City of South Portland
Bid # 31-18
Request for Proposals for
Aerial Fire Truck
TABLE OF CONTENTS

SECTION I: GENERAL INFORMATION
   A. Introduction
   B. Questions
   C. Schedule

SECTION II: SCOPE OF WORK

SECTION III: SUBMISSION REQUIREMENTS AND INSURANCE
   A. Time and Place for Submission of Proposals
   B. Format and Content of Proposals
   C. Price Proposal
   D. Copies of Current Licenses and Certifications
   E. Bid Security
   F. Insurance Requirements

SECTION IV: EVALUATION AND SELECTION CRITERIA
   A. Minimum Qualifications
   B. Selection Criteria

ATTACHMENTS:

Appendix A

Appendix B

Appendix C
SECTION I: GENERAL INFORMATION

A. INTRODUCTION

The City of South Portland is requesting proposals from qualified bidders to provide the City with an Aerial Fire Truck.

The City requires that all contractors building equipment must possess the ability to perform successfully under the terms and conditions of the contract. Proposals will be received by the City of South Portland, ME for the furnishing of all necessary labor, equipment and material for the Fire Apparatus and other equipment as outlined.

The City of South Portland, Maine reserves the right to reject any and all bids, wholly or in part, and to award the bid in a manner deemed in the best interest of the City of South Portland. Bids may be withdrawn at any time prior to the time of opening said bids as stated in these general conditions. This truck may be bid two ways; vendors are encouraged to submit proposals under both options.

Option 1
The preference is for a complete custom firefighting apparatus per the attached specifications which will be labeled appropriately Fire Truck Option #1. The equipment specifications are listed in Appendix B, which cover the minimum requirements as to the type of construction and tests to which the apparatus must conform.

Option 2
A vendor has the option of submitting a bid under Fire Truck Option #2 that consists of a manufacturer’s stock model, or other manufacturing method, that meets a majority of our specifications listed in Appendix B. This option is being requested to determine if an acceptable vehicle might be available with a shorter delivery timetable and what the price difference might be if the City wishes to proceed with that option. No exceptions shall be allowed under this option with regards to these base requirements:

  a. Single Source Manufacture
  b. Maximum Height of 11’6”
  c. Minimum Engine Size: Cummings ISL9 450 hp. 6-cylinder diesel motor
  d. Allison EVS4000P Automatic Transmission
  e. Minimum 100’ Aerial Ladder Painted Black
  f. Minimum 500 Gallon Water Tank
  g. Minimum 30 Gallon Foam Tank
  h. Minimum 1500 GPM Hale Pump
  i. Minimum 3 GPM Foam Pump
  j. Minimum 6 Passenger Tilt Cab
  k. Minimum 1500 GPM Waterway
  l. Single Rear Axle
  m. Compartment Doors Shall Be Hinged
  n. Plumbd Bumper Line Capable of Holding 150’ of 1 ¾ Hose.
  o. Hot Dipped Galvanized Frame and Cross Members
p. Water Tank Cross Cradle Shall Be Hot Dipped Galvanized
q. 8K Hydraulic Generator
r. Three Plumbed Crosslays Capable of Two 200’ 1 ¾ Each and One 200’ of 2 ½
s. Hose Bed Shall Be Capable of holding 1000’ of 5” LDH
t. NFPA 1901 Compliant

Option 2 proposals need to submit Appendix B noting any and all exceptions. Additionally, the proposer needs to provide a detailed explanation of the process for which the vehicle will be constructed.

B. QUESTIONS ABOUT AND CLARIFICATIONS OF THE REQUEST FOR PROPOSAL

All questions regarding this Request for Proposal (RFP) shall be submitted via email. Questions will be accepted and answered accordance with the terms and conditions of this RFP. All questions shall be submitted on or before Tuesday, November 9, 2017, at 3:00 p.m., and shall be emailed to James Wilson, JWILSON@southportland.org with a copy email sent to Colleen Selberg, Cselberg@southportland.org. The City will provide written responses by November 14, 2017.

C. SCHEDULE

<table>
<thead>
<tr>
<th>Proposal Phase</th>
<th>Anticipated Date(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFD Issued and Advertised</td>
<td>October 27, 2017</td>
</tr>
<tr>
<td>Deadline for Written Questions and Clarification</td>
<td>November 9, 2017</td>
</tr>
<tr>
<td>Proposals Due</td>
<td>November 27, 2017</td>
</tr>
<tr>
<td>Selection Committee Reviews Proposals</td>
<td>November 28, 2017</td>
</tr>
<tr>
<td>Recommendation of Committee to Council</td>
<td>November 30, 2017</td>
</tr>
<tr>
<td>City Council Approval of Award</td>
<td>December 4, 2017</td>
</tr>
<tr>
<td>Notice of Intent to Award</td>
<td>December 5, 2017</td>
</tr>
<tr>
<td>Tentative Contract Award Date</td>
<td>December 22, 2017</td>
</tr>
</tbody>
</table>
SECTION II: SCOPE OF WORK

It shall be the intent of these specifications to cover the furnishing and delivery of a complete fire apparatus. The City of South Portland is seeking a qualified contractor to provide one (1) aerial fire truck that meets the equipment specifications listed in Appendix B of this RFP. These detailed specifications cover the requirements as to the type of construction, finish, equipment and tests to which the fire apparatus shall conform.

Exceptions shall be referenced in Appendix C to the paragraph and page of these specifications where the item appears. Drawings, photographs, and technical information about the exception shall be included as necessary. Any exceptions may be considered during the evaluation process, and the decision shall be final. Proposals taking total exceptions to specifications shall not be accepted.

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

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

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

The manufacturer shall also be certified to operate a Quality Management System under the requirements of ISO 9001. These standards sponsored by the International organization for Standardization (ISO) specify the quality systems that shall be established by the manufacturer for design, manufacture, installation and service. A copy of the certificate of compliance shall be included with the proposal. To insure proper break in of all components vehicle shall be delivered under its own power to final destination - rail or truck freight shall not be acceptable.
The manufacturer shall supply at time of delivery, complete operation and maintenance manuals covering the complete apparatus as delivered. A permanent plate shall be mounted in the driver’s compartment which specifies the quantity and type of fluid required including engine oil, hydraulic oil, engine coolant, transmission, pump transmission lubrication, pump primer and drive axle.

An apparatus safety video, in DVD format shall be provided at time of delivery. This video shall address key safety considerations for personnel to follow when they are driving, operating, and maintaining the apparatus. Safety procedures for the following shall be included on the video: vehicle pre-trip inspection, chassis operation, pump operation, aerial operation and maintenance.

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

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

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

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

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

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

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

In the event the apparatus fails to meet the test requirements of these specifications on the first trial, second trials may be made at the option of the vendor within 30 days of the date of the first trial. Such trials shall be final and conclusive and failure to comply with these requirements shall be cause for rejection. Failure to comply with changes to conform to any clause of the specifications, within 30 days after notice is given to the vendor of such changes, shall also be cause for rejection of the apparatus. Permission to keep or store the apparatus in any building owned or occupied by the purchaser or its use by the purchaser during the above-specified period with the permission of the vendor shall not constitute acceptance.
TO ENSURE FULL SERVICE AFTER DELIVERY, THE SELLING VENDOR/DEALERSHIP MUST BE CAPABLE OF PROVIDING SERVICE WHEN REQUIRED.

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

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

The vendor/dealership must state the location of this authorized service center. This service center must have a staff of factory-trained mechanics, well versed in all aspects of service for all major components of the apparatus. The service center must be within one hundred fifty (150) miles of the Fire Department.

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

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

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

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

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

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

The manufacturer shall offer regional factory hands-on repair and maintenance training classes. The manufacturer shall employ a minimum of four certified EVT technicians on staff, not only providing technical expertise in the repair of fire apparatus, but also demonstrating the commitment to service after the sale.
This unit shall comply with the NFPA standards effective January 1, 2016, except for fire department specifications that differ from NFPA specifications. These exceptions shall be set forth in the Statement of Exceptions.

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

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

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

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

To assure the vehicle is built to current NFPA standards, the apparatus, in its entirety, shall be third-party, independent, audit-certified through Underwriters Laboratory (UL) that it is built and complies to all applicable standards in the current edition of NFPA 1901. The certification includes: all design, production, operational, and performance testing of not only the apparatus, but those components that are installed on the apparatus.

A placard shall be affixed in the driver's side area stating the third party agency, the date, the standard and the certificate number of the whole vehicle audit.

A third party inspection certificate for the aerial device shall be furnished upon delivery of the aerial device. The certificate shall be Underwriters Laboratories Inc. Type 1 and shall indicate that the aerial device has been inspected on the production line and after final assembly.

Visual structural inspections shall be performed on all welds on both aluminum and steel ladders.

On critical weld areas, or on any suspected defective area, the following tests shall be conducted: Magnetic particle inspection shall be conducted on steel aerials to assure the integrity of the weldments and to detect any flaws or weaknesses. Magnets shall be placed on each side of the weld while iron powder is placed on the weld itself. The powder shall detect any crack that may exist. This test shall conform to ASTM E709 and be performed prior to assembly of the aerial device.

A liquid penetrant test shall be conducted on aluminum aerials to assure the integrity of the weldments and to detect any flaws or weaknesses. This test shall conform to ASTM E165 and be performed prior to assembly of the aerial device.

Ultrasonic inspection shall be conducted on all aerials to detect any flaws in pins, bolts and other critical mounting components.
In addition to the tests above, functional tests, load tests, and stability tests shall be performed on all aerials. These tests shall determine any unusual deflection, noise, vibration, or instability characteristics of the unit.

The pump shall be tested, approved, and certified by Underwriter's Laboratory at the manufacturer's expense. The test results and the pump manufacturer's certification of hydrostatic test; the engine manufacturer's certified brake horsepower curve; and the manufacturer's record of pump construction details shall be forwarded to the Fire Department.

The generator shall be tested, approved, and certified by Underwriters Laboratories at the manufacturer's expense. The test results shall be provided to the Fire Department at the time of delivery.

The vendor shall provide two (2) factory inspection trips for three (3) South Portland Fire Department customer representative(s). The inspection trips shall be scheduled at times mutually agreed upon between the manufacturer's representative and the customer. All costs such as travel, lodging and meals shall be the responsibility of the vendor.

A qualified training engineer shall be provided by the vendor. The training engineer shall instruct the South Portland Fire Department personnel in the operation and maintenance of the chassis, pump, aerial, and foam operation for a period of not less than four (4) days.

The contract for the specified apparatus shall be directly with the City of South Portland, Maine and the manufacturer. Contracts with dealers or representatives of the manufacturer will not be executed.

All components shall be new and unused (with the exception of use incidental to the construction, testing, transport and delivery of the apparatus). Any old or used components shall constitute grounds for automatic rejection of the entire apparatus.

Vendors must identify by manufacturer and model number purchased components utilized in the apparatus proposed in the bid submission. In order to make valid comparisons between bids, components must be accurately identified. Therefore, any bid or technical proposal which does not so identify the components being offered will not be considered.

The successful vendor shall also provide weekly photographic progress reports and inspection services, provided by an independent third party.

- Comprehensive review of the bid documents with the factory order to ensure accuracy.
- Weekly progress reports including photographs of the apparatus or the major components as they are being constructed. The reports shall commence at the beginning of the manufacturing process and shall continue until just prior to the final inspection. The reports shall show the progress of the apparatus through the course of each week. Special attention shall be given to show the unique features and aspects of the apparatus as construction progresses.
In addition, after the final inspection has been completed by the customer or third party, the third party inspector shall review all items noted in the inspection for completion prior to the apparatus leaving the manufacturing facility for delivery to the local service area for pre-delivery service.
SECTION III: SUBMISSION REQUIREMENTS

A. Time and Place for Submission of Proposals

Proposals must be received by **November 27, 2017 2:00 PM**. Postmarks will not be considered in judging the timeliness of submissions. Proposals may be delivered in person or mailed to:

City of South Portland  
25 Cottage Road  
South Portland, ME 04106  
Reference: Aerial Fire Truck Proposal

Proposers shall submit one (1) original and three (3) copies of the proposal, which must be individually bound with the pages numbered accordingly. The original document must be clearly marked as “Original” and the copies must be clearly marked as “Copy”. Each proposal received will be screened to ensure that the information required in this RFP is included. Partial or complete omission of any of these items from a proposal may disqualify proposals from further consideration. Proposals submitted by fax or email/electronic communication will not be accepted.

**Late submissions will not be considered.**

B. Format and Content of Proposals

Please submit your proposal in a three-ring binder, printed on recycled paper, double-sided to the maximum extent that is practical. Please do not bind our proposal with spiral binding, glued binding or any similar type of binding. You may use tabs or other separators within the document. All proposals must include a Table of Contents.

Firms interested in responding to this RFP must submit the following information, in the order specified below:

a. Introduction and Executive Summary  
   Submit a letter of introduction and executive summary of the proposal. The letter must be signed by a person authorized by your firm to obligate your firm to perform the commitments contained in the proposal. Submission of the signed letter of introduction will constitute a representation by your firm that your firm is willing and able to perform the commitments contained in the proposal.

b. Technical Proposal
   i. The Proposer must address how it demonstrates compliance with the Minimum Qualifications as outlined in Evaluation and Selection Criteria.
   ii. All proposers must confirm their compliance with the requirements of the technical proposal specifications of the attached Specifications Appendix B and submit a copy of the Equipment Specifications with their proposal. Proposers shall indicate compliance with each section and line item specifications as required in the line space provided by marking with a “Y” for “Yes”. If proposer is offering an alternate of equal or superior status to the line item specification, proposer shall indicate by
marking with an “A” for “Alternate” and for those items that do not meet the specification should be marked with an “E” for “Exception” on each line item. The proposer must then reference each item Alternate ‘A’ and Exception “E” and explain the proposed Alternate or Exception on Equipment Deviation Sheets, (Appendix B).

iii. Proposals which do not include confirmation of each section and line item as required will be deemed to take exception to such proposal requirements which may result in the proposal being considered non-responsive.

iv. Describe in detail the apparatus your firm proposes to provide to the City. Include the following information:

1. Computer-aided design drawings showing all six (6) views of the vehicle with specific dimensions from the top (overhead “see through view” of the cab, aerial module, and body showing seating and general layout), front, back, right and left sides, and bottom of the vehicle. The drawing will also include the chassis, make and model, location of key components such as location of lights, sirens, horns, pump panels, equipment compartments, mirrors, and major components, to include maximum height, maximum width, maximum length, and undercarriage clearance and angle of approach and departure.

2. Schedule and ability to complete the project within the City’s required time frame.

c. Firm Qualifications and References

Provide information on your firm’s background and qualifications which covers the following items:

i. Name, address, and telephone number of a contact person

ii. A brief description of your firm

iii. Brief resumes of key personnel assigned to this project

iv. A description of three (3) projects similar in size and scope provided by your firm including reference information, schedule and project summary. Each reference must include the name and location, make and model number of Engine and horsepower, length of Fire Trucks and quantities sold. Also, include the name, address, email, telephone number and fax numbers of the contact person. Descriptions should be limited to one (1) page for each project.

C. Price Proposal

a. Enter the price proposal on Appendix A, Price Proposal Sheet. Price shall be F.O.B Destination and exclusive of any Federal, State, local sales or use tax.

b. Included in the proposal price is an allowance of $30,000 to be used at the discretion of the Chief or his designee for equipment on the apparatus.

c. The City intends to award this contract to the firm that it considers will provide the best overall approach to providing the specified fire apparatus. The City reserves the right to accept other than the lowest priced offer and to reject any proposals that are
not responsive to this request.

d. All proposals shall be considered firm for a period of 365 calendar days, commencing the day following the date of the proposal due date. Any proposals specifying any time less than 365 calendar days shall be deemed non-responsive.

e. The City may at its option consider purchasing a second vehicle with the same specifications (or nearly identical specifications). Please provide cost adjustment parameters for a subsequent purchase that the City could elect on May 15, 2022 or May 15, 2023. An example might be; Vehicle constructed under same specification would have an annual price adjustment of the lessor of 3% or CPI-U rate for the period under consideration. Company would quote rate under this contract 6 month prior to election date based on these parameters.

D. Copies of Current Licenses and Certifications
   a. Manufacturer’s certification as an authorized dealer and service facility (if proposer is not the manufacturer)
   b. ISO Certificate of Compliance of documentation of codes of practices, quality control, and assurance programs or procedures utilized by the manufacturer.

E. Bid Security
   a. All vendors shall provide a bid bond as security for the bid in the form of a 10% bid bond to accompany their bid. This bid bond shall be issued by a Surety Company who is listed on the U.S. Treasury Departments list of acceptable sureties as published in Department Circular 570. The bid bond shall be issued by an authorized representative of the Surety Company and shall be accompanied by a certified power of attorney dated on or before the date of bid. The bid bond shall include language, which assures that the vendor/principal shall give a bond or bonds as may be specified in the bidding or contract documents, with good and sufficient surety for the faithful performance of the contract, including the Basic One (1) Year Limited Warranty, and for the prompt payment of labor and material furnished in the prosecution of the contract. Proposals received from vendors who do not manufacture the chassis shall provide a warranty that shall be issued jointly and severally by, and signed by, both the vendor and the chassis manufacturer. If the successful vendor does not manufacture the chassis, the vendor shall supply a warranty bond, in addition to their performance bond, along with their signed contract. This warranty bond shall guarantee all terms and conditions of the Basic One (1) Year Limited Warranty and names both the vendor and chassis manufacturer as co-principals. This warranty bond shall be issued for the contract amount and shall remain in force for a term which is consistent with the term of the Basic One (1) Year Limited Warranty. Notwithstanding any document or assertion to the contrary, any surety bond related to the sale of a vehicle shall apply only to the Basic One (1) Year Limited Warranty for such vehicle. Any surety bond related to the
sale of a vehicle shall not apply to any other warranties that are included within this bid (OEM or otherwise) or to the warranties (if any) of any third party of any part, component, attachment or accessory that is incorporated into or attached to the vehicle. In the event of any contradiction or inconsistency between this provision and any other document or assertion, this provision shall prevail.

b. The successful vendor shall furnish a Performance and Payment bond (Bond) equal to 100% of the total contract amount within 30 days of the notice of award. Such Bond shall be in a form acceptable to the Owner and issued by a surety company included within the Department of Treasury's Listing of Approved Sureties (Department Circular 570) with a minimum A.M. Best Financial Strength Rating of A and Size Category of XV. In the event of a bond issued by a surety of a lesser Size Category, a minimum Financial Strength rating of A+ is required. Vendor and Vendor's surety agree that the Bond issued hereunder, whether expressly stated or not, also includes the surety's guarantee of the vehicle manufacturer's Basic One (1) Year Limited Warranty period included within this proposal. Owner agrees that the penal amount of this bond shall be simultaneously amended to 100% percent of the total contract amount upon satisfactory acceptance and delivery of the vehicle(s) included herein. Notwithstanding anything contained within this contract to the contrary, the surety's liability for any warranties of any type shall not exceed one (1) year from the date of such satisfactory acceptance and delivery, or the actual Basic One (1) Year Limited Warranty period, whichever is shorter.

