted in brackets fastened to the apparatus
(5) Two crowbars mounted in brackets fastened to the apparatus
(6) Two claw tools mounted in brackets fastened to the apparatus
(7) Two 12 lb (3 kg) sledgehammers mounted in brackets fastened to the apparatus
(8) Four portable hand lights mounted in brackets fastened to the apparatus
(9) One approved dry chemical portable fire extinguisher with a minimum 80-B:C rating mounted in a bracket fastened to the apparatus
(10) One 2 1/2 gal (9.5 L) or larger water extinguisher mounted in a bracket fastened to the apparatus
(11) One self-contained breathing apparatus (SCBA) complying with NFPA 1981, Standard on Open-Circuit Self Contained Breathing Apparatus (SCBA) for Emergency Services, for each assigned sealing position. But not fewer than four, mounted in brackets fastened to the apparatus or stored in containers supplied by the SCBA manufacturer
(12) One spare SCBA cylinder for each SCBA carried, each mounted in a bracket fastened to the apparatus or stored in a specially designed storage space
(13) One first aid kit
(14) Two salvage covers each a minimum size of 12 ft x 18 ft (3.7 m x 5.5 m)
(15) Four combination spanner wrenches mounted in brackets fastened to the apparatus

(16) Two scoop shovels mounted in brackets fastened to the apparatus
(17) One pair of bolt cutters, 24 in. (0.6 m) minimum, mounted in a bracket fastened to the apparatus
(18) Four ladder belts meeting the requirements of NFPA 1983, Standard on Life Safety Rope and Equipment for Emergency Services
(19) One 150 ft (45 m) light-use life safety rope meeting the requirements of NFPA 1983
(20) One 150 ft (45 m) general-use life safety rope meeting the requirements of NFPA I983
(21) Two 150 ft (45 m) utility ropes having a breaking strength of at least 5000 lb (2300 kg)
(22) One box of tools to include the following:
(a) One hacksaw with three blades
(b) One keyhole saw
(c) One 12 in. (0.3 m) pipe wrench
(d) One 24 in. (0.6 m) pipe wrench
(e) One ballpeen hammer
(f) One pair of tin snips
(g) One pair of pliers
(h) One pair of lineman's pliers
(i) Assorted types and sizes of screwdrivers
(j) Assorted adjustable wrenches
(k) Assorted combination wrenches
(23) Two or more wheel chocks. Mounted in readily accessible locations, that together will hold the apparatus. When loaded to its GVWR or GCWR, on a hard surface with a 20 percent grade with the transmission in neutral and the parking brake released
(24) One traffic vest for each seating position, each vest to comply with ANSI/ISEA 207, Standard for High-Visibility Public Safety Vests, and have a five-point breakaway feature that includes two at the shoulders, two at the sides, and one at the front
(25) Five fluorescent. orange traffic cones not less than 28 in. (711 mm) in height, each equipped with a 6 in. (152 mm) retroflective white band no more than 4 in. (102 111m) from the top of the cone, and an additional 4 in. (102 mm) retroflective white band 2 in. (51 mm) below the 6 in. (152 mm) hand
(26) Five illuminated warning devices such as highway flares, unless the live fluorescent orange traffic cones have illuminating capabilities
(27) One automatic external defibrillator (AED)

8.8.3 If the aerial fire apparatus is equipped with a fire pump, the requirements of 8.8.3.1 through 8.8.3.3 shall apply.
8.8.3.1 The following equipment shall be provided:
(1) One double female 2 1/2 in. (65 mm) adapter with National Hose (NH) threads, mounted in a bracket fastened to the apparatus
(2) One double male 2 1/2 in. (65 mml) adapter with NH threads, mounted in a bracket fastened to the apparatus
(3) One rubber mallet, for use on suction hose connections, mounted in a bracket fastened to the apparatus
(4) Two hydrant wrenches mounted in brackets fastened to the apparatus
8.8.3.2 If the supply hose carried does not use sexless couplings, an additional double female adapter and double male adapter, sized to fit the supply hose carried, shall be carried mounted in brackets fastened to the apparatus.
8.8.3.3 If none of the pump intakes are valved, a hose appliance that is equipped with one or more gated intakes with female swivel connection(s) compatible with the supply hose used on one side and a swivel connection with pump intake threads on the other side shall be carried. Any intake connection larger than 3 in. (75 mm) shall include a pressure relief device that meets the requirements of 16.6.6.