F: Insurance Requirements

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

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

- Each Occurrence $1,000,000
- Products/Completed Operations Aggregate $1,000,000
- Personal and Advertising Injury $1,000,000
- General Aggregate $5,000,000

Coverage shall be written on a Commercial General Liability form. The policy shall be written on an occurrence form and shall include Contractual Liability coverage for bodily injury and property damage subject to the terms and conditions of the policy. The policy shall include Owner as an additional insured when required by written contract.
The successful vendor shall, during the performance of the contract keep in force at least the following minimum limits of commercial automobile liability insurance:

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

Coverage shall be written on a Commercial Automobile liability form.

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

- Aggregate: $25,000,000
- Each Occurrence: $25,000,000

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

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

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

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

A. Minimum Qualifications

The following outlines the minimum qualifications from vendors who wish to be considered for award of the Aerial Fire Truck contract. Proposals that do not demonstrate that the proposer meets these minimum requirements at the time the proposal is submitted will be considered non-responsive and will not be eligible for award of the contract.

In order to be considered, proposers must submit documentation that substantiates the following:

a. The proposer’s company must have experience in building aerial fire trucks. The manufacturer shall have built aerial fire trucks for at least five (5) years and have built at least twenty (20) units of the one being proposed, which are in service and shall provide references for at least three (3) fire departments that have taken delivery of said units.

b. If the proposer is an authorized dealer and service facility for the manufacturer for the apparatus offered, the proposer must provide written certification with its proposal from the manufacturer (on manufacturer’s letterhead) stating such authorization. Proposer must have a minimum of five (5) years of relevant experience in sales and servicing of aerial fire trucks.

c. In order to ensure continuity of quality and warranty, the manufacturer shall be the manufacturer of the entire modular body and shall mount that modular body on the specified chassis. The manufacturing and mounting of the modular body shall not be performed at a location or by employees other than that of the manufacturer to whom the proposal is awarded. The City does not wish to purchase a prototype or non-proven body.

d. Proposer must be able to demonstrate to the City’s satisfaction their capabilities including evidence that they possess adequate facilities to fully comply with the requirements of the contract prior to award and at any time during the contract term of extension thereof. Also, proposer’s experience record regarding past performance and the ability to perform on schedule may be requested. The proposer shall furnish any documentation requested by the City within seven (7) business days from the date of request.

e. The City reserves the right to inspect the proposer’s place of business prior to award or at any time during the contract term or any extension thereof, to determine the proposer’s capabilities and qualifications.

f. Submit a letter from a surety stating that the surety will provide the proposer with a performance bond and a labor and materials bond, each valued at 100% of the contract amount.

g. The City reserves the right to reject any proposal if the documentation submitted by
the proposer fails to satisfy City and/or proposer is unable to supply the documentation within the time period requested. Also, the City reserves the right to terminate the contract after the award if any of the documentation is found later to be misleading or the proposer has misrepresented their qualifications and experience.

B. Selection Criteria
The Selection Committee will evaluate each proposal that meets the minimum qualification requirements set forth below on a scale of 100 points. The Selection Committee will be comprised of staff from the City Hall and the Fire Department. The evaluation will be conducted in two (2) phases: (1) minimum qualification review (pass/fail) and (2) evaluation of technical requirements, pricing and written proposals.

Any false, incomplete or otherwise unresponsive statements in connection with a proposal or any documentation or other information supplied to the City by the proposer may be cause for rejection by the City of the proposal or disqualification of the proposer at the City’s sole discretion. Any judgment as to the significance of any falsity, incompleteness or unresponsiveness shall be the prerogative of the City and its judgment is final.

The City will evaluate the proposals in accordance with the criteria below. The evaluation of the proposals shall be within the sole judgment and discretion of the Selection Committee. Proposers may be required to submit additional information to clarify their proposals at any time throughout the evaluation process.

1. **Sale Support, Service Experience of Firm**
   Evaluation will include relevant experience and qualifications. Record of past performance (both within and outside the department, including references), previous department experience with the vendors’ products and repair services; quality of recently completed projects for other purchases, including adherence to schedules, deadlines and budgets as well as experience with similar projects.

2. **Quality, Durability and Value**
   Will be evaluated on the quality and strength of the materials and components used in the manufacture of the apparatus. Quality of finish, fit, workmanship and overall attention to detail. Durability of both design and components used Innovation, design features, and performance including tip loads, flow ratings, and operational restrictions. Ease of operation and maintenance. Safety designs and safety records. Extent and length of the various warranties. Overall comparative value versus price.
3. **Technical Proposal**
   Proposers will be evaluated on their understanding and compliance of the equipment specifications, exceptions taken, technical capabilities for performing each section of the specifications, and drawings of the apparatus as required.

4. **Price Proposal**
   Price will not be the sole selection criteria

The City has elected to allow an Option 2 bid submission as an alternative. This option allows the City to consider any other proposals which meet fewer of the specifications as outlined in Appendix C. The primary purpose for this option is to receive the vehicle with significant less lead time.
Appendix A: Bid Form

The UNDERSIGNED hereby proposes to furnish One Custom Built Aerial Fire Truck to the City of South Portland, Maine, in accordance with the attached Invitation to Bid and Specifications, and at the following price, warranty, and delivery time:

Option 1. A complete custom built firefighting apparatus per the specifications described in Appendix C which will be labeled appropriately Fire Truck Option #1. The equipment specifications are listed in Appendix C, which cover the minimum requirements as to the type of construction and tests to which the apparatus must conform.

Total $____________________

Year, Make & Model _____________________________________________

_______________________________________________________________

Warranty_______________________________________________________

_______________________________________________________________

_______________________________________________________________

Delivery Time _________________________________________________

Option 2. A vendor has the option of submitting a bid under Fire Truck Option #2 that consists of a manufacturer’s stock model, or other manufacturing method, that meets a majority of our specifications. This option is being requested to determine if an acceptable vehicle might be available with a shorter delivery timetable and what the price difference might be if the City wishes to proceed with that option. No exceptions shall be allowed under this option with regards to these base requirements:

- Single Source Manufacture
- Maximum Height of 11’6”
- Minimum Engine Size: Cummings ISL9 450 hp. 6-cylinder diesel motor
- Allison EVS4000P Automatic Transmission
- Minimum 100’ Aerial Ladder Painted Black
- Minimum 500 Gallon Water Tank
- Minimum 30 Gallon Foam Tank
- Minimum 1500 GPM Hale Pump
i. Minimum 3 GPM Foam Pump  
j. Minimum 6 Passenger Tilt Cab  
k. Minimum 1500 GPM Waterway  
l. Single Rear Axle  
m. All Compartment Doors Shall Be Hinged  
n. Plumbed Bumper Line Capable of Holding 150’ of 1 ¾ Hose.  
o. Hot Dipped Galvanized Frame and Cross Members  
p. Water Tank Cross Cradle Shall Be Hot Dipped Galvanized  
q. 8K Hydraulic Generator  
r. Three Plumbed Crosslays Capable of Two 200’ 1 ¾ Each and One 200’ of 2 ½  
s. Hose Bed Shall Be Capable of holding 1000’ of 5” LDH  
t. NFPA 1901 Compliant

Option 2 proposals need to submit Appendix B noting any and all exceptions. Additionally, the proposer needs to provide a detailed explanation of the process for which the vehicle will be or has been constructed.

**Total $____________**

Year, Make & Model ____________________________________________________________

____________________________________________________________________________

Warranty_______________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

Delivery Time _________________________________________________________________

Vendor is also requested to submit any pricing incentive program offered.

The City may at its option consider purchasing a second vehicle with the same specifications (or nearly identical specifications). Please provide cost adjustment parameters for a subsequent purchase that the City could elect on May 15, 2022 or May 15, 2023. An example might be; Vehicle constructed under same specification would have an annual price adjustment of the lessor of 3% or CPI-U rate for the period under consideration. Company would quote rate under this contract 6 month prior to election date based on these parameters.

Signed: ____________________________________________

(Corporation, Firm or Company)

By: ________________________________________________
(Officer, Authorized Individual or Owner)

Title: ____________________________________________

Mailing Address: ____________________________________

Zip Code: __________________________________________

Telephone: _________________________________________

Fax: _______________________________________________

Email: _____________________________________________

Note: Bids must bear the handwritten signature of a duly authorized member or employee of the organization making the bid.

Date: _____________________________________________
APPENDIX C: SPECIFICATIONS FOR A HEAVY DUTY AERIAL LADDER

Proposer ________________________
Option # ________________________

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

WHEELBASE
The wheelbase of the vehicle shall be a minimum of 230.00”

GVW RATING
The gross vehicle weight rating shall be a minimum of 50,000 lbs.

FRAME
The chassis frame shall be built with two (2) steel channels bolted to cross members. Vendors shall submit frame dimensions with resisting bending moment (rbm). Vendor’s shall summit frame reinforcement assembly with steel dimensions and rbm.

FRAME REINFORCEMENT
A full-length mainframe "L" liner shall be provided. The liner shall be heat-treated steel. Vendor’s shall submit each reinforcement section modulus cubic inches, psi yield strength and resisting bending moment (rbm).

GALVANIZED CHASSIS FRAME ASSEMBLY
The chassis frame assembly shall be hot dip galvanized before the installation of the cab and body, and before installation of the engine and transmission assembly, air brake lines, electrical wire harnesses, etc.

Components that are included with the chassis frame assembly that shall be hot dip galvanized are:
- Frame rails
- Frame liners
- Cross members
- Front frame extension
- Battery boxes

All galvanized components are inspected for compliance with ASTM specifications.

**HOT DIP GALVANIZED COMPARTMENT SUBSTRUCTURE**

The compartment substructure shall be treated through a hot dip galvanizing process. These components shall be immersed in molten zinc to provide a coating that shall help protect against the effects of corrosion.

**FRONT NON DRIVE AXLE**

The front axle shall be of the independent suspension design.

Each control arm shall be mounted to the center section using elastomer bushings. These rubber bushings shall rotate on low friction plain bearings and be lubricated for life. Each bushing shall also have a flange end to absorb longitudinal impact loads, reducing noise and vibrations.

There shall be nine (9) grease fittings supplied, one (1) on each control arm pivot and one (1) on the steering gear extension.

The upper control arm shall be shorter than the lower arm so that wheel end geometry provides positive camber when deflected below rated load and negative camber above rated load.

Camber at load shall be 0 degrees for optimum tire life.

The ball joint bearing shall be of low friction design and be maintenance free.

Toe links that are adjustable for alignment of the wheel to the center of the chassis shall be provided.

The wheel ends must have little to no bump steer when the chassis encounters a hole or obstacle.

The steering linkage shall provide proper steering angles for the inside and outside wheel, based on the vehicle wheelbase.

The axle shall have a third party certified turning angle of 45 degrees. Front discharge, front suction, or aluminum wheels shall not infringe on this cramp angle.
The independent suspension system shall be designed to provide maximum ride comfort. The design shall allow the vehicle to travel at highway speeds over improved road surfaces and at moderate speeds over rough terrain with minimal transfer of road shock and vibration to the vehicle's crew compartment.

Each wheel shall have a torsion bar type spring. In addition, each front wheel end shall also have energy absorbing jounce bumpers to prevent bottoming of the suspension.

**FRONT SHOCK ABSORBERS**
Heavy-duty telescoping shock absorbers shall be provided on the front suspension.

**FRONT OIL SEALS**
Oil seals with viewing window shall be provided on the front axle.

**FRONT TIRES**
Front tires shall be Goodyear radials, 20 ply MSA tread, rated for maximum axle load and 68 mph maximum speed.

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

**REAR AXLE**
The rear axle shall be a Meritor.

**TOP SPEED OF VEHICLE**
A rear axle ratio shall be furnished to allow the vehicle to reach a top speed of 68 mph.

**REAR SUSPENSION**
The rear springs shall have a ground rating equal to the rear axle. Spring hangers shall be castings with provisions for lubrication. The grease fittings shall be 90-degree type and shall be accessible without removing the wheels or cutting any sheet metal. Two (2) top leaves shall wrap the forward spring hanger pin and the top leaf shall wrap the rear spring hanger pin on both the front and rear suspensions.

Kaiser spring pins shall be provided, with double figure-eight grease grooves and a layer of electrolysis nickel plating, 1.0 mil thick, around the entire pin. The bushing that holds the spring pin in place shall also have a grease groove.
**REAR OIL SEALS**
Oil seals shall be provided on the rear axle(s).

**REAR TIRES**
Rear tires shall be four (4) Goodyear radials, 20 ply all season tread, rated for maximum axle load and 68 mph maximum speed.

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

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

**TIRE PRESSURE MANAGEMENT**
There shall be a tire alert pressure management system provided, that shall monitor each tire's pressure. A sensor shall be provided on the valve stem of each tire for a total of six (6) tires.

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

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

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

**CHROME LUG NUT COVERS**
Chrome lug nut covers shall be supplied on front and rear wheels.

**MUD FLAPS**
Mud flaps shall be installed behind the front and rear wheels of the apparatus.
MUD FLAPS
Mud flaps shall be installed ahead of the rear wheels on the apparatus.

WHEEL CHOCKS
There shall be one (1) pair of folding Ziamatic, Model SAC-44-E, aluminum alloy, Quick-Choc wheel blocks with easy-grip handle provided.

WHEEL CHOCK BRACKETS
There shall be one (1) pair of Zico, Model SQCH-44-H, horizontal mounting wheel chock brackets provided for the Ziamatic, Model SAC-44-E, folding wheel chocks. The brackets shall be made of aluminum and consist of a quick release spring loaded rod to hold the wheel chocks in place. The brackets shall be mounted below the left side forward compartment.

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

BRAKES
The service brake system shall be full air type.

The front brakes shall be Knorr/Bendix disc type with a 17.00" ventilated rotor for improved stopping distance.

The brake system shall be certified, third party inspected, for improved stopping distance.

The rear brakes shall be Meritor™ 16.50" x 8.63" cam operated with automatic slack adjusters. Dust shields cannot be provided.
AIR COMPRESSOR, BRAKE SYSTEM
The air compressor shall be a Bendix®, Model BA-921, with 15.80 cubic feet per minute output at 1,250 rpm.

BRAKE SYSTEM
The brake system shall include:

- Bendix® dual brake treadle valve with vinyl covered foot surface
- Heated automatic moisture ejector on air dryer
- Total air system capacity of 5,198 cubic inches
- Two (2) air pressure gauges with a red warning light and an audible alarm, that activates when air pressure falls below 60 psi
- Spring set parking brake system
- Parking brake operated by a push-pull style control valve
- A parking "brake on" indicator light on instrument panel
- Park brake relay/inversion and anti-compounding valve, in conjunction with a double check valve system, with an automatic spring brake application at 40 psi
- A pressure protection valve to prevent all air operated accessories from drawing air from the air system when the system pressure drops below 80 psi (550 kPa)
- 1/4 turn drain valve on each air tank

The air tank shall be primed and painted to meet a minimum 750-hour salt spray test. To reduce the effects of corrosion, the air tank shall be mounted with stainless steel brackets (no exception).

BRAKE SYSTEM AIR DRYER
The air dryer shall be WABCO System Saver 1200 with spin-on coalescing filter cartridge and 100 watt heater.

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

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

**ALL WHEEL LOCK-UP**
An additional all wheel lock-up system shall be installed which applies air to the front brakes only. The standard spring brake control valve system shall be used for the rear.

**ENGINE**
The chassis shall be powered by a Cummings ISL9 450 hp. 6-cylinder diesel motor. Peak torque of 1250 lb. ft. at 1400 rpm. The engine shall include On-board diagnostics (OBD), which provides self-diagnostic and reporting. The system shall give the owner or repair technician access to state of health information for various vehicle sub systems. The system shall monitor vehicle systems, engine and after treatment. The system shall illuminate a malfunction indicator light on the dash console if a problem is detected.

**REPTO DRIVE**
A rear engine power take off shall be provided to drive the water pump. A vibration dampener shall be provided between the REPTO and water pump. Transmission PTO's used to drive the water pump shall not be allowed due to their lower torque ratings. The rear engine power take off shall be the same as used extensively throughout the construction industry. Rear engine PTO's allow for continuous 240 hp. and 480 lb. ft. torque ratings needed for large pump applications. The rear engine power take off shall have the same warranty as the engine provided by the engine manufacturer.

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

The high idle shall be operational only when the parking brake is on and the truck transmission is in neutral. A green indicator light shall be provided, adjacent to the switch. The light shall illuminate when the above conditions are met. The light shall be labeled "OK to Engage High Idle."
**CLUTCH FAN**
A clutch fan shall be provided. The fan clutch shall be automatic when the pump transmission is in "Road" position, and fully engaged in "Pump" position.

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

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

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

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

**ENGINE AIR INTAKE**
The air intake with an ember separator shall be supplied. The ember separator is designed to prevent road dirt and recirculating hot air from entering the engine.

The ember separator shall be easily accessible.

**EXHAUST SYSTEM**
The exhaust system shall include a diesel particulate filter (DPF) and a selective catalytic reduction (SCR) device to meet current EPA standards. The exhaust system shall be stainless steel from the turbo to the inlet of the SCR device and shall be 5.00” in diameter. An insulation wrap shall be provided on all exhaust pipes between the turbo and SCR to minimize the transfer of heat to the cab. The exhaust shall terminate horizontally ahead of the right side rear wheels. A tailpipe diffuser shall be provided to reduce the temperature of the exhaust as it exits. Heat deflector shields shall be provided to isolate chassis and body components from the heat of the tailpipe diffuser.

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

For maximum corrosion resistance and cooling performance, the entire radiator core shall be constructed using long life aluminum alloy. The 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 minimum frontal area of approximately 1,352 square inches. Supply tank made of glass-reinforced nylon and a return tank of cast aluminum alloy 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 radiator assembly shall include an integral de-aeration tank permanently mounted to the top of the radiator framework, with a readily accessible remote-mounted overflow tank. For visual coolant level inspection, the radiator shall have a built-in sight glass. The radiator shall be equipped with a 15 psi pressure relief cap.

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

A heavy-duty fan shall draw in fresh, cool air through the radiator. Shields or baffles shall be provided to prevent recirculation of hot air to the inlet side of the radiator.

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

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

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

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

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

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

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

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

**DIESEL EXHAUST FLUID TANK**

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

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

A fill inlet shall be located on the driver's side of the body and be covered with a hinged, spring loaded, polished stainless steel door that is marked "Diesel Exhaust Fluid Only".

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

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

**FUEL COOLER**

An air to fuel cooler shall be installed in the engine fuel return line.

**TRANSMISSION**

An Allison 5th generation, Model EVS 4000P, electronic, torque converting, automatic transmission shall be provided.