8.8.3.4 If the apparatus does not have a 2 1/2 in. intake with NH threads, an adapter from 2 1/2 in. NH female to a pump intake shall be carried, mounted in a bracket fastened to the apparatus if not already mounted directly to the intake.

8.8.3.5 If the supply hose carried has other than 2 1/2 in. NH threads, adapters shall be carried to allow feeding the supply hose from a 2 1/2 in. NH thread male discharge and to allow the hose to connect to a 2 1/2 in. NH female intake, mounted in brackets fastened to the apparatus if not already mounted directly to the discharge or intake.

8.8.4* If the aerial fire apparatus does not have a prepiped waterway provided, the following equipment shall be furnished:

(1) Manual ladder pipe with 1 1/4 in. (32 mm), l 3/8 in. (35 mm), and 1 1/2 in. (38 mm) tips or electric ladder pipe with automatic nozzle that can be attached to the aerial ladder

(2) Sufficient length(s) of 3 in. (75 mm) or larger attack hose complying with the requirements of NFPA 1961, Standard on Fire Hose, to reach between the installed ladder pipe and the ground with at least 10 ft (3 m) of hose available on the ground with the ladder at full extension

(3) One hose strap for each ladder section

(4) Halyards to control the ladder pipe from ground level (for manual ladder pipe only)

8.8.4.1 A bracket for carrying the detachable ladder pipe shall be provided on the apparatus and shall be designed so that the ladder pipe clamps will not have to be readjusted to secure the pipe to the aerial ladder.

14.1.8.4 Fire Helmet.

It is the responsibility of the purchaser to ensure that "Fire helmets shall not be worn by persons riding in enclosed driving and crew areas any time the apparatus in placed in service.

14.1.8.4.1 A location for helmet storage shall be provided.

14.1.8.4.2 If helmets are to be stored in the driving or crew compartment, the helmets shall be secured in compliance with 14.1.11.2.

14.1.10 SCBA Mounting.

It is the responsibility of the purchaser to ensure that any SCBA equipment has been supplied and installed on the apparatus in order to achieve compliance with the standard prior to placing it in service.

14.1.10.1 Where SCBA units are mounted within a driving or crew compartment, a positive latching mechanical means of holding the SCBA device in its stowed position shall he provided such that the SCBA unit cannot be retained in the mount unless the positive latch is engaged.

14.1.10.2 The bracket holding device and its mounting shall retain the SCBA unit when subjected to a 9 G force and shall be installed in accordance with the bracket manufacturer's requirements.

14.1.10.3 If the SCBA unit is mounted in a seatback, the release mechanism shall be accessible to the user while seated.

14.1.11 Equipment Mounting.

It is the responsibility of the purchaser to ensure that any equipment installed on the apparatus by them or their subcontractor meets the following requirements prior to placing it in service.

14.1.11.1 All equipment required to be used during an emergency response shall be securely fastened.

14.1.11.2 All equipment not required to be used during an emergency response, with the exception of SCBA units, shall not be mounted in a driving or crew area unless it is contained in a fully enclosed and latched compartment capable of containing the contents when a 9 G force is applied in the longitudinal axis of the vehicle or a 9G force is applied in any other direction, or the equipment is mounted in a bracket(s) that can contain the equipment when the equipment is subjected to those same forces.

Section 15.9.3 Reflective Striping.

It is the responsibility of the purchaser to ensure that Reflective Striping has been supplied and installed on the apparatus in order to achieve compliance with the standard prior to placing it in service.

15.9.3.1'" A retroreflective stripe(s) shall be affixed to at least 50 percent of the cab and body length on each side, excluding the pump panel areas, and at least 25 percent of the width of the front of the apparatus.

15.9.3.1.1 The stripe or combination of stripes shall be a minimum of 4 in. (100 mm) in total width.

15.9.3.1.2 The 4 in. (100 mm) wide stripe or combination of stripes shall be permitted to be interrupted by objects (i.e., receptacles, cracks between slats in roll up doors) provided the full stripe is seen as conspicuous when approaching the apparatus.

15.10 Hose Storage.

It is the responsibility of the purchaser to ensure that any hose storage area includes a positive means to prevent unintentional deployment in order to achieve compliance with the standard prior to placing it in service.

15.10.7 Any hose storage area shall be equipped with a positive means to prevent unintentional deployment of the hose from the top, sides, front, and rear of the hose storage area while the apparatus is underway in normal operations.