The transmission shall be equipped with prognostics to monitor oil life, filter life, and transmission health. A wrench icon on the shift selector's digital display shall indicate when service is due.
Two (2) PTO openings shall be located on left side and top of converter housing (positions 8 o'clock and 1 o'clock).

A transmission temperature gauge with red light and buzzer shall be installed on the cab instrument panel.

**TRANSMISSION SHIFTER**
A six (6)-speed push button shift module shall be mounted to right of driver on console. Shift position indicator shall be indirectly lit for after dark operation.

The transmission ratio shall be:

<table>
<thead>
<tr>
<th>Gear</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>3.51 to 1.00</td>
</tr>
<tr>
<td>2nd</td>
<td>1.91 to 1.00</td>
</tr>
<tr>
<td>3rd</td>
<td>1.43 to 1.00</td>
</tr>
<tr>
<td>4th</td>
<td>1.00 to 1.00</td>
</tr>
<tr>
<td>5th</td>
<td>0.75 to 1.00</td>
</tr>
<tr>
<td>6th</td>
<td>0.64 to 1.00</td>
</tr>
<tr>
<td>R</td>
<td>4.80 to 1.00</td>
</tr>
</tbody>
</table>

**TRANSMISSION COOLER**
An externally mounted Modine bar plate transmission oil cooler shall be provided using engine coolant to control the transmission oil temperature. The internal bar plates shall be constructed of stainless steel. The cooler's housing shall be constructed of 1020 steel, coated to protect from corrosion. The cooler shall be tagged with information including OEM part number, vendor serial number and date / lot code.

**DRIVELINE**
Drivelines shall be a heavy-duty metal tube and be equipped with Spicer® 1810 universal joints. The shafts shall be dynamically balanced before installation. A splined slip joint shall be provided in each driveshaft. The slip joint shall be coated with Glidecoat or equivalent.

**STEERING**
Dual Sheppard, Model M110, steering gears, with integral heavy-duty power steering, shall be provided. For reduced system temperatures, the power steering shall incorporate an air to oil cooler and an Eaton, Model VN20, hydraulic pump
with integral pressure and flow control. All power steering lines shall have wire braded lines with crimped fittings.

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

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

**BUMPER**
A one (1)-piece bumper manufactured from steel shall be provided. The bumper shall be a minimum of 10.00" high with a 1.50" top and bottom flange, and shall extend 19.00" from the face of the cab. The bumper shall be 95.28" wide with 45 degree corners and side plates. The bumper shall be chrome finished.

To provide adequate support strength, the bumper shall be mounted directly to the front of the C channel frame. The frame shall be a bolted modular extension frame.

**AUTOMATIC CHASSIS LUBRICATION**
A Vogel Automatic Lubrication System shall be provided. The lubrication shall be supplied while the vehicle ignition switch is active to allow a uniform application of grease to the locations listed. The electronic control unit that forms part of the system shall activate the pump after an adjustable interval time. The unit shall control and monitor pump operation and report any faults via an indicator light on the driver's dashboard of the cab.

The lubrication system reservoir, which requires a 15.00" wide x 14.50" high x 6.25" deep mounting area, shall be located in the pump house towards the front on the right (Officer's) side on the apparatus.

- Independent suspension control Arm Pivot Points
- Rear Axle Slack Adjusters
- Rear Axle Brake Cam Screws
- Rear Suspension Spring Pins
- Rear Suspension Shackle Pins
- Walking Beam Pins Tandem axle, if applicable
GRAVEL PAN
A gravel pan, constructed of bright aluminum tread plate, shall be furnished between the bumper and the cab face. The pan shall be properly supported from the underside to prevent flexing and vibration.

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

The tray shall have a capacity of 125' of 1.75" double jacket cotton-polyester hose.

Louver air vents shall be provided to allow the compartment to be ventilated. The vents shall be installed to prevent water and debris from entering.

Black rubber grating shall be provided at the bottom of the tray. Drain holes are also provided.

CENTER HOSE TRAY COVER
A bright aluminum tread plate cover shall be provided over the center hose tray.

The cover shall be attached with a stainless steel hinge.

One (1) D-ring latch shall secure the cover in the closed position and a pneumatic stay arm on each side shall hold the cover in the open position.

LIFT AND TOW MOUNTS
Mounted to the frame extension shall be lift and tow mounts. The lift and tow mounts shall be designed and positioned to adapt to certain tow truck lift systems.

The lift and tow mounts with eyes shall be painted the same color as the frame.

TOW HOOKS
Two (2) chromed steel tow hooks shall be installed under the bumper and attached to the front frame members. The tow hooks shall be designed and positioned to allow up to a 6,000 lb. straight horizontal pull in line with the centerline of the vehicle. The tow hooks shall not be used for lifting of the apparatus.
CAB
The cab shall be designed specifically for the fire service and shall be manufactured by the chassis builder.

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

For reasons of structural integrity and enhanced occupant protection, the cab shall be a heavy duty design. Chassis or compatible chassis of the following shall be considered. E-ONE Cyclone 67”, Pierce Arrow XT 72”, Sutphen Monarch 73” or Seagrave Attacker 72”.

The cab shall have main vertical structural members located in the A-pillar (front cab corner posts), B-pillar (side center posts), C-pillar (rear corner posts), and rear wall areas. All main vertical structural members shall run from the floor to the roof extrusions to provide a cage-like structure with the A-pillar and roof extrusions being welded.

The front of the cab shall be constructed with a firewall plate, covered with a front skin, and reinforced with a full width cross-cab support located just below the windshield and fully welded to the engine tunnel. The cross-cab support shall run the full width of the cab and weld to each A-pillar, firewall plate, and the front skin.

The cab floors shall be constructed of aluminum plate and reinforced at the firewall. The front floor area shall also be supported with two (2) triangular wall extrusions that also provides the mounting point for the cab lift. This tubing shall run from the floor wire way of the cab to the engine tunnel side plates, creating the structure to support the forces created when lifting the cab.

The cab shall be a minimum of 96.00” wide (outside door skin to outside door skin) to maintain maximum maneuverability

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

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

The cab shall be a full tilt cab style.
A 3-point cab mount system with rubber isolators shall improve ride quality by isolating chassis vibrations from the cab.

**CLEARANCE PLATE**
A plate that is highly visible to the driver while seated shall be provided. This plate shall show the overall height.

**CAB SAFETY SYSTEM**
The cab shall be provided with a safety system designed to protect occupants in the event of a side roll or frontal impact. Vendors’ shall supply their safety system, air bags and roll protection, and frontal impact.

**CAB ROOF DRIP RAIL**
For enhanced protection from inclement weather, a drip rail shall be furnished on the sides of the cab. The drip rail shall be painted to match the cab roof, and bonded to the sides of the cab. The drip rail shall extend the full length of the cab roof.

**INTERIOR CAB INSULATION**
The cab shall include insulation in the ceiling and side walls, and insulation in the rear wall to maximize acoustic absorption and thermal insulation.

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

**WINDSHIELD**
A safety glass windshield shall be provided with over 2,750 square inches of clear viewing area. The windshield shall consist of three (3) layers: outer light, middle safety laminate, and inner light. The outer light layer shall provide superior chip resistance. The middle safety laminate layer shall prevent the windshield glass pieces from detaching in the event of breakage. The inner light shall provide yet another chip resistant layer. The cab windshield shall be bonded to the aluminum windshield frame using a urethane adhesive. A custom fit pattern shall be applied on the outside perimeter of the windshield for a finished automotive appearance. Windshield replacement glass will be readily available from local auto glass suppliers.
**WINDSHIELD WIPERS**
A minimum of Two (2) electric windshield wipers with washer shall be provided that meet FMVSS and SAE requirements.

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

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

**CAB REAR WALL EXTERIOR COVERING**
The exterior surface of the rear wall of the cab shall be overlaid with bright aluminum tread plate except for areas that are not typically visible when the cab is lowered.

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

The hydraulic pump shall have a manual override for backup in the event of electrical failure.

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

The engine shall be easily accessible and capable of being removed with the cab tilted. The cab shall be capable of tilting 45 degrees and 90 degrees with crane assist.

Cab shall be locked down by a 2-point automatic spring-loaded hook mechanism that actuates after the cab has been lowered.

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

For increased safety, a redundant mechanical stay arm shall be provided.

**CAB LIFT INTERLOCK**
The cab lift system shall be interlocked to the parking brake. The cab tilt mechanism shall be active only when the parking brake is set and the ignition switch is in the on position. If the parking brake is released, the cab tilt mechanism shall be disabled.
**GRILLE**
A bright finished aluminum mesh grille screen, inserted behind a bright finished grille surround, shall be provided on the front center of the cab.

**DOOR JAMB SCUFF PLATES**
All cab door jambs shall be furnished with a polished stainless steel scuff plate, mounted on the striker side of the jamb.

**SIDE OF CAB MOLDING**
Chrome molding shall be provided on both sides of cab.

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

**DOORS**
To enhance entry and egress to the cab, the forward cab doors shall be as large as possible. The crew cab doors shall be located on the sides of the cab and shall be constructed in the same manner as the forward cab doors. The crew cab doors shall be barrier style, as large as possible.

The forward cab and crew cab doors shall be constructed of extruded aluminum. The exterior door skins shall be constructed from aluminum.

A flush mounted, chrome plated paddle type door handle shall be provided on the exterior of each cab door. Each door shall also be provided with an interior flush paddle handle.

The cab doors shall be provided with both interior (rotary knob) and exterior (keyed) locks as required by FMVSS 206. The locks shall be capable of activating when the doors are open or closed. The doors shall remain locked if locks are activated when the doors are opened, then closed.

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

A chrome grab handle shall be provided on the inside of each cab and crew cab door.
The cab steps at each door location shall be located below the cab doors and shall be exposed to the exterior of the cab.

**DOOR PANELS**
There shall be a full height brushed stainless steel door panel installed on the inside of all cab doors. The cab door panels shall be removable without disconnecting door and window mechanisms.

**MANUAL CAB DOOR WINDOWS**
All cab entry doors shall contain a conventional roll down window.

**CAB STEPS**
The forward cab and crew cab access steps shall be a full size two (2) step design to provide largest possible stepping surfaces for safe ingress and egress. The bottom steps shall be designed with a grip pattern punched into bright aluminum tread plate material to provide support, slip resistance, and drainage. The bottom steps shall be a bolt-in design to minimize repair costs should they need to be replaced. The inside cab steps shall not exceed 18.00" in height and be limited to two (2) steps. Three (3) step entrance designs shall not be acceptable due to safety concerns. A slip-resistant handrail shall be provided adjacent to each cab door opening to assist during cab ingress and egress.

**STIRRUP STEPS**
Stirrup steps with grip strut shall be provided below each cab and crew cab door.

The stirrup step shall be lit by a white 12-volt DC LED light provided on the step.

The step light shall be activated automatically when the battery switch is on and the exit doors are opened or by the same means as the body step lights.

**STEP LIGHTS**
For reduced overall maintenance costs compared to incandescent lighting, there shall be four (4) white LED step lights provided. The lights shall be installed at each cab and crew cab door, one (1) per step. The lights shall be located in the driver side front doorstep, driver side crew cab doorstep, passenger side front doorstep and passenger side crew cab doorstep.

In order to ensure exceptional illumination, each light shall provide a minimum of 25 foot-candles (fc).

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

**FENDER CROWNS**
Stainless steel fender crowns shall be installed at the cab wheel openings. The fender crowns shall have a radius outside corner that allows the fender crown to extend beyond the side wall of the front tires and also allow the crew cab doors to open fully.

**CREW CAB WINDOWS**
One (1) fixed window with tinted glass shall be provided on each side of the cab, to the rear of the front cab door. The windows shall be sized to enhance light penetration into the cab interior.

The rear wall of the crew cab shall have two (2) windows, each being a minimum of 10" wide x 16" high.

**MOUNTING BRACKET**
A mounting bracket, located at the officer’s side of the cab dashboard as earmarked by the customer during the final inspection, shall be provided as a base mount for the factory installed, Knox Box. The mounting surface of the bracket shall be at a 45-degree angle, making access easier for the end user.

It shall be made of steel and painted to match the cab interior.

**UNIVERSAL COMPUTER MOUNT**
There shall be one (1) universal computer mount(s) with tilt / swivel / slide attachment located Officers side in front of the officer’s position, recessed. The mount shall be adjustable for laptop computers within the following dimensions:

- Computer widths from 10.62" to 16.50"
- Computer depths from 9.00" to 12.38"
• Computer thickness up to 1.50” (with screen open)

A 12-volt DC, 15-amp power point shall be provided near the mount.

The following Gamber Johnson components shall be provided:

• One (1) Notepad V, Universal computer mount
• One (1) Quadmotion TS3, Bracket
• One (1) DS-56, Mounting base

**CAB INTERIOR PAINT**
The cab interior metal surfaces shall be painted red, vinyl texture paint.

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

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

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

The engine tunnel shall be painted aluminum to match the cab interior.

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

**CAB INTERIOR UPHOLSTERY**
The cab interior upholstery shall be gray woven with black.

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

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

**CAB/CREW CAB HEATER**
Two (2) auxiliary heaters shall be provided in the cab. The heaters shall have a 3-speed blower and temperature controls accessible to the driver and officer. There shall also be louvers located below the rear facing seat riser and below the driver and officer positions for airflow.

The heaters shall be mounted, one (1) within each rear facing seat riser.

**CAB DEFROSTER**
There shall be a minimum of 45,000 BTU defroster in the cab located under the engine tunnel.

The defroster ventilation shall be built into the design of the cab dash instrument panel and shall be easily removable for maintenance.

The defroster shall have a 3-speed blower and temperature controls accessible to the driver and officer.

The defroster ducts shall be designed to provide maximum defrosting capabilities for the front cab windows.

The defroster shall be capable of clearing 98 percent of the windshield and side glass when tested under conditions where the cab has been cold soaked at 0 degrees Fahrenheit for 10 hours, and a 2 ounce per square inch layer of frost/ice has been able to build up on the exterior windshield. The defroster system shall meet or exceed SAE J382 requirements.

**AIR CONDITIONING**
A high-performance, customized air conditioning system shall be furnished inside the cab and crew cab. The compressor shall be installed on the engine.

The air conditioning system shall be capable of cooling the average cab temperature from 100 degrees Fahrenheit to 72 degrees Fahrenheit at 50 percent relative humidity within 30 minutes. The cooling performance test shall be run only after the cab has been heat soaked at 100 degrees Fahrenheit for a minimum of 4 hours.

A roof-mounted condenser that meets and exceeds the performance specification shall be installed on the cab roof. Mounting the condenser below the cab or body would reduce the performance of the system and shall not be acceptable. The condenser cover and mounting legs to be painted black # 101 to match the roof.
An evaporator unit that meets and exceeds the performance specification shall be installed in the cab, located in the center of the cab ceiling over the engine tunnel. The evaporator shall include two (2) high performance cores and plenums with multiple outlets, one (1) plenum directed to the front and one (1) plenum directed to the rear of the cab.

The evaporator unit shall be provided with adjustable air outlets strategically located to direct air flow to the driver, officer and crew cab area.

All hose used shall be class 1 type to reduce moisture ingestion into the air conditioning system.

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

**WINDOW DEFROST FANS**

Two (2) window defrost fans shall be mounted on the ceiling of the cab, one (1) on each side of the cab.

**SUN VISORS**

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

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

**GRAB HANDLE**

A black rubber covered grab handle shall be mounted on the lower portion of the driver's side cab entrance to assist in entering the cab. The grab handle shall be securely mounted to the post area between the door and steering wheel column.

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

A black rubber covered grab handle shall be mounted on the passenger's side door post, above the instrument panel.

**ENGINE COMPARTMENT LIGHTS**

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

These light(s) shall be activated automatically when the cab is raised.
ACCESS TO ENGINE DIPSTICKS
For access to the engine oil and transmission fluid dipsticks, there shall be a door on the engine tunnel, inside the crew cab. The door shall be on the rear wall of the engine tunnel, on the vertical surface.

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

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

VELCRO STRAP(S) FOR MAP BOX
There shall be one (1) Velcro® strap(s) installed on the map box.

MAP BOX
There shall be one (1) map box(s) with three (3) bins, open at top. The map box(s) shall be installed at final inspection. The map box(s) shall be divided into three (3) bins, each being 12.50” wide x 3.00” high x 12.00” deep. Each bin shall slant 30 degrees from horizontal. The map box(s) shall be constructed of 0.125” aluminum and shall be painted to match the cab interior.

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

DRIVER SEAT
A seat shall be provided in the cab for the driver. The seat design shall be a cam action type, with air suspension. For increased convenience, the seat shall include a manual control to adjust the horizontal position (6.00” travel). The manual horizontal control shall be a towel-bar style located below the forward part of the seat cushion. To provide flexibility for multiple driver configurations, the seat shall have an adjustable reclining back. The seat back shall be a high back style with side bolster pads for maximum support. For optimal comfort, the seat shall be provided with 17.00” deep foam cushions designed with EVC (elastomeric vibration control).

The seat shall be furnished with a 3-point, shoulder type seat belt. The seat belt shall be furnished with dual automatic retractors that shall provide ease of operation in the normal seating position.
OFFICER SEAT
A seat shall be provided in the cab for the officer. The seat design shall be a cam action type, with air suspension. For increased convenience, the seat shall include a manual control to adjust the horizontal position (6.00" travel). The manual horizontal control shall be a towel-bar style located below the forward part of the seat cushion. To provide flexibility for multiple driver configurations, the seat shall have an adjustable reclining back. The seat back shall be a high back style with side bolster pads for maximum support. For optimal comfort, the seat shall be provided with 17.00" deep foam cushions designed with EVC (elastomeric vibration control).

The seat shall be furnished with a 3-point, shoulder type seat belt. The seat belt shall be furnished with dual automatic retractors that shall provide ease of operation in the normal seating position.

RADIO COMPARTMENT
A radio compartment shall be provided under the officer's seat and the driver’s seat. A drop-down door with a chrome plated lift and turn latch shall be provided for access.

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

REAR FACING DRIVER SIDE OUTBOARD SEAT
There shall be one (1) rear facing seat provided at the driver side outboard position in the crew cab. For optimal comfort, the seat shall be provided with 15.00" deep foam cushions designed with EVC (elastomeric vibration control).

The seat back shall be an SCBA back style with 5 degree fixed recline angle. The SCBA cavity shall be adjustable from front to rear in 1.00" increments, to accommodate different sized SCBA cylinders. Moving the SCBA cavity shall be accomplished by unbolting, relocating, and re-bolting it in the desired location.

REAR FACING PASSENGER SIDE OUTBOARD SEAT
There shall be one (1) rear facing seat provided at the passenger side outboard position in the crew cab. For optimal comfort, the seat shall be provided with 15.00" deep foam cushions designed with EVC (elastomeric vibration control).

The seat back shall be an SCBA back style with 5 degree fixed recline angle. The SCBA cavity shall be adjustable from front to rear in 1.00" increments, to
accommodate different sized SCBA cylinders. Moving the SCBA cavity shall be accomplished by unbolting, relocating, and re-bolting it in the desired location.

**FORWARD FACING DRIVER SIDE OUTBOARD SEAT**
There shall be one (1) forward facing, foldup seat provided at the driver side outboard position in the crew cab. The seat back shall be a high back style with 9 degree fixed recline angle. For optimal comfort, the seat shall be a minimum of 15.00" from the front of the cushion to the face of the seat back and designed with EVC (elastomeric vibration control). To ensure safe operation, the seat shall be equipped with seat belt sensors in the seat cushion and belt receptacle, that shall activate an alarm indicating a seat is occupied but not buckled.

The seat shall be furnished with a 3-point, shoulder type seat belt. The seat belt shall be furnished with dual automatic retractors that shall provide ease of operation in the normal seating position.

**FORWARD FACING CENTER EMS COMPARTMENT**
Two (2) forward facing EMS compartments shall be provided in the crew cab at the center position.

The upper compartment shall be 24.00" wide x 16.00" high x 16.00" deep with a web netting door. The netting is to be made with 1.00" wide nylon material with 2.00" openings. A metal stiffener shall be provided at the top and bottom of the netting. Permanently attach the top of the netting, to the top of the upper cabinet, and place side release buckles at the bottom of the opening. The door shall face the front of the cab with a clear door opening of 21.50" wide x 13.50" high.

The lower compartment shall extend from the rear wall of the crew cab to the engine tunnel. The compartment shall be approximately 36.00" wide x 24.00" high x 44.00" deep. A web netting door shall be provided on each end of the compartment. The netting is to be made with 1.00" wide nylon material with 2.00" openings. A metal stiffener shall be provided at the top and bottom of the netting. This netting shall be installed inboard on each side wall. Two (2) seat belt type buckles shall be used at the top of the netting with a single footman's loop, mounted at the bottom center of the opening. Each clear door opening of the compartment shall be 34.00" wide x 20.00" high. A compartment bottom shall be provided in this compartment to provide a smooth sliding surface for items stored inside.

The top of the compartment shall also be reinforced for tool mounting.

The compartments shall be constructed of smooth aluminum and painted to match the color of the cab interior.
**Compartment Light**
The lower compartment shall have one (1) LED strip light provided at the front of the compartment shining to the rear. The light shall be mounted as high as possible. The crew cab door switches shall control this lower compartment light.

**FORWARD FACING PASSENGER SIDE OUTBOARD SEAT**
There shall be one (1) forward facing foldup seat provided at the passenger side outboard position in the crew cab. The seat back shall be a high back style with 9 degree fixed recline angle. For optimal comfort, the seat shall be a minimum of 15.00" from the front of the cushion to the face of the seat back and designed with EVC (elastomeric vibration control). To ensure safe operation, the seat shall be equipped with seat belt sensors in the seat cushion and belt receptacle, that shall activate an alarm indicating a seat is occupied but not buckled.

The seat shall be furnished with a 3-point, shoulder type seat belt. The seat belt shall be furnished with dual automatic retractors that shall provide ease of operation in the normal seating position.

**MATTING IN EMS COMPARTMENT**
Vinyl grating shall be provided in two (2) EMS compartments.

The vinyl grating shall be .50" thick and be cross bonded by .25" diameter ribbed sections spaced for aeration

**SEAT UPHOLSTERY**
All seat upholstery shall be gray Turnout Tuff material.

**AIR BOTTLE HOLDERS**
All SCBA type seats in the cab shall have a "Hands-Free" auto clamp style bracket in its backrest. For efficiency and convenience, the bracket shall include an automatic spring clamp that allows the occupant to store the SCBA bottle by simply pushing it into the seat back. For protection of all occupants in the cab, in the event of an accident, the inertial components within the clamp shall constrain the SCBA bottle in the seat and shall exceed the NFPA standard of 9G. Bracket designs with manual restraints (belts, straps, buckles) that could be inadvertently left unlocked and allow the SCBA to move freely within the cab during an accident, shall not be acceptable.

There shall be a quantity of four (4) SCBA brackets
**SEAT BELTS**
All seating positions in the cab and crew cab shall have red seat belts.

To provide quick, easy use for occupants wearing bunker gear, the female buckle and seat belt webbing length shall meet or exceed the current edition of NFPA 1901 and CAN/ULC - S515 standards.

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

**SHOULDER HARNESS HEIGHT ADJUSTMENT**
All seating positions furnished with 3-point shoulder type seat belts shall include a height adjustment. This adjustment shall optimize the belts effectiveness and comfort for the seated firefighter.

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

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

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

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

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

**OVERHEAD MAP LIGHTS**
There shall be two (2) white halogen, round adjustable map lights installed in the cab:

- One (1) overhead in front of the driving position.
- One (1) overhead in front of the passenger's position.

Each light shall include a switch on the light housing.

The light switches shall be connected directly to the battery switched power.
CAB INSTRUMENTATION

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

CAB INTERIOR

The wrap-around style high impact ABS plastic cab dash fascia shall be designed to provide unobstructed visibility to instrumentation. The dash layout shall provide the driver with a quick reference to gauges that allows more time to focus on the road.

HELMET STORAGE PROVIDED BY FIRE DEPARTMENT

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

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

GAUGES

The gauge panel shall include the following eleven (11) gauges with chrome bezels to monitor vehicle performance:

- Volmeter Gauge (Volts):
  - Low volts (11.8 VDC)
    - Amber indicator on gauge assembly with alarm
  - High volts (15 VDC)
    - Amber indicator on gauge assembly with alarm
  - Very low volts (11.3 VDC)
    - Amber indicator on gauge assembly with alarm
  - Very high volts (16 VDC)
    - Amber indicator on gauge assembly with alarm
- Tachometer (RPM)
- Speedometer Primary (outside) MPH, Secondary (inside) Km/H
- Fuel Level Gauge (Empty - Full in fractions):
• Low fuel (1/8 full)
  ▪ Amber indicator on gauge assembly with alarm
• Very low fuel (1/32) fuel
  ▪ Amber indicator on gauge assembly with alarm
• Engine Oil Pressure Gauge (PSI):
  • Low oil pressure to activate engine warning lights and alarms
    ▪ Red indicator on gauge assembly with alarm
• Front Air Pressure Gauge (PSI):
  • Low air pressure to activate warning lights and alarm
    ▪ Red indicator on gauge assembly with alarm
• Rear Air Pressure Gauge (PSI):
  • Low air pressure to activate warning lights and alarm.
    ▪ Red indicator on gauge assembly with alarm
• Transmission Oil Temperature Gauge (Fahrenheit):
• High transmission oil temperature activates warning lights and alarm
  • Amber indicator on gauge assembly with alarm
• Engine Coolant Temperature Gauge (Fahrenheit):
  • High engine temperature activates an engine warning light and alarm
    ▪ Red indicator on gauge assembly with alarm
• Diesel Exhaust Fluid Level Gauge (Empty - Full in fractions):
  • Low fluid (1/8 full)
    ▪ Amber indicator on gauge assembly with alarm

All gauges and gauge indicators shall perform prove out at initial power-up to ensure proper performance.

**INDICATOR LAMPS**
To promote safety, the following telltale indicator lamps shall be integral to the gauge assembly and are located above and below the center gauges. The indicator lamps shall be "dead-front" design that is only visible when active. The colored indicator lights shall have descriptive text or symbols.

The following amber telltale lamps shall be present:

• Low coolant
• Trac cntl (traction control) (where applicable)
• Check engine
• Check trans (check transmission)
• Aux brake overheat (Auxiliary brake overheat)
• Air rest (air restriction)
• Caution (triangle symbol)
• Water in fuel
• DPF (engine diesel particulate filter regeneration)
• Trailer ABS (where applicable)
• Wait to start (where applicable)
• HET (engine high exhaust temperature) (where applicable)
• ABS (antilock brake system)
• MIL (engine emissions system malfunction indicator lamp) (where applicable)
• SRS (supplemental restraint system) fault (where applicable)
• DEF (low diesel exhaust fluid level)

The following red telltale lamps shall be present:

• Warning (stop sign symbol)
• Seat belt
• Parking brake
• Stop engine

The following green telltale lamps shall be provided:

• Left turn
• Right turn
• Battery on

The following blue telltale lamp shall be provided:

• High beam

**ALARMS**

Audible steady tone warning alarm: A steady audible tone alarm shall be provided whenever a warning message is present.

Audible pulsing tone caution alarm: A pulsing audible tone alarm (chime/chirp) shall be provided whenever a caution message is present without a warning message being present.

Alarm silence: Any active audible alarm shall be able to be silenced by holding the ignition switch at the top position for three (3) to five (5) seconds. For improved safety, silenced audible alarms shall intermittently chirp every 60 seconds until the alarm condition no longer exists. The intermittent chirp shall act as a reminder to
the operator that a caution or warning condition still exists. Any new warning or caution condition shall enable the steady or pulsing tones respectively.

**INDICATOR LAMP AND ALARM PROVE-OUT**
Telltales indicators and alarms shall perform prove-out at initial power-up to ensure proper performance.

**CONTROL SWITCHES**
For ease of use, the following controls shall be provided immediately adjacent to the cab instrument panel within easy reach of the driver:

- Emergency master switch: A molded plastic push button switch with integral indicator lamp shall be provided. Pressing the switch shall activate emergency response lights and siren control. A green lamp on the switch provides indication that the emergency master mode is active. Pressing the switch again disables the emergency master mode.
- Headlight / Parking light switch: A three (3)-position maintained rocker switch shall be provided. The first switch position shall deactivate all parking lights and the headlights. The second switch position shall activate the parking lights. The third switch position shall activate the headlights.
- Panel back lighting intensity control switch: A three (3)-position momentary rocker switch shall be provided. The first switch position decreases the panel back lighting intensity to a minimum level as the switch is held. The second switch position is the default position that does not affect the back lighting intensity. The third switch position increases the panel back lighting intensity to a maximum level as the switch is held.

The following standard controls shall be integral to the gauge assembly and are located below the right hand gauges. All switches have backlit labels for low light applications:

- High idle engagement switch: A two (2)-position momentary rocker switch with integral indicator lamp shall be provided. The first switch position is the default switch position. The second switch position shall activate and deactivate the high idle function when pressed and released. The "Ok To Engage High Idle" indicator lamp must be active for the high idle function to engage. A green indicator lamp integral to the high idle engagement switch shall indicate when the high idle function is engaged.
• "Ok To Engage High Idle" indicator lamp: A green indicator light shall be provided next to the high idle activation switch to indicate that the interlocks have been met to allow high idle engagement.

The following standard controls shall be provided adjacent to the cab gauge assembly within easy reach of the driver. All switches shall have backlit labels for low light applications.

• Ignition switch: A three (3)-position maintained/momentary rocker switch shall be provided. The first switch position shall deactivate vehicle ignition. The second switch position shall activate vehicle ignition. The third momentary position shall disable the Command Zone audible alarm if held for three (3) to five (5) seconds. A green indicator lamp shall be activated with vehicle ignition.

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

• 4-way hazard switch: A two (2)-position maintained rocker switch shall be provided. The first switch position shall deactivate the 4-way hazard switch function. The second switch position shall activate the 4-way hazard function. The switch actuator shall be red and includes the international 4-way hazard symbol.

• Turn signal arm: A self-canceling turn signal with high beam headlight and windshield wiper/washer controls shall be provided. The windshield wiper control shall have high, low, and intermittent modes.

• Parking brake control: An air actuated push/pull park brake control valve shall be provided.

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

CUSTOM SWITCH PANELS
The design of cab instrumentation shall allow for emergency lighting and other switches to be placed within easy reach of the operator thus improving safety. There shall be positions for up to three (3) switch panels in the overhead console on the driver's side, up to four (4) switch panels in the engine tunnel console facing the driver, up to three (3) switch panels in the overhead console on the officer's side and up to three (3) switch panels in the engine tunnel rear facing console accessible to both driver and officer. All switches shall have backlit labels for low light applications.
**DIAGNOSTIC PANEL**
A diagnostic panel 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 ABS systems to provide blink codes should a problem exist. The diagnostic panel shall include the following:

- Engine diagnostic port
- Transmission diagnostic port
- ABS diagnostic port
- SRS diagnostic port (where applicable)
- Truck USB diagnostic port
- ABS diagnostic switch (blink codes flashed on ABS telltale indicator)
- Diesel particulate filter regeneration switch (where applicable)
- Diesel particulate filter regeneration inhibit switch (where applicable)

**CAB LCD DISPLAY**
A digital four (4)-row by 20-character dot matrix display shall be integral to the gauge panel. The display shall be capable of showing simple graphical images as well as text. The display shall be split into three (3) sections. Each section shall have a dedicated function. The upper left section shall display the outside ambient temperature. The upper right section shall display odometer, trip mileage, PTO hours, fuel consumption, engine hours, aerial hours, and other configuration specific information. The bottom section shall display INFO, CAUTION, and WARNING messages. Text messages shall automatically activate to describe the cause of an audible caution or warning alarm. The LCD shall be capable of displaying multiple text messages should more than one caution or warning condition exist.

**AIR RESTRICTION INDICATOR**
A high air restriction warning indicator light LCD message with amber warning indicator and audible alarm shall be provided.
"DO NOT MOVE APPARATUS" INDICATOR
A flashing red indicator light, located in the driving compartment, shall be illuminated automatically per the current NFPA requirements. The light shall be labeled "Do Not Move Apparatus If Light Is On."

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

DO NOT MOVE TRUCK MESSAGES
Messages shall be displayed on the color display located within sight of the driver whenever the Do Not Move Truck light is active. The messages shall designate the item or items not in the stowed for vehicle travel position (parking brake disengaged).

The following messages shall be displayed (where applicable):

- Do Not Move Truck
- DS Cab Door Open (Driver Side Cab Door Open)
- PS Cab Door Open (Passenger's Side Cab Door Open)
- DS Crew Cab Door Open (Driver Side Crew Cab Door Open)
- PS Crew Cab Door Open (Passenger's Side Crew Cab Door Open)
- DS Body Door Open (Driver Side Body Door Open)
- PS Body Door Open (Passenger's Side Body Door Open)
- Rear Body Door Open
- Hatch Door Open
- Aerial Not Stowed (Aerial Device Not Stowed)
- Stabilizer Not Stowed
- Steps Not Stowed
- Handrail Not Stowed

Any other device that is opened, extended, or deployed that creates a hazard or is likely to cause major damage to the apparatus if the apparatus is moved shall be displayed as a caution message after the parking brake is disengaged.

SWITCH PANELS
The emergency light switch panel shall have a master switch for ease of use plus individual switches for selective control. Each switch panel shall contain eight (8) membrane-type switches each rated for one million (1,000,000) cycles. Panels containing less than eight (8) switch assignments shall include non-functioning black appliqués. Documentation shall be provided by the manufacturer indicating
the rated cycle life of the switches. The switch panel(s) shall be located in the overhead position above the windshield on the driver side overhead to allow for easy access.

Additional switch panel(s) shall be located in the overhead position(s) above the windshield or in designated locations on the lower instrument panel layout.

The switches shall be membrane-type and also act as an integral indicator light. For quick, visual indication the entire surface of the switch shall be illuminated white whenever back lighting is activated and illuminated green whenever the switch is active. An active illuminated switch shall flash when interlock requirements are not met or device is actively being load managed. For ease of use, a two (2)-ply, scratch resistant laser engraved label indicating the use of each switch shall be placed in the center of the switch. The label shall allow light to pass through the letters for ease of use in low light conditions.

**WIPER CONTROL**
For simple operation and easy reach, the windshield wiper control shall be an integral part of the directional light lever located on the steering column. The wiper control shall include high and low wiper speed settings, a one (1)-speed intermittent wiper control and windshield washer switch. The control shall have a "return to park" provision, which allows the wipers to return to the stored position when the wipers are not in use.

**HOUR METER - AERIAL DEVICE**
An hour meter for the aerial device shall be provided and located within the cab display or instrument panel.

**AERIAL PTO SWITCH**
A PTO switch for the aerial with indicator light shall be provided.

**SPARE CIRCUIT**
There shall be two (2) pair of wires, including a positive and a negative, installed on the apparatus. Installation shall be between the officer seat and the rear facing seat.

The above wires shall have the following features:

- The positive wire shall be connected directly to the battery power
- The negative wire shall be connected to ground
- Wires shall be protected to 15 amps at 12 volts DC
• Power and ground shall terminate behind the officer seat
• Termination shall be with a 10-place bus bar with screws and removable cover
• Wires shall be sized to 125 percent of the protection
The circuit(s) may be load managed when the parking brake is set.

SPARE CIRCUIT
There shall be two (1) pair of wires, including a positive and a negative, installed on the apparatus. Installation shall be between the driver’s seat and the rear facing seat.

The above wires shall have the following features:

• The positive wire shall be connected directly to the battery power
• The negative wire shall be connected to ground
• Wires shall be protected to 15 amps at 12 volts DC
• Power and ground shall terminate behind the Driver’s seat
• Termination shall be with a 10-place bus bar with screws and removable cover
• Wires shall be sized to 125 percent of the protection
The circuit(s) may be load managed when the parking brake is set.

DEDICATED RADIO EQUIPMENT CONNECTION POINTS
There shall be three (3) studs provided in the primary power distribution center located in front of the officer for two-way radio equipment.

• The studs shall consist of the following:
  • 12-volt 40-amp battery switched power
  • 12-volt 60-amp ignition switched power
  • 12-volt 60-amp direct battery power
There shall also be a 12-volt 100-amp ground stud located in or adjacent to the power distribution center.

INFORMATION CENTER
An information center employing a 7.00” diagonal touch screen color LCD display shall be encased in an ABS plastic housing.

The information center shall have the following specifications:

• Operate in temperatures from -40 to 185 degrees Fahrenheit
• An Optical Gel shall be placed between the LCD and protective lens
- Five weather resistant user interface switches
- Grey with black accents
- Sunlight Readable
- Linux operating system
- Minimum of 1000nits rated display
- Display can be changed to an available foreign language
- A LCD display integral to the cab gauge panel shall be included as outlined in the cab instrumentation area.
- Programmed to read US Customary

**GENERAL SCREEN DESIGN**

Where possible, background colors shall be used to provide vehicle information. If information provided on a screen is within acceptable limits, a green background shall be used.

If a caution or warning situation arises the following shall occur:

- An amber background/text color shall indicate a caution condition
- A red background/text color shall indicate a warning condition
- The information center shall utilize an "Alert Center" to display text messages for audible alarm tones. The text messages shall be written to identify the item(s) causing the audible alarm to sound. If more than one (1) text message occurs, the messages shall cycle every second until the problem(s) have been resolved. The background color shall change to indicate the severity of the "warning" message. If a warning and a caution condition occur simultaneously, the red background color shall be shown for all alert center messages.
- A label for each button shall exist. The label shall indicate the function for each active button for each screen. Buttons that are not utilized on specific screens shall have a button label with no text or symbol.

**HOME/TRANSIT SCREEN**

This screen shall display the following:

- Vehicle Mitigation (if equipped)
- Water Level (if equipped)
- Foam Level (if equipped)
- Seat Belt Monitoring Screen
- Tire Pressure Monitoring (if equipped)
- Digital Speedometer
**ON SCENE SCREEN**
This screen shall display the following and shall be auto activated with pump engaged (if equipped):

- Battery Voltage
- Fuel
- Oil Pressure
- Coolant Temperature
- RPM
- Water Level
- Water Flow Rate
- Water Used
- Active Alarms

**PAGE SCREEN**
The page screen shall display the following and allow the user to progress into other screens for further functionality:

- Diagnostics
  - Faults
    - Listed by order of occurrence
    - Allows to sort by system
  - Interlock
    - Throttle Interlocks
    - Pump Interlocks
    - Aerial Interlocks
    - PTO Interlocks
  - Load Manager
    - A list of items to be load managed shall be provided. The list shall provide a description of the load.
    - The lower the priority numbers the earlier the device shall be shed should a low voltage condition occur.
    - The screen shall indicate if a load has been shed (disabled) or not shed.
    - Color features are utilized on this screen.
  - Systems
    - Module type and ID number
    - Module Version
    - Input or output number
    - Circuit number connected to that input or output
- Status of the input or output
- Power and Constant Current module diagnostic information
  - Pressure Controller (if equipped)
  - Generator Frequency (if equipped)
- Live Data
  - General Truck Data
- Maintenance
  - Engine oil and filter
  - Transmission oil and filter
  - Pump oil (if equipped)
  - Foam (if equipped)
  - Aerial (if equipped)
- Setup
  - Clock Setup
  - Date & Time
    - 12 or 24-hour format
    - Set time and date
  - Backlight
    - Daytime
    - Night time
    - Sensitivity
  - Unit Selection
  - Home Screen
  - Virtual Button Setup
  - On Scene Screen Setup
  - Configure Video Mode
    - Set Video Contrast
    - Set Video Color
    - Set Video Tint
- Do Not Move
  - The screen shall indicate the approximate location and type of item that is open or is not stowed for travel. The actual status of the following devices shall indicate
    - Driver Side Cab Door
    - Passenger's Side Cab Door
    - Driver Side Crew Cab Door
    - Passenger's Side Crew Cab Door
    - Driver Side Body Doors
    - Passenger's Side Body Doors
- Rear Body Door(s)
- Ladder Stow
- Stabilizers

- Notifications
  - View Active Alarms
    - Shows a list of all active alarms including date and time of the occurrence is shown with each alarm
  - Silence Alarms - All alarms are silenced

- Timer Screen
- HVAC
- Tire Information

Button functions and button labels may change with each screen.

**SPEEDOMETER**

A second Speedometer (Primary (outside) MPH, Secondary (inside) Km/H) shall be installed in the officer’s area for easy viewing.

**VEHICLE DATA RECORDER**

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

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

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

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

A seat belt monitoring system (SBMS) shall be provided on the color display and in the center overhead of the cab instrument panel. The SBMS shall be capable of monitoring up to 10 seating positions indicating the status of each seat position per the following:

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

The seat belt monitoring screen shall become active on the color display when:

- The home screen is active:
  - and there is any occupant seated but not buckled or any belt buckled with an occupant.
  - and there are no other Do Not Move Apparatus conditions present.

  As soon as all Do Not Move Apparatus conditions are cleared, the SBMS shall be activated.

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

**RADIO WITH CD PLAYER**

There shall be one (1) Sony, AM/FM/CD/ stereo radio, with front auxiliary input for use with Apple™, or other USB devices installed within reach of the officer.

There shall be one (1) pair of 5.25” speakers in the cab and one (1) pair of 5.25” speakers in the crew cab.

There shall be a roof-mounted rubber antenna located in an open space, on the cab roof.

**RADIO ANTENNA MOUNT**

There shall be four (4) standard 1.125”, 18 thread antenna-mounting base(s) installed Rear of crew cab near the EMS compartment on the cab roof with high efficiency, low loss, coaxial cable(s) routed to the crew cab compartment located Evenly spaced behind the light bar. A weatherproof cap shall be installed on each mount.
**VEHICLE CAMERA SYSTEM**

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

- One (1) camera located at the rear of the apparatus, pointing rearward, displayed automatically with the vehicle in reverse
- One (1) camera located on the passenger side of the apparatus, pointing rearward, displayed automatically with the passenger side turn signal
- One (1) camera located on the driver side of the apparatus, pointing rearward, displayed automatically with the driver side turn signal

The camera images shall be displayed on the driver's color display. Audio from the microphone on the rear camera shall be emitted by an amplified speaker with volume control located on the instrument panel.

**KNOX-BOX**

There shall be a Knox-Box® Key Secure 4 Wi-Fi with key pad access provided.

The system shall allow all administration functions to be performed via a USB port. The box shall be surface mounted and installed Location to be forward at the officer side cab area, coil extra wire for placement at the final inspection.

**ELECTRICAL POWER CONTROL SYSTEM**

The primary power distribution shall be located forward of the officer's seating position and be easily accessible while standing on the ground for simplified maintenance and troubleshooting. Additional electrical distribution centers shall be provided throughout the vehicle to house the vehicle's electrical power, circuit protection, and control components. The electrical distribution centers shall be located strategically throughout the vehicle to minimize wire length. For ease of maintenance, all electrical distribution centers shall be easily accessible. All distribution centers containing fuses, circuit breakers and/or relays shall be easily accessible.

Distribution centers located throughout the vehicle shall contain battery powered studs for supplying customer installed equipment thus providing a lower cost of ownership.

Circuit protection devices, which conform to SAE standards, shall be utilized to protect electrical circuits. All circuit protection devices shall be rated per NFPA requirements to prevent wire and component damage when subjected to extreme current overload. General protection circuit breakers shall be Type-I automatic reset (continuously resetting). When required, automotive type fuses shall be utilized to protect electronic equipment. Control relays and solenoid shall have a direct current
rating of 125 percent of the maximum current for which the circuit is protected per NFPA.

**SOLID-STATE CONTROL SYSTEM**

A solid-state electronics based control system shall be utilized to achieve advanced operation and control of the vehicle components. A fully computerized vehicle network shall consist of electronic modules located near their point of use to reduce harness lengths and improve reliability. The control system shall comply with SAE J1939-11 recommended practices.

The control system shall operate as a master-slave system whereas the main control module instructs all other system components. The system shall contain software that maintains critical vehicle operations in the unlikely event of a main controller error. The system shall utilize a Real Time Operating System (RTOS) fully compliant with OSEK/VDX™ specifications providing a lower cost of ownership.

For increased reliability and simplified use the control system modules shall include the following attributes:

- Green LED indicator light for module power
- Red LED indicator light for network communication stability status
- Control system self-test at activation and continually throughout vehicle operation
- No moving parts due to transistor logic
- Software logic control for NFPA mandated safety interlocks and indicators
- Integrated electrical system load management without additional components
- Integrated electrical load sequencing system without additional components
- Customized control software to the vehicle's configuration
- Factory and field reprogrammable to accommodate changes to the vehicle's operating parameters
- Complete operating and troubleshooting manuals
- USB connection to the main control module for advanced troubleshooting

To assure long life and operation in a broad range of environmental conditions, the solid-state control system modules shall meet the following specifications:

- Module circuit board shall meet SAE J771 specifications
- Operating temperature from -40C to +70C
- Vibration to 50g
IP67 rated enclosure (Totally protected against dust and also protected against the effect of temporary immersion between 15 centimeters and one (1) meter)

Operating voltage from eight (8) volts to 16 volts DC

The main controller shall activate status indicators and audible alarms designed to provide warning of problems before they become critical.

**CIRCUIT PROTECTION AND CONTROL DIAGRAM**

Copies of all job-specific, computer network input and output (I/O) connections shall be provided with each chassis. The sheets shall indicate the function of each module connection point, circuit protection information (where applicable), wire numbers, wire colors and load management information.

**PROGNOSTICS**

A software based vehicle tool shall be provided to predict remaining life of the vehicles critical fluid and events (no exceptions).

The system shall send automatic indications to the multi-plex screen display, color display and/or wireless enabled device to proactively alert of upcoming service intervals.

Prognostics shall include:

- Engine oil and filter
- Transmission oil and filter
- Pump oil
- Aerial oil and filter

**ADVANCED DIAGNOSTICS**

An advanced, Windows-based, diagnostic software program shall be provided for this control system. The software shall provide troubleshooting tools to service technicians equipped with a Windows-based computer or wireless enabled device.

The service and maintenance software shall be easy to understand and use and have the ability to view system input/output (I/O) information.

**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.

**ENHANCED SOFTWARE**
The solid-state control system shall include the following software enhancements:

All perimeter lights and scene lights (where applicable) shall be deactivated when the parking brake is released.

Cab and crew cab dome lights shall remain on for ten (10) seconds for improved visibility after the doors close. The dome lights shall dim after ten (10) seconds or immediately if the vehicle is put into gear.

**EMI/RFI PROTECTION**
To prevent erroneous signals from crosstalk contamination and interference, the electrical system shall meet, at a minimum, SAE J551/2, thus reducing undesired electromagnetic and radio frequency emissions. An advanced electrical system shall be used to ensure radiated and conducted electromagnetic interference (EMI) or radio frequency interference (RFI) emissions are suppressed at their source.

The apparatus shall have the ability to operate in the electromagnetic environment typically found in fire ground operations to ensure clean operations. The electrical system shall meet, without exceptions, electromagnetic susceptibility conforming to SAE J1113/25 Region 1, Class C EMR for 10KHz-1GHz to 100 Volts/Meter. The vehicle OEM, upon request, shall provide EMC testing reports from testing conducted on an entire apparatus and shall certify that the vehicle meets SAE J551/2 and SAE J1113/25 Region 1, Class C EMR for 10KHz-1GHz to 100 Volts/Meter requirements. Component and partial (incomplete) vehicle testing is not adequate as overall vehicle design can impact test results and thus is not acceptable by itself.

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

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

Electrical wiring and equipment shall be installed utilizing the following guidelines:

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

All lights and reflectors, required to comply with Federal Motor Vehicle Safety Standard #108, shall be furnished. Rear identification lights shall be recessed mounted for protection. Lights and wiring mounted in the rear bulkheads shall be protected from damage by installing a false bulkhead inside the rear compartments. An operational test shall be conducted to ensure that any equipment that is permanently attached to the electrical system is properly connected and in working order.

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

**BATTERY SYSTEM**

There shall be six (6) 12 volt batteries that include the following features shall be provided:

- 950 CCA, cold cranking amps
• 190-amp reserve capacity
• High cycle
• Group 31
• Rating of 5700 CCA at 0 degrees Fahrenheit
• -140 minutes of reserve capacity
• Threaded stainless steel studs

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

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

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

**JUMPER STUDS**
One (1) set of battery jumper studs with plastic color-coded covers shall be installed on the bottom of the driver's side battery box. This shall provide for easy jumper cable access.

**BATTERY COMPARTMENTS**
Batteries shall be stored in well-ventilated compartments that are located under the cab and bolted directly to the chassis frame. The battery compartments shall be constructed of steel plate and be designed to accommodate a maximum of three (3) group 31 batteries in each compartment. The battery hold-downs shall be of a non-corrosive material. All bolts and nuts shall be stainless steel.

The compartments shall include formed fit heavy duty roto-molded polyethylene battery trays with drain tubes for the batteries to sit in.

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

Battery terminal connections shall be coated with anti-corrosion compound. Battery solenoid terminal connections shall be encapsulated with semi-permanent rubberized compound.
**MASTER BATTERY SWITCH**
There shall be a master battery switch provided within the cab within easy reach of the driver to activate the battery system.

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

**BATTERY CHARGER**
There shall be a Kussmaul battery charger provided. A bar graph display indicating the state of charge shall be provided.

The charger shall have a maximum output of 40 amps and a fully automatic regulation.

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

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

The battery charger indicator shall be located in the driver's step area.

**SHORELINE**
There shall be one (1) 20 amp 120-volt AC straight blade inlet(s) NEMA 5-20 with a yellow cover provided to operate the dedicated 120-volt AC circuits on the apparatus.

The shoreline shall be connected to the battery charger in D3.

A mating connector body shall also be supplied with the loose equipment.

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

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

The shoreline receptacle shall be located in the driver side lower step well of cab.

**ALTERNATOR**
A Delco Remy®, Model 55SI, alternator shall be provided. It shall have a rated output current of 430 amps, as measured by SAE method J56. The alternator shall feature an integral regulator and rectifier system that has been tested and qualified.
to an ambient temperature of 257 degrees Fahrenheit (125 degrees Celsius). The alternator shall be connected to the power and ground distribution system with heavy-duty cables sized to carry the full rated alternator output.

**DUAL USB SOCKET**
There shall be four (4) Kussmaul, 091-219, dual USB type A charger sockets installed two (2) on the Officers Instrument Panel, one (1) on the Drivers Instrument Panel, one (1) to be Determined. Power shall be directly to the battery power.

**ELECTRONIC LOAD MANAGER**
An electronic load management (ELM) system shall be provided that monitors the vehicles 12-volt electrical system, automatically reducing the electrical load in the event of a low voltage condition, and automatically restoring the shed electrical loads when a low voltage condition expires. This ensures the integrity of the electrical system.

For improved reliability and ease of use, the load manager system shall be an integral part of the vehicle's solid state control system requiring no additional components to perform load management tasks. Load management systems which require additional components shall not be allowed.

The system shall include the following features:

- System voltage monitoring.
- A shed load shall remain inactive for a minimum of five minutes to prevent the load from cycling on and off.
- Sixteen available electronic load shedding levels.
- Priority levels can be set for individual outputs.
- High Idle to not be controlled by the load manager.
  - If enabled:
    - "Load Man Hi-Idle On" shall display on the information center.
    - Hi-Idle shall not activate until 30 seconds after engine start up.
- Individual switch "on" indicator to flash when the particular load has been shed.
- The information center indicates system voltage.

The information center, where applicable, includes a "Load Manager" screen indicating the following:
• Load managed items list, with priority levels and item condition.
• Individual load managed item condition:
  o ON = not shed
  o SHED = shed

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.

For improved reliability and ease of use, the load sequencing system shall be an integral part of the vehicle's solid state control system requiring no additional components to perform load sequencing tasks. Load sequencing systems which require additional components shall not be allowed.

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.

Sequencing of the following items shall also occur, in conjunction with the ignition switch, at half-second intervals:

• Cab Heater and Air Conditioning
• Crew Cab Heater (if applicable)
• Crew Cab Air Conditioning (if applicable)
• Exhaust Fans (if applicable)
• Third Evaporator (if applicable)

HEADLIGHTS

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

• The outside light on each side shall contain a LED low beam module.
• The inside light on each side shall contain a LED high beam module only.

All lights shall be heated for severe winter weather use.
**DIRECTIONAL LIGHTS**
There shall be two (2) Whelen® M6 series, LED combination directional/marker lights provided. The lights shall be located on the outside cab corners, next to the headlights.

The color of the lenses shall be the same color as the LED's.

**INTERMEDIATE LIGHT**
There shall be two (2) Weldon, Model 9186-8580-29, amber LED turn signal marker lights furnished, one (1) each side, in the rear fender panel. The light shall double as a turn signal and marker light.

**CAB CLEARANCE/MARKER/ID LIGHTS**
There shall be seven (7) amber LED lights provided to indicate the presence and overall width of the vehicle in the following locations:

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

**FRONT CAB SIDE DIRECTIONAL/MARKER LIGHTS**
There shall be two (2) Truck-Lite®, Model 19036Y, amber LED lights installed to the outside of the chrome wrap around bezel, one (1) on each side of the cab.

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

**REAR CLEARANCE/MARKER/ID LIGHTING**
There shall be a three (3) LED light bar used as identification lights located at the rear of the apparatus per the following:

- As close as practical to the vertical centerline
- Centers spaced not less than 6.00” or more than 12.00” apart
There shall be two (2) LED lights installed at the rear of the apparatus used as clearance lights located at the rear of the apparatus per the following:

- To indicate the overall width of the vehicle
- One (1) each side of the vertical centerline
- As near the top as practical
- Red in color
- To be visible from the rear
- All at the same height
- There shall be two (2) LED lights installed on the side of the apparatus used as marker lights as close to the rear as practical per the following:
  - To indicate the overall length of the vehicle
  - One (1) each side of the vertical centerline
  - As near the top as practical
  - Red in color
  - To be visible from the side
  - All at the same height

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

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

Per FMVSS 108 and CMVSS 108 requirements.

**LICENSE PLATE BRACKET**

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

A white LED light shall illuminate the license plate. A polished stainless steel light shield shall be provided over the light that shall direct illumination downward, preventing white light to the rear.
**BACK-UP ALARM**
An electronic audible back-up alarm that actuates when the truck is shifted into reverse shall be provided. The device shall sound at 60 pulses per minute and automatically adjust its volume to maintain a minimum ten (10) dB above surrounding environmental noise levels.

**MARKER LIGHTS**
There shall be one (1) pair of amber and red LED marker lights with rubber arm, located one each side of the truck mounted at the rear of the body as low as practical. The amber lens shall face the front and the red lens shall face the rear of the truck and be the most rearward marker light.

These lights shall be activated with the running lights of the vehicle.

**REAR FMVSS LIGHTING**
The rear stop/tail and directional LED lighting shall consist of the following:

- Two (2) Whelen®, Model M6BTT, red LED stop/tail lights
- Two (2) Whelen, Model M6T, amber LED arrow turn lights

The lights shall be provided with color lenses.

The lights shall be mounted in a polished combination housing.

There shall be two (2) Whelen Model M6BUW, LED backup lights provided in the tail light housing.

**CAB PERIMETER SCENE LIGHTS**
There shall be four (4) 20.00" white LED strip lights provided, one (1) for each cab door.

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

**PUMP HOUSE PERIMETER LIGHTS**
There shall be one (1) 20.00" LED weatherproof strip light with bracket provided under the passenger's side pump panel running board.

The lights shall be controlled by the same means as the body perimeter lights.
**BODY PERIMETER SCENE LIGHTS**

There shall be one (1) 20.00" 12-volt DC LED strip lights provided.

The lights shall be mounted in the following locations:

- One (1) light under the driver's side turntable access steps

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

**STEP LIGHTS**

There shall be two (2) white LED, step lights provided. One (1) step light shall be provided on each side of the body.

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

These step lights shall be actuated when the ignition switch is on and the parking brake is set.

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

**12 VOLT LIGHTING**

There shall be one (1) 12-volt DC LED combination spot/floodlight(s) installed on the apparatus.

The painted parts of this light assembly to be white.

The light shall be installed on an extendable pole Passenger side rear of cab, matching the driver’s side.

The light(s) to be installed on a side body/surface mount push-up pole(s).

The length of the outside pole to be 20.00".

The inside pole length to be 57.00" long or as long as practical to fit in the location selected.

The light pole(s) to be installed without handle holder(s).

The lights shall be controlled by the following:

- a switch at the passenger's side switch panel.
- a switch at the pump operator's panel.
- A switch at the driver’s side switch panel.

These light(s) may be load managed when the parking brake is applied.
**12 VOLT LIGHTING**

There shall be one (1) 12-volt DC LED combination spot/floodlight(s) installed on the apparatus.

The painted parts of this light assembly to be white.

The lights shall produce a minimum of 20,000 lumens each.

The light shall be installed on an extendable pole Drivers side rear of cab, matching the passenger’s side.

The light(s) to be installed on a side body/surface mount push-up pole(s).

The length of the outside pole to be 20.00".

The inside pole length to be 57.00" long or as long as practical to fit in the location selected.

The light pole(s) to be installed without handle holder(s).

The lights shall be controlled by the following:

- a switch at the driver’s side switch panel.
- a switch at the pump operator’s panel.
- a switch at the passenger’s side switch panel.

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

---

**LIGHT POLE GUARD**

A polished stainless steel guard shall be provided at the rear of the cab to cover the light pole for a telescoping floodlight. This guard shall provide protection for the pole from any damage that may be caused by the hose couplings during removal of hose from the cross lay hose beds.

There shall be a total of two (2) guards provided.

---

**12 VOLT LIGHTING**

There shall be one (1) 12-volt surface mounted LED combination spot/flood light(s) located Drivers side of cab, behind the crew cab door, as high as possible. The light shall be mounted with black flange(s).

The light selected above shall be controlled by the following:

- a switch at the driver's side switch panel
- a switch at the passenger’s side switch panel

These light(s) may be load managed when the parking brake is set.
12 VOLT LIGHTING
There shall be one (1) 12-volt surface mounted LED combination spot/flood light(s) located Passengers side of cab, behind the crew cab door, as high as possible. The lights shall be mounted with black flange(s).

The light(s) selected above shall be controlled by the following:

- a switch at the passenger's side switch panel
- a switch at the driver’s side switch panel

These light(s) may be load managed when the parking brake is set.

12 VOLT LIGHTING
There shall be one (1) 12-volt surface mounted LED combination spot/flood light(s) located one (1) on the Passenger’s side body panel, centered above the compartment over the rear wheels. The lights shall be mounted with black flange(s).

The light(s) selected above shall be controlled by the following:

- a switch at the driver's side switch panel
- a switch at the passenger's side switch panel
- a switch at the driver's side pump panel

These light(s) may be load managed when the parking brake is set.

12 VOLT LIGHTING
There shall be one (1) 12-volt surface mounted LED combination spot/flood light(s) located one (1) on the Driver’s side body panel, centered above the compartment over the rear wheels. The lights shall be mounted with black flange(s).

The light(s) selected above shall be controlled by the following:

- a switch at the driver's side switch panel
- a switch at the passenger's side switch panel
- a switch at the driver's side pump panel

These light(s) may be load managed when the parking brake is set.

12 VOLT LIGHTING
There shall be one (1) 12 volt LED combination spot/flood light(s) provided on the front visor, centered.

The painted parts of this light assembly to be black.
The light(s) shall be controlled by the following:

- a switch at the driver's side switch panel
- a switch at the passenger's side switch panel
- no additional switch location

These light(s) may be load managed when the parking brake is set.

**WORK LIGHTS**

Two (2)-6.00" deck lights shall be provided at the rear of the apparatus. The lights shall be Whelen LED.

**WALKING SURFACE LIGHT**

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

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

**WATER TANK**

The water tank shall have a capacity of 500 gallons and shall be constructed of polypropylene plastic in a rectangular shape.

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

The tank shall be baffled in accordance with current NFPA 1901 requirements.

The baffles shall have vent openings at both the top and bottom of each baffle to permit movement of air and water between compartments.

The longitudinal partitions shall be constructed of 0.38” polypropylene plastic and extend from the bottom of the tank through the top cover to allow positive welding.

The transverse partitions extend from 4.00” off the bottom to the underside of the top cover.

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

The tank top shall be constructed of 0.50” polypropylene.

It shall be recessed 0.38” and shall be welded to the tank sides and the longitudinal partitions.

It shall be supported to keep it rigid during fast filling conditions.

Construction shall include 2.00" polypropylene dowels spaced no more than 30.00” apart and welded to the transverse partitions.
Two of the dowels shall be drilled and tapped (0.50" diameter, 13.00" deep) to accommodate lifting eyes.

A sump shall be provided at the bottom of the water tank. The sump shall include a drain plug and the tank outlet.

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

Sufficient cross members are provided to properly support bottom of tank.

Cross members are constructed of steel bar channel or rectangular tubing.

Tank "floats" in cradle to avoid torsional stress caused by chassis frame flexing.

Rubber cushions, 0.50" thick x 3.00" wide, shall be placed on all horizontal surfaces that the tank rests on.

Stops are provided to prevent an empty tank from bouncing excessively while moving vehicle.

Tank mounting system is approved by the manufacturer.

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

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

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

**HOT DIP GALVANIZED WATER TANK CRADLE**

The water tank cradle shall be treated through a hot dip galvanizing process. The cradle shall be immersed in molten zinc to provide a coating that shall help protect against the effects of corrosion.

**HOSE BED**

The hose bed shall be fabricated of aluminum.

The sides of the hose bed shall not form any portion of the fender compartments.

The upper and rear edges of the hose bed side panels shall have a double break for rigidity.

The hose bed shall be located ahead of the ladder turntable.
There shall be a hose chute to the side and rear of the hose bed on both the driver and passenger side to allow for payout/removal of the hose.

The hose bed flooring shall consist of removable aluminum grating with a top surface that is perforated to aid in hose aeration.

Hose capacity shall be a minimum of 1000' of 5.00" large diameter hose with continuous pay out.

**LIGHTS BELOW HOSE BED COVER**
There shall be two (2) 63.00" LED rope lights(s) provided, one each side of the hose bed.

The light(s) shall be activated when the parking brake is applied.

**AERIAL HOSE BED HOSE RESTRAINT**
The hose in the hose beds shall be restrained by black nylon Velcro® straps at the top of the hose bed and 1.00" black nylon web design with a 2.00" box pattern at the rear of the hose beds. The Velcro strap shall be installed to the top of the hose bed side sheets. The rear webbing shall have 1.00" web straps that loop through footman loops and fasten with spring clip and hook fasteners.

**RUNNING BOARDS**
The running boards shall be fabricated of bright aluminum tread plate and supported by structural steel angle assemblies bolted to the chassis frame rails.

Running boards shall be 13.00" deep and are spaced away from the body 0.50".

A splash guard shall be provided to keep road dirt or water from splashing up onto the pump panels.

The running boards shall have a riser on the body to protect the painted surface from damage by stepping on the running boards.

The entire surface of the running boards shall be covered with bright aluminum tread plate.

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

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

Drain holes shall be provided in the bottom of all vertically mounted handrails.
Two (2) handrails shall be provided, one above each running board.

**TURNTABLE STEPS**

Access to the turntable shall be provided by a set of swing-down steps, one on the driver side of the truck.

The access steps shall be located rearward of the compartmentation.

All steps shall have a height no greater than 14.00" from top surface to top surface.

The swing down step mechanism shall be constructed of brushed aluminum with bright aluminum steps. The steps shall be designed with a grip pattern punched into the bright aluminum material to provide support, slip resistance, and drainage.

The stepwell shall be lined with bright aluminum tread plate to act as scuff plates.

A handrail shall be provided on each side of the access steps.

Holes shall be provided in each side step plate for hand holds.

The bottom step shall have a step height not exceeding 12.00" from the ground to the top surface of the step at any time.

The steps shall be connected to the "Do Not Move Truck" indicator in the cab.

**STEP LIGHTS**

There shall be three (3) white LED step lights provided for each set of aerial turntable access steps.

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

The step lights shall be actuated by the aerial master switch in the cab.

**SMOOTH ALUMINUM REAR WALL**

The rear wall shall be smooth aluminum.

**TOW EYES**

Two (2) rear painted tow eyes shall be located at the rear of the apparatus and shall be mounted directly to the frame rails. The inner and outer edges of the tow eyes shall be radiused.
COMPARTMENTATION
Compartmentation shall be fabricated of aluminum.

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

Circular fender liners shall be provided. For prevention of rust pockets and ease of maintenance, the fender liners shall be formed from aluminum and removable for maintenance.

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

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

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

Side compartment covers shall be separate from the compartment tops.

All screws and bolts, which are not Grade 8, shall be stainless steel and where they protrude into a compartment shall have acorn nuts on the ends to prevent injury.

UNDERBODY SUPPORT SYSTEM
The backbone of the body support system shall begin with the aerial torque box which is the strongest component of the apparatus and is designed for sustaining maximum loads. An aluminum body structure shall be mounted to the aerial torque box.

The body structure shall be mounted with neoprene elastomer isolators. These isolators shall have a broad load range, proven viability in vehicular applications, be of a fail-safe design and allow for all necessary movement.

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

LOUVERS
All body compartments shall be vented to provide one (1) way airflow out of the compartment that prevents water and dirt from gaining access to the compartment.
**TESTING OF BODY DESIGN**

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

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

The criteria used during the testing procedure shall include:

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

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

**DRIVER SIDE COMPARTMENTATION**

A full height, vertically hinged, single door compartment ahead of the rear wheels shall be provided. The depth of the compartment shall be calculated with the compartment door closed. The compartment interior shall be fully open from the compartment ceiling to the compartment floor and designed so that no permanent dividers are required between the upper and lower sections.

A positive door holder shall be furnished with this compartment.

A horizontally hinged, single lift-up door compartment over the rear wheels shall be provided. The depth of the compartment shall be calculated with the compartment door closed.

The lift-up door shall be furnished with two (2) gas-charged cylinders to assist in the opening of the door and to maintain the door in an open position. There shall be a field adjustable, three-position bracket mounted on the vertical side door opening that shall allow the door to be held open at 87°, 90°, or 93°.

Closing of the door shall not require releasing, unlocking, or unlatching any mechanism.
A full height, vertically hinged, door compartment behind the rear wheels shall be provided. The depth of the compartment shall be calculated with the compartment door closed. The compartment interior shall be fully open from the compartment ceiling to the compartment floor and designed so that no permanent dividers are required between the upper and lower sections.

Positive door holders shall be furnished with this compartment.

**PASSENGERS SIDE COMPARTMENTATION**

A full height, vertically hinged, single door compartment ahead of the rear wheels shall be provided. The depth of the compartment shall be calculated with the compartment door closed. The compartment interior shall be fully open from the compartment ceiling to the compartment floor and designed so that no permanent dividers are required between the upper and lower sections.

A positive door holder shall be furnished with this compartment.

A horizontally hinged, single lift-up door compartment over the rear wheels shall be provided. The depth of the compartment shall be calculated with the compartment door closed.

The lift-up door shall be furnished with two (2) gas-charged cylinders to assist in the opening of the door and to maintain the door in an open position. There shall be a field adjustable, three-position bracket mounted on the vertical side door opening that shall allow the door to be held open at 87°, 90°, or 93°.

Closing of the door shall not require releasing, unlocking, or unlatching any mechanism.

A full height, vertically hinged, door compartment behind the rear wheels shall be provided. The depth of the compartment shall be calculated with the compartment door closed. The compartment interior shall be fully open from the compartment ceiling to the compartment floor and designed so that no permanent dividers are required between the upper and lower sections.

Positive door holders shall be furnished with this compartment.

**REAR COMPARTMENT**

A compartment shall be provided at the rear of the unit.

The compartment rollup Amdor shall be painted with red #90.
All hinges, barrel clips and end pieces shall be nylon 66. All nylon components shall withstand temperatures from plus 300 to minus 40 degrees Fahrenheit. Hardened plastic shall not be acceptable.

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

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

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

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

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

**REAR BUMPER**
An aluminum rub rail shall be provided at the rear of the unit. It shall extend the full width of the body.

**COMPARTMENT LIGHTING**
There shall be eight (8) compartment(s) with two (2) white 12-volt DC LED compartment light strips. The dual light strips shall be centered vertically along each side of the door framing. There shall be two (2) light strips per compartment. The dual light strips shall be in all body compartment(s).

Any remaining compartments without light strips shall have a 6.00" diameter DC LED light.

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

**MOUNTING TRACKS**
There shall be recessed tracks installed vertically to support the adjustable shelf(s).

Tracks shall not protrude into any compartment in order to provide the greatest compartment space and widest shelves possible.

The tracks shall be provided in each compartment except for the one that contains the pump operator's panel.
**ADJUSTABLE SHELVES**
There shall be seven (7) shelves with a capacity of 500 lb. provided.

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

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

The shelves shall be held in place by brackets and bolts.

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

**SLIDE-OUT FLOOR MOUNTED TRAY**
There shall be five (5) floor mounted slide-out tray(s) provided.

Each tray shall have 2.00" high sides and a minimum capacity rating of 500 lb. in the extended position.

Each tray shall be constructed of aluminum painted spatter gray.

There shall be two under mount-roller bearing type slides rated at 250lb each provided. The pair of slides shall have a safety factor rating of 2.

To ensure years of dependable service, the slides shall be coated with a finish that is tested to withstand a minimum of 1,000 hours of salt spray per ASTM B117.

To ensure years of easy operation, the slides shall require no more than a 50lb force for push-in or pull-out movement when fully loaded after having been subjected to a 40-hour vibration (shaker) test under full load. The vibration drive file shall have been generated from accelerometer data collected from a heavy truck chassis driven over rough gravel roads in an unloaded condition. Proof of compliance shall be provided upon request.

Automatic locks shall be provided for both the "in" and "out" positions. The trip mechanism for the locks shall be located at the front of the tray for ease of use with a gloved hand.

The location(s) shall be D1, P1, D3, P3 and R1.
SWING OUT TOOL BOARD
A swing out aluminum tool board shall be provided.

A 1.00” x 1.00” aluminum tube frame shall be welded to the edge of the smooth aluminum board.

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

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

The board shall be mounted on adjustable tracks from front to back within the compartment.

There shall be Two (2) tool board(s) provided. The tool board(s) shall be spatter gray painted and installed in compartment P2 and D2.

SLIDE-OUT TOOL BOARD
Two slide-out smooth aluminum tool board shall be provided. It shall have a painted finish to match the compartment interior.

The board shall be mounted on an under mount-roller bearing type slide rated at 250 lb. with a factor of safety of 2.

To ensure years of dependable service the slides shall be coated with a finish that is tested to withstand a minimum of 1,000 hours of salt spray per ASTM B117.

To ensure years of easy operation, the slides shall require no more than a 50-pound force for push-in or pull-out movement when fully loaded after having been subjected to a 40-hour vibration (shaker) test under full load. The vibration drive file shall have been generated from accelerometer data collected from a heavy truck chassis driven over rough gravel roads in an unloaded condition. Proof of compliance shall be provided upon request.

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

The tool board shall be mounted on adjustable tracks side to side within the compartment.
There shall be two (2) provided.

**MATTING, COMPARTMENT FLOOR**
Turtle Tile compartment matting shall be provided in five (5) compartments on the compartment floor. The locations are, to be determined.

The Turtle Tile shall be gray and the leading edge of the matting shall include the beveled edge. The beveled edge shall be gray.

**MATTING, COMPARTMENT SHELVING**
Turtle Tile compartment matting shall be provided in twelve (12) shelves. The locations are, each compartment shelf and tray.

The color of Turtle Tile shall be gray.

**AIR BOTTLE STORAGE (TRIPLE)**
A quantity of two (2) air bottle compartments designed to hold (3) air bottles up to 7.25” in diameter x 26.00” deep shall be provided on the passenger side forward of the rear wheels and on the passenger side rearward of the rear wheels. A polished stainless steel door with a chrome plated flush lift & turn latch shall be provided to contain the air bottle. A dielectric barrier shall be provided between the door hinge, hinge fasteners and the body sheet metal.

Inside the compartment, black rubber matting shall be provided.

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

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

Trim shall be 3” high with 1.50” flanges turned outward for rigidity.

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

**BODY FENDER CROWNS**
Polished stainless steel fender crowns shall be provided around the rear wheel openings.
An unpainted fender liner shall be provided to avoid paint chipping. The liners shall be removable to aid in the maintenance of rear suspension components.

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

The fender crowns shall be held in place with stainless steel screws that thread directly into a composite nut and not directly into the parent body sheet metal to eliminate dissimilar metals contact and greatly reduce the chance for corrosion.

**HARD SUCTION HOSE**

Hard suction hose shall not be required.

**FOUR (4)-SECTION 100+ FOOT AERIAL LADDER**

**CONSTRUCTION STANDARDS**

The ladder shall be constructed to meet all of the requirements as described in the current NFPA 1901 standards.

The aerial device shall be a true ladder type device; therefore, ladders attached to booms shall not be considered.

These capabilities shall be established in an unsupported configuration.

All structural load supporting elements of the aerial device that are made of a ductile material shall have a design stress of not more than 50% of the minimum yield strength of the material based on the combination of the live load and the dead load. This 2:1 structural safety factor meets the current NFPA 1901 standard.

All structural load supporting elements of the aerial device that are made of non-ductile material shall have a design stress of not more than 20% of the minimum ultimate strength of the material, based on the combination of the rated capacity and the dead load. This 5:1 safety factor meets the current 1901 NFPA standard.

Wire ropes and attaching systems used to extend and retract the fly sections shall have a 5:1 safety factor based on the ultimate strength under all operating conditions. The factor of safety for the wire rope shall remain above 2:1 during any extension or retraction stall. The minimum ratio of the diameter of wire rope used to the diameter of the sheave used shall be 1:12. Wire ropes shall be constructed of seven (7) strands over an inner wire core for increased flexibility. The wire rope shall be galvanized to reduce corrosion.
The aerial base pivot bearings shall be maintenance free type bearings and require no external lubrication.

The aerial device shall be capable of sustaining a static load one and one-half times its rated tip load capacity (live load) in every position in which the aerial device can be placed when the vehicle is on a firm level surface.

The aerial device shall be capable of sustaining a static load one and one-third times its rated tip load capacity (live load) in every position the aerial device can be placed when the vehicle is on a slope of five degrees downward in the direction most likely to cause overturning.

With the aerial device out of the cradle and in the fully extended position at zero degrees’ elevation, a test load shall be applied in a horizontal direction normal to the centerline of the ladder. The turntable shall not rotate and the ladder shall not deflect beyond what the product specification allows.

All welding of aerial components, including the aerial ladder sections, turntable, pedestal, and outriggers, shall be in compliance with the American Welding Society standards. All welding personnel shall be certified, as qualified under AWS welding codes.

The aerial device shall be capable of operating with the maximum rated tip load in either of the two (2) following conditions:

- Conditions of high wind up to 35 mph
- Conditions of icing, up to a coating of 0.25" over the entire aerial structure

All of the design criteria must be supported by the following test data (no exception):

- Strain gage testing of the complete aerial device
- Analysis of deflection data taken while the aerial device was under test load

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 acceptable
- Material testing that is performed after the mill test shall be for verification only and not with the intent of changing the classification
- All welded structural components for the ladder shall be traceable to their mill lots

**LADDER CONSTRUCTION**

The ladder shall be comprised of four sections.

The ladder shall have the capability to support a minimum of 750 pounds at the tip in the unsupported configuration, based upon 360-degree rotation, up to full extension and from -10 degrees to +77 degrees.

The ladder (handrails, base rails, trusses, K-braces and rungs) shall be constructed for heavy duty use with a minimum 100,000 pounds per square inch yield, with full traceability on all structural members.

Each section shall be trussed diagonally, vertically and horizontally using welded tubing.

All ladder rungs shall be round and welded to each section utilizing "K" bracing for torsional rigidity.

The minimum inside width dimensions of the ladder shall be:

- Base Section 41"
- Inner-Mid Section 34"
- Outer-Mid Section 27"
- Fly Section 21"

The minimum height of the handrails above the centerline of the rungs shall be:

- Base Section 26"
- Inner-Mid Section 22"
- Outer-Mid Section 20"
- Fly Section 17"

The ladder shall be designed to provide continuous egress for firefighters and civilians from an elevated position to the ground. The end of the fly section shall be constructed in a manner that aids personnel in climbing off the ladder.
The egress section shall be designed to maintain the rated load of the aerial device. It shall be bolted on for easy replacement. There shall be a tow eye welded on to each side of the egress.

**VERTICAL HEIGHT**
The ladder shall extend to a minimum height of 100' above the ground at full extension and elevation. The measurement of height shall be consistent with NFPA standards.

**HORIZONTAL REACH**
The rated horizontal reach shall be a minimum of 100' (no exception). The measurement of horizontal reach shall be consistent with NFPA standards.

**TURNTABLE**
The upper turntable assembly shall connect the aerial ladder to the turntable bearing. The steel structure shall have a mounting position for the aerial elevation cylinders, ladder connecting pins, and upper turntable operator's position.

The turntable shall be aluminum plate, coated with a non-skid, chemical resistant material in the walking areas. The stepping surfaces shall meet the skid-resistance requirements of the current NFPA 1901 standard.

The turntable shall be modified at the passenger side to allow for easier access to the hose bed for hose loading. The portion of the turntable outboard of the rotational motor shall be omitted, and the handrails shall be modified as required.

The turntable handrails shall be a minimum 42" high and shall not increase the overall travel height of the vehicle. The handrails shall be constructed from aluminum and have a slip resistant knurled surface.

**ELEVATION SYSTEM**
Dual elevating cylinders shall be mounted on the underside of the base section of the ladder, one (1) on each side. One (1) stainless steel pin shall fasten each cylinder to the ladder and one (1) stainless steel pin shall fasten each cylinder to the turntable. The pins shall have 125,000 psi minimum yield strength and shall be secured with Grade 8 bolts with castle nut and cotter pin. The bolts are to ensure that the pins do not walk out of the mounting brackets on the turntable and base section.
The elevating cylinders shall be mounted utilizing maintenance-free spherical bearings on both ends of the cylinders (no exception). The aerial base pivot bearings shall be maintenance-free type bearings with no external lubrication required (no exception). The cylinders shall function only to elevate the ladder and not as a structural member to stabilize the ladder side movement. The elevating cylinders shall be provided with pilot-operated check valves on the barrel and rod side of the piston to prevent movement of the ladder in case of a loss of hydraulic pressure.

The operation envelope shall be 10 degrees below horizontal to 77 degrees above horizontal.

The elevation system shall be designed following NFPA standards. The elevation hydraulic cylinders shall incorporate cushions on the upper limit of travel.

The lift cylinders shall be equipped with integral holding valves located in the cylinder to prevent the unit from descending should the charged lines be severed, at any point within the hydraulic system and to maintain the ladder in the bedded position during road travel. The integral holding valves shall NOT be located in the transfer tubes.

The elevation system shall be controlled by the microprocessor. Linear transducers shall measure the extension of the elevation cylinder. The microprocessor shall provide the following features:

- Collision avoidance of the elevation system to prevent accidental body damage
- Automatic deceleration when the aerial device is lowered into the cradle
- Automatic deceleration at the end of stroke, in maximum raise and lower positions
- Deceleration of the aerial device at the limits of travel.

**EXTENSION/RETRACTION SYSTEM**

A hydraulically powered, extension and retraction system shall be provided through dual hydraulic cylinders and wire ropes. Each set shall be capable of operating the ladder in the event of a failure, of the other. For safety, systems that use only a single extension/retraction system shall not be acceptable. The extension cylinder rod shall be chrome plated to provide smooth operation of the aerial device and reduce seal wear. The extension/retraction cylinders shall be equipped, with integral holding valves, to prevent the unit from retracting should the charged line be severed, at
any point within the hydraulic system. The integral holding valves shall NOT be located in the transfer tubes.

Wire ropes and attaching systems used to extend and retract the fly sections shall have a 5:1 safety factor based on the ultimate strength under all operating conditions. The factor of safety for the wire rope shall remain above 2:1 during any extension or retraction stall. The minimum ratio of the diameter of wire rope used to the diameter of the sheave used shall be 1:12. Wire ropes shall be constructed of seven (7) strands over an inner wire for increased flexibility. The wire rope shall be galvanized to reduce corrosion.

The extension/retraction system shall be controlled by the microprocessor. Linear transducers shall measure the ladder extension. The microprocessor shall provide the following features:

- Automatic deceleration at the end of stroke, in maximum extend and retract positions

All sheaves shall require lubrication. They shall have bronze bushings and grease zerk.

**MANUAL OVERRIDE CONTROLS**

Manual override controls shall be provided for all aerial and stabilizer functions.

**LADDER SLIDE MECHANISM**

UHMW polyethylene wear pads shall be used between the telescoping ladder sections, to provide greater bearing surface area for load transfer. Adjustable slide pads shall be used to control side play between the ladder sections.

**ROTATION SYSTEM**

The aerial shall be supplied with a powered rotation system as outlined in NFPA standards. The hydraulic rotation motor shall provide continuous rotation under all rated conditions and be supplied with a brake to prevent unintentional rotation. One (1) hydraulically driven, planetary gear box with drive speed reducers shall be used to provide infinite and minute rotation control throughout the entire rotational travel. One (1) spring applied, hydraulically released disc type swing brake shall be furnished to provide positive braking of the turntable assembly. Provisions shall be made for emergency operation of the rotation system should complete loss of normal hydraulic power occur. The hydraulic system shall be equipped with pressure relief valves which shall limit the rotational torque to a nondestructive power. The gearbox shall have a minimum continuous torque rating of 80,000 in.
lbs. and a minimum intermittent rating of 160,000 in. lbs. The turntable bearing, ring gear teeth, pinion gear, planetary gearbox, and output shaft shall be certified by the manufacturer of the components for the application.

The rotation system shall be controlled by the microprocessor. The microprocessor shall provide the following features:

- Collision avoidance to prevent accidental body damage
- Prevent the aerial from being rotated into an unstable condition.

**ROTATION INTERLOCK**

The microprocessor shall be used to prevent the rotation of the aerial device to the side in which the stabilizers have not been fully deployed (short-jacked). The microprocessor shall allow full and unrestricted use of the aerial, in the 180-degree area, on the side(s) where the stabilizers have been fully deployed. The system shall also have a manual override, to comply with NFPA 1901. **SYSTEMS THAT PERMIT THE AERIAL TO ROTATE TO THE "SHORT JACK" SIDE, WITHOUT AUTOMATICALLY STOPPING THE ROTATION AND/OR WITHOUT ACTUATION OF THE "MANUAL OVERRIDE", SHALL NOT BE ACCEPTED. SYSTEMS THAT ONLY INCLUDE AN ALARM ARE NOT CONSIDERED AN INTERLOCK AND SHALL NOT BE ACCEPTED.**

**LADDER CRADLE INTERLOCK SYSTEM**

A ladder cradle interlock system shall be provided through the microprocessor to prevent the lifting of the aerial device from the nested position until the operator places all the stabilizers in a load supporting configuration. A switch shall be installed at the boom support to prevent operation of the stabilizers once the aerial has been elevated from the nested position.

**AERIAL TORQUE BOX/PEDESTAL**

The pedestal assembly shall be a welded assembly made of high strength plate. The vertical member shall be a reinforced wall and shall connect the rotation bearing mounting plate to the lower substructure.

The pedestal assembly shall be bolted to the chassis frame with Grade 8 bolts, and shall be utilized to mount the outrigger jacks and reservoir for the aerial hydraulic system.
LOAD CAPACITIES
The following load capacities shall be established, with the stabilizers at full horizontal extension and placed in the down position, to level the truck and to relieve the weight from the tires and axles.

Capacities shall be based upon full 360-degree rotation with ladder extended to operational limits at 0 degrees’ elevation.

A load chart, visible at the operator's station shall be provided. The load chart shall show the recommended safe load at any condition of the aerial device's elevation and extension (no exception).

BOOM SUPPORT
A heavy duty boom support shall be provided for support of the ladder in the travel position. On the base section of the ladder, a stainless steel scuff plate shall be provided where the ladder comes into contact with the boom support.

The boom support shall be located just to the rear of the chassis cab.

AERIAL BOOM SUPPORT LIGHT
There shall be one (1) white incandescent light mounted on the boom support cradle. This light shall be activated by the aerial master switch.

AERIAL BOOM PANEL
There shall be one boom panel provided on each side of the aerial ladder base section. The boom panel shall be painted #90 red.

The boom panels shall be designed so no mounting bolts are in the face of the panel. This shall keep the lettering surface free of holes.

EXTENSION INDICATOR
Extension markings and corresponding numerical indicators shall be provided along each inside and outside top rail of the base section of the aerial every 10’. They shall indicate various positions of extension up to full. Markings and indicators shall be clearly visible to the console operator. To aid in visibility during hours of darkness, the markings and numerical indicators shall be red reflective material.
FOLDING STEPS
One (1) set of folding steps shall be provided at the tip of the ladder. An additional set of folding steps shall be provided at the base of the fly section. The steps shall be bright finished, non-skid with a black coating.

AERIAL DEVICE RUNG COVERS
Each rung shall be covered with a secure, heavy-duty, fiberglass pultrusion that incorporates an aggressive, no-slip coating.

The rung covers shall be glued to each rung, and shall be easily replaceable should the rung cover become damaged.

The center portion of each rung cover shall be black and the outside 2.00" edge at each side shall be safety yellow.

Under no circumstances shall the rung covers be fastened to the rungs using screws or rivets (no exception).

The rung covers shall have a life time warranty.

LIGHTS FOR TURNTABLE WALKWAY
There shall be white LED lights provided at the aerial turntable. The lights shall be located to illuminate the entire walking surface of the turntable including the area around the turntable console. These lights shall be activated by the aerial master switch.

TURNTABLE CONSOLE LIGHTING
There shall be one (1), white LED light strip mounted in the turntable console cover to illuminate the controls located on both the upper and lower portion of the turntable control station. These lights shall be activated by the aerial master switch.

INFORMATION CENTER
There shall be an information center provided. The information center shall operate in temperatures from -40 to 185 degrees Fahrenheit. The information center shall employ a Linux operating system and a 7.00" (diagonal measurement) LCD display. The LCD shall have a minimum 1000nits rated, color display. The LCD shall be sunlight readable, true digital operation, and shall have improved resolution. The LCD display shall be encased in an ABS, grey plastic housing with a gray decal. There shall be five (5), weather-resistant user interface switches provided. The LCD display can be changed to an available foreign language.
**OPERATION**
The information center shall be designed for easy operation in everyday use. There shall be a page button to cycle from one screen to the next screen in a rotating fashion. A video button shall allow an NTSC signal into the information center to be displayed on the LCD. If any button is pressed while viewing a video feed, the information center shall return to the vehicle information screens. There shall be a menu button to provide access to maintenance, setup, and diagnostic screens. All other button labels shall be specific to the information being viewed.

**GENERAL SCREEN DESIGN**
Where possible, background colors shall be used to provide vehicle information. If the information provided on a screen is within acceptable limits, a black background color shall be used. If the information provided on a screen is not within acceptable limits, an amber background color shall indicate a caution condition and a red background color shall indicate a warning condition.

Every screen in the information center shall include the time (12- or 24-hour mode) and a fault alert triangle symbol. The time shall be synchronized between all Command Zone color displays located on the vehicle. Once the fault alert triangle is selected, a text message shall identify any items causing the audible alarm to sound. If more than one (1) audible alarm is activated, the text message for each alarm shall cycle every second until the problems have been resolved. The background for the Alert Center shall change to indicate the severity of the warning message. Amber shall indicate a caution condition and red shall indicate a warning condition. If a warning and a caution condition occur simultaneously, the red background color shall be shown for all Alert Center messages.

A label or symbol shall be provided for each button. The label or symbol shall indicate the function for each active button for each screen. If the button is not utilized on specific screens, it shall remain black.

Symbols shall accurately depict the aerial device type the information pertains to such as rear mount ladder, rear mount platform, mid-mount ladder or mid-mount platform.

**PAGE SCREENS**
The Information center shall include the following pages:

The Aerial Main and Load Chart page shall indicate the following information:
- Rungs Aligned and Rungs Not Aligned shall be indicated with respective green or red colored ladder symbols.

- Ladder Elevation shall be indicated via a fire apparatus vehicle with ladder symbol with the degree of elevation indicated between the vehicle and ladder.

- Water Flow shall be indicated via a water nozzle symbol and text indicating flow / time.

Color features shall be utilized on this screen. A fault alert triangle symbol in the lower right portion of the screen shall indicate any caution faults with a yellow background. Warning type conditions shall be indicated via a red background. Conditions operating within acceptable limits shall be indicated via a green background.

The Aerial Reach and Hydraulic Systems page shall indicate the following information:

- Aerial hydraulic oil temperature shall be indicated with symbol and text.

- Aerial Hydraulic Oil Pressure shall be indicated with a symbol and text.

- The following calculations shall be indicated on a representative vehicle symbol:
  - Aerial Device Extension length
  - Aerial Device Height indicating the height of the aerial device tip from the ground
  - Aerial Device Angle indicating the angle from the vehicle which the device is at.

- *At A Glance* color features shall be utilized on this screen. A fault alert triangle symbol in the lower right portion of the screen shall indicate any caution faults with a yellow background. Warning type conditions shall be indicated via a red background. Conditions operating within acceptable limits shall be indicated via a green background.

The Level Vehicle page shall indicate the following information:

- The grade of the vehicle shall be indicated via a fire apparatus vehicle symbol with the degree of grade shown in text format. The symbol shall tilt dependent on the vehicle grade.

- The slope of the vehicle shall be indicated via a fire apparatus vehicle symbol with the degree of slope shown in text format. The symbol shall tilt dependent on the vehicle slope.
- Outriggers status shall be indicated via a colored symbol for each outrigger present. Each outrigger status shall be defined as one of the following:

- Outrigger stowed indicated with a silver pan located close to the vehicle
- Outrigger fully extended indicated with a fully deployed green outrigger
- Outrigger short-jacked indicated by a yellow outrigger partially deployed
- Outrigger not set indicated by a red outrigger that is not set on the ground

- A bedding assist alert shall indicate that the aerial device is being aligned by the Control system as the operator lowers the aerial device into the cradle with the joystick.

Color features shall be utilized on this screen. A fault alert triangle symbol in the lower right portion of the screen shall indicate any caution faults with a yellow background. Warning type conditions shall be indicated via a red background. Conditions operating within acceptable limits shall be indicated via a green background.

The aerial operation envelope page shall indicate the following:

- A top view of the aerial operating envelope
- A side view of the aerial operating envelope

**MENU SCREENS**
The following screens shall be available through the Menu button:

The View System Information screen shall display aerial device hours, aerial PTO hours, ladder aligned for stowing, aerial rotation angle, total water flow, and aerial waterway valve status.

The Set Display Brightness screen shall allow brightness increase and decrease and include a default setting button.

The Configure Video Mode screen shall allow setting of video contrast, video color and video tint.

The Set Startup screen allows setting of the screen that shall be active at vehicle power-up.

The Set Date and Time screen has a 12- or 24-hour format, and allows setting of the time and date.
The View Active Alarms screen shows a list of all active alarms including the date and time of each alarm occurrence, and shows all alarms that are silenced.

The System Diagnostics screen allows the user to view system status for each module and its respective inputs and outputs. Viewable data shall include the module type and ID number; the module version; and module diagnostics information including input or output number, the circuit number connected to that input or output, the circuit name (item connected to the circuit), status of the input or output, and other module diagnostic information.

Aerial Calibrations screen indicates items that may be calibrated by the user and instructions to follow for proper calibration of the aerial device.

Button functions and button labels may change with each screen.

**LOWER STABILIZER CONTROL STATIONS**

A lower control station shall be located on each side of the rear wall of the apparatus in an easily accessible area. The controls and indication labels shall be illuminated for nighttime operation. The following items shall be furnished at the lower control station and shall be clearly identified and conveniently located for ease of operation and viewing:

- Level assist switch
- Override switch to override interlocks
- Emergency stop
- Emergency hydraulic power unit switch

The stabilizer controls shall include the following:

- Leveling assist toggle switch
- Left and right side stabilizer beam in/out switches
- Left and right side stabilizer beam up/down switches
- Rear stabilizer up/down switch

**TURNTABLE CONTROL STATION**

There shall be one (1) device control station located on the left side of the turntable so the operator may easily observe the ladder while operating the controls. All elevation, extension and rotation controls shall operate from this location. The
controls shall permit the operator to regulate the speed of the aerial functions, within the safe limits, as determined by the manufacturer and NFPA standards. Each control shall be equipped with a positive lock to hold the control in a neutral position preventing accidental activation. In addition to the neutral lock, a console cover shall be provided at the turntable control station. The controls shall be so designed to allow the turntable control station to immediately override the tip controls, if equipped, even if the ladder is being operated by the tip controls.

The following items shall also be provided at the turntable control station, clearly identified and illuminated for nighttime operation and conveniently located for ease of operation and viewing:

- Intercom controls
- Tip tracking light switch
- Emergency stop switch

**REMOTE AERIAL CONTROL**

A remote control shall be provided whereby all ladder movements can be controlled at the pump operator's panel in addition to the standard pedestal control console and optional tip controls.

The three (3) ladder functions (extension, rotation, elevation) shall be controlled individually by means of spring loaded, return to center 12-volt proportional controls.

A momentary push button on the side of the pump panel remote ladder control module shall activate the controls.

A red "Emergency Stop" mushroom switch shall be installed at the pump panel next to the remote ladder controls.

The turntable control console ladder controls shall override the pump panel mounted controls. The pump panel mounted controls shall override the optional ladder tip mounted controls.

The remote control aerial speed shall be set in accordance with the current NFPA 1901 standards.

**HIGH IDLE**

The high idle shall be controlled by the microprocessor. The microprocessor shall automatically adjust the engine rpm, to compensate for the amount of load placed upon the system. The system shall include a safety device that allows activation of the high idle, only when the parking brake is set and the transmission is placed in neutral.
**STABILIZERS**
The vehicle shall come equipped with an out and down stabilization system. The system shall consist of a minimum of two (2) hydraulically operated out and down style stabilizers mounted above the frame and a stabilizer jack.

The stabilizers shall have a maximum spread of 18' from the centerline of the footpads when fully extended. The internal tubes top, bottom, and sides shall be steel and shall be extended out by hydraulic cylinders. Vendors shall specify steel thickness and psi yield strength. The cylinders shall have pilot-operated check valves with thermal relief. This shall insure that the beams shall be in the stowed during travel. Vendors shall specify external tube wall thickness. The internal jack tubes shall slide on permanently attached wear pads.

The extension cylinders shall be totally enclosed within the extension beams. The horizontal extension cylinders shall be of the trombone type to eliminate wear and potential failure of hydraulic hoses (no exception).

The stabilizers shall have a tip over safety margin of 1 1/2 times its rated load in any position the aerial device can be placed as outlined in the current edition of NFPA 1901. The aerial shall be able to sustain a 1 1/3 to 1 rated load on a 5-degree slope downward in the position most likely to cause overturning. The maximum ground slope the apparatus can be set up on is 12 percent. On the 12 percent slope, the apparatus can be leveled within a 6 percent operating range with the apparatus cab facing uphill.

The cylinders shall be supplied with dual pilot operated check valves on each stabilizer cylinder to hold the cylinder in the stowed or working position should a charged line be severed at any point in the hydraulic system. Stabilizers shall contain safety lock valves and shall require no mechanical pins to assure there shall be no "leak down" of stabilizer legs.

Each stabilizer leg shall have attached to the end of the leg a 16 gauge polished stainless steel shield. This plate shall serve as a protective guard and a mounting surface for warning lights. The top, forward, and rear edges shall be flanged back for added strength.

The stabilizer cylinders shall be sized to maximize ground penetration. The lift cylinders shall be mounted on the end of the stabilizer tube.

Each stabilizer that can be extended from the body shall be supplied with a red warning light as outlined in the current edition of NFPA. The stabilizers shall be connected to a warning light in the cab to warn the operator if the stabilizers are deployed.
**STABILIZER CONTROL BOX SMOOTH ALUMINUM DOOR**
Vertically hinged smooth aluminum doors shall be provided over each stabilizer control box. The doors shall be hinged inboard.

**STABILIZER PLACEMENT**
There shall be cameras provided and installed on the body, one (1) directly above each stabilizer. The cameras shall be activated with a switch in the cab and shall provide a picture to specify the fully extended stabilizer position allowing the driver the ability to position the vehicle with the proper clearance for stabilizer deployment.

**POWER TAKEOFF / HYDRAULIC PUMP**
The apparatus shall be equipped with a power takeoff driven by the chassis transmission and actuated by an electric shift, located inside the cab.

The power takeoff which drives the hydraulic pump shall meet all the requirements for the aerial unit operations.

An amber indicator light shall be installed on the cab instrument panel to notify the operator that the power takeoff is engaged.

An interlock shall be provided that allows operation of the aerial power takeoff shift only after the chassis spring brake has been set and the chassis transmission has either been placed in the neutral position or drive position after the driveline has been disengaged from the rear axle.

**HYDRAULIC CYLINDERS**
All hydraulic cylinders used on the aerial device shall be produced by a manufacturer that specializes in the production of hydraulic cylinders. Each hydraulic cylinder shall have a structural warranty of not less than five (5) years, and a seal warranty of not less than two and a half (2.5) years (no exception).

**HYDRAULIC SYSTEM**
The hydraulic system shall have a five (5)-year warranty.

The hydraulic plumbing shall consist of hydraulic rated hoses and steel tubing.

The hoses transmitting hydraulic pressure shall have abrasion resistant covers.

All hydraulic fittings and tubing shall be plated to minimize corrosion.

The fitting shall use an O-ring seal where possible to minimize hydraulic leaks.
All pressure carrying hydraulic hoses and tubes shall have a 4:1 safety rating based on burst pressure.

An interlock shall be provided that prevents activation of the hydraulic pump until the transmission is placed in neutral and the parking brake set as outlined in the current NFPA 1901 standard.

The hydraulic system shall be of a constant pressure design and incorporate features to minimize heat buildup and provide smooth control of the aerial ladder.

The system shall meet the performance requirement in the current NFPA 1901 standard, which requires adequate cooling less than 2.5 hours of operations.

All hydraulic components that are non-sealing whose failure could result in the movement of the aerial shall comply with current NFPA 1901 standards and have burst strength of 4:1.

Dynamic sealing components whose failure could cause aerial movement shall have a margin of 2:1 on maximum operating pressure per the current NFPA 1901 standard.

All hydraulic hoses, tubes and connections shall have minimum burst strength of 4:1 per the current NFPA 1901 standard.

A hydraulic oil sight gauge shall be supplied at the rear of the unit for easy fluid level verification.

A chassis-mounted positive displacement piston pump for consistent pressure and rapid response shall supply hydraulic power for all aerial operations.

The positive displacement piston pump shall provide 3,150 psi.

The hydraulic pump shall be solely dedicated to aerial operations.

The hydraulic system shall consist of a 20-gallon reservoir mounted to the pedestal and plumbed to the hydraulic pump.

There shall be plumbing for a supply and return line and a tank drain on the reservoir.

The hydraulic oil reservoir shall be labeled per the current NFPA 1901 standard.

The hydraulic system shall use multi-weight, SAE grade oil. ISO grade shall be based on geographical location.

The oil shall be pre-filtered before it is installed into the reservoir.
Oil samples taken from the oil diagnostic test ports must meet or exceed the hydraulic rating of 18/16/13 per ISO 4406:1999 before delivery.

The low pressure oil filter shall be integrated with the hydraulic manifold and designed to prevent oil loss during filter change.

The system shall incorporate the following filters to provide dependable service:

- Return filter: Beta 200 at 6 micron
- Desiccant breather filter: Water capacity 13 fluid oz. 2-micron rating

The aerial hydraulic system shall be designed in such a manner that a hydraulic pump failure or line rupture shall not allow the aerial or outriggers to lose position.

Hydraulic holding valves shall be mounted directly on cylinders.

To insure reliable performance of holding valves, no hoses shall be permitted between a holding valve and cylinder.

The aerial shall incorporate the use of trombone steel tubes inside the stabilizer beams to eliminate hydraulic hose wear and leaks.

Hydraulic power to the ladder shall be transferred from the pedestal by a hydraulic swivel.

**EMERGENCY PUMP**

The hydraulic system shall be designed with an auxiliary power unit meeting the guidelines of the current NFPA 1901 standard.

The auxiliary power unit shall be a 12-volt pump connected to the chassis electrical system.

The pump shall provide operation at reduced speeds to store the aerial device and outriggers for road transportation.

Self-centering switches shall be provided at the turntable and each stabilizer control station to activate the system.

The system shall be designed to provide a minimum of 30 minutes of hydraulic power to operate functions (no exception).

**HYDRAULIC SWIVEL**

The aerial ladder shall be equipped with a six (6) port, high pressure hydraulic swivel which shall connect the hydraulic lines from the hydraulic pump and
reservoir through the rotation point to the aerial control bank. The hydraulic swivel shall allow for 360-degree continuous rotation of the aerial.

**ELECTRIC SWIVEL**
The ladder shall be equipped with an electric swivel to allow 360-degree rotation of the aerial while connecting all electrical circuits through the rotation point. A minimum of 28 collector rings shall be provided that are capable of supplying 20-amp continuous service. All collector rings shall be enclosed and protected with desiccant plugs against condensation and corrosion. No oil or silicone shall be used.

**WATER SWIVEL**
Water shall be transferred to the aerial waterway by means of a 5.00" internal diameter waterway through the swivel, permitting 360-degree continuous rotation.

**13-BIT ABSOLUTE ENCODER**
The aerial ladder shall be equipped with a 13-Bit Absolute Encoder, CAN-based, which provides 8192 counts per shaft turn for position and direction reference.

The 13-Bit Absolute Encoder shall provide a unique binary word to reference each position and direction for all 360 degrees of rotation.

If the power is interrupted for any reason, the 13-Bit Absolute Encoder shall allow power to be returned to the system without having to re-zero the settings.

The 13-Bit Absolute Encoder shall be an integral part of a micro-processor based control system.

**ELECTRICAL SYSTEM**
The aerial device shall utilize a microprocessor-based control system. The system shall consist of the following components:

Control System Modules

Each of the control system modules shall be configured as follows:

Sealed to a NEMA 4X rating
Operating range from -40 degrees F to 156 degrees F (-40 degrees C to 70 degrees C)

Communicate using J1939 data link

Two (2) diagnostic LED lights

One (1) green light that illuminates when module has power (B+) and ground

One (1) red light that flashes to indicate the module is capable of communicating via the data link

Up to 16 diagnostic LEDs on each module

Ground matrix identification system

The following control system modules shall be used:

Control Module

Main controller for the system

USB connection allows for computer diagnostics

Power Module

Built-in fault sensing

Eight (8) digital outputs

Pulse width modulating (PWM) capable

10A continuous per output

Circuit protection based on actual current draw (not affected by heat)

Current Control Module

Built-in fault sensing

Three (3) analog inputs

Eight (8) digital outputs

Pulse width modulating (PWM) capable

3A continuous per output

Closed Loop System
Circuit protection based on actual current draw (not affected by heat)

Input Module
16 software selectable (digital or analog) inputs

Output Module
16 digital outputs

Input/output Module
Eight (8) software selectable (digital or analog) inputs
Eight (8) digital outputs

TRACKING LIGHTS
There shall be two (2) Whelen Micro Pioneer, 12-volt DC LED spot lights furnished. Power to the base section lights shall also be provided by a master on/off switch at the turntable control operator's position.

- One (1) light shall be mounted on the base section of the aerial device on the driver's side.
- One (1) light shall be mounted on the base section of the aerial device on the passenger’s side.

The painted parts of this light assembly to be black

TIP LIGHTS
There shall be two (2) Whelen, white 12-volt DC LED floodlights provided on pedestal mounts.

The two (2) tip lights shall be mounted on the tip of the ladder, one (1) on each side.

Power to the tip lights shall be controlled by switch(s) at turntable only.

The tip lights and the tracking lights shall be mounted below the handrail height so as not to increase the overall height of the unit.

LIGHTING ON AERIAL LADDER
There shall be LED rung lighting provided on both sides of the aerial ladder base, lower and upper mid, and fly sections. The lighting shall be located adjacent to the ladder rungs along the lower rail of the ladder sections and shall run the length of the ladder section.
The color of the sections shall be:

- The base section of the ladder to be green.
- The lower mid-section of the ladder to be amber.
- The upper mid-section of the ladder to be amber.
- The fly section of the ladder to be red.

The LED rung lighting shall be activated when a switch at the turntable operator's panel is activated through the master battery switch.

The lights shall not be load managed when the parking brake is applied.

**STABILIZER WARNING LIGHTS**
There shall be Whelen, flashing LED warning lights installed on the stabilizer cover panel.

The color of these lights shall be red Super LED/clear lens each side built in scene light

These lights shall be mounted with a flange.

These warning lights shall be activated by the same switch as the side warning lights.

**STABILIZER BEAM WARNING LIGHTS**
There shall be two (2) Whelen 2.00” round red LED flashing lights mounted on each stabilizer, one (1) facing forward and one (1) facing rearward.

The lights shall be recessed in the horizontal beam of the stabilizer.

These warning lights shall be activated with the aerial master switch.

**120-VOLT RECEPTACLE AT TIP**
A 120-volt, 20-amp, three (3)- prong house receptacle, with weatherproof cover shall be provided at the tip of the aerial device.

**2-WAY AERIAL COMMUNICATION SYSTEM**
There shall be a two-way intercom system provided. There shall be a control module located on the turntable operator console and in the pump compartment. Each control shall have an LED volume display and push-button volume control.
A hands free module shall be located at the aerial tip or platform and constantly transmit to the other modules unless the control module push-to-talk button is pressed.

Each intercom unit shall be weatherproof.

**AERIAL PEDESTAL**
The aerial pedestal shall accommodate the height of the cab.

**LIFTING EYE - ROPE RESCUE ATTACHMENT**
Two (2) eyes shall be welded, one (1) to each ladder beam, at the ladder egress with a spreader bar to mounted between the eyes. This design shall distribute a load evenly across the ladder beams because of a single lifting eye on the spreader bar. The bar is retained by two (2) locking pins, one (1) at each end outboard of each eye. Leveling is maintained by the bar rotating in the eyes.

**AERIAL CHAIN SAW SLEEVE**
A chain saw sleeve shall be provided at the aerial tip to hold a Cutter’s Edge model ventilation saw 16” bar with chain guard and depth gauge.

**LADDER TIP TOOL BOX**
An aluminum or stainless removable tool box with hinged cover shall be provided at the tip section of the aerial. Minimum dimensions should be 8” wide, 12” deep and 12” long. Vendor to provide details of this item.

**SAFETY BARS, AERIAL TURNTABLE**
ManSaver™ bars shall be installed at the aerial turntable.

**WATER SYSTEM**
A waterway system shall be provided consisting of the following components and features:

A 5.00” pipe shall be connected to the water supply on one end and to a 5.00" internal diameter water swivel at the rotation point of the turntable. The water swivel shall permit 360-degree continuous rotation of the aerial device.

The 5.00" waterway swivel is to be routed through the rotation point up to the heel pin swivel. The heel pin swivel shall allow the water to flow to the ladder pipe while elevating the aerial ladder from -10 degrees to 77 degrees. The heel pivot pin is not integral with the waterway swivel at any point. The design of the waterway
shall allow complete servicing of the waterway swivel without disturbing the heel pivot pin.

The integral telescopic water system shall consist of a 4.50" diameter tube in the base section, a 4.00" diameter tube in the mid-section and a 3.50" diameter tube in the fly section. The telescopic waterway shall be constructed of anodized aluminum pipe.

The aerial shall be capable of discharging up to 1000 gpm at 100 psi parallel to the ladder and 90 degrees to each side of center while maintaining the 500lb tip load.

The aerial shall be capable of discharging between 1001 and up to 1500 gallons per minute at 100 psi parallel to the ladder and 40 degrees to each side of center while maintaining the 500lb tip load.

When the aerial device is positioned at -10 to 0 degrees of elevation, the master stream shall be capable of flow up to 30 degrees above horizontal.

An adjustable pressure relief valve shall be furnished to protect the aerial waterway from a pressure surge.

A 1.50" drain valves shall be located at the lowest points of the waterway system.

**WATERWAY SEALS**
The waterway seals shall be of Type-B PolyPak design, composed of nitroxile seal and a nitrile wiper, which together offer maximum stability and extrusion resistance on the waterway. The seal shall be capable of withstanding pressures up to 2000 psi, temperatures in excess of 250 degrees Fahrenheit and have resistance to all foam generating solutions. The seals shall be internally lubricated.

The waterway seals shall have automatic centering guides constructed of synthetic thermalpolymer. The guides shall provide positive centering of the extendible sections within each other and the base section to insure longer service life and smoother operation.

**AERIAL MONITOR**
An Akron, model 3480 monitor with stow and deploy shall be provided at the tip with an Akron 1250 gpm Model 1577. This monitor shall allow for an additional 30 degrees of travel above horizontal at the aerial tip.

The monitor's functions shall be controlled electrically from three (3) separate locations. One (1) control shall be located at the control console, one (1) shall be located in the water pump control compartment and the other at the ladder tip.
There shall be a courtesy light at the tip of the aerial to illuminate the controls.

If the aerial has a quick-lock waterway, a limit switch shall be provided to disable the extended vertical travel when the monitor is locked to the lower ladder section.

Waterway flow, including total water flowed, shall be monitored by the microprocessor. An LCD display shall be located at the turntable control station and the pump operator’s compartment.

**REAR INLET**
A 5.00" NST inlet to the aerial waterway shall be provided at the rear of the apparatus. The inlet shall have 5.00" aluminum plumbing. It shall be furnished with a 5.00" chrome plated adapter and a 5.00" chrome plated, long handle cap.

**WATERWAY LOCKING SYSTEM**
The aerial ladder waterway monitor shall be capable of being positioned at either the fly section or at the next lower section of the ladder.

The monitor location shall be changeable by the use of a single handle, located at the side of the ladder.

The handle, attached to a cam bracket, shall simply be moved forward to lock the monitor at the fly section and back to lock it to the previous section.

There shall be no pins to remove and reinstall.

The monitor shall be operational at all times, regardless of its position, without connecting or disconnecting electrical lines.

**ADAPTER, STORZ INLET**
A Storz 5.00" FNST x 5.00" Storz 30-degree elbow with blind cap shall be provided on the rear aerial inlet.

**2.50" AUXILIARY OUTLET AT AERIAL TIP**
An auxiliary hose connection outlet shall be supplied at the tip of the aerial ladder.

It shall be located on the left hand side of the aerial waterway.

Flow to the auxiliary outlet shall be supplied by 2.50" piping. A 2.50" gate valve with a non-rising stem and crank handle shall be supplied. A cap and chain shall be provided.
Flow to the aerial waterway monitor shall be controlled by a 4.00" aluminum butterfly valve with a non-rising stem and crank handle. The valve shall be located at the monitor inlet.

A 200 psi relief valve and a .75" automatic drain valve shall be supplied in the waterway at the tip.

**MIDSHIP FIRE PUMP**
Midship fire pump shall be a Hale QMAX-150, 1500 gpm single (1) stage midship mounted centrifugal type.

Pump shall be the class "A" type.

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

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

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

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

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

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

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

Pump shall have one (1) double suction impeller. The pump body shall have two (2) opposed discharge volute cutwaters to eliminate radial unbalance.
Pump impeller shall be hard, fine grain bronze of the mixed flow design, accurately machined, hand-ground, and individually balanced. The vanes of the impeller intake eyes shall be hand-ground and polished to a sharp edge. They shall be of sufficient size and design to provide ample reserve capacity utilizing minimum horsepower.

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

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

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

**PUMP PACKING**

Pump shaft shall have one (1) packing gland located on inlet side of the pump, and shall be of the split design for ease of repacking.

Packing gland shall be a full-circle threaded design to exert uniform pressure on packing and prevent "cocking" and uneven packing load when it is tightened (no exception).

The packing gland shall be easily adjusted by hand (with a rod or screwdriver), no special tools or wrenches required.

Packing rings shall be of a unique, permanently lubricated, long-life graphite composition, and have sacrificial zinc foil separators to protect the pump shaft from galvanic corrosion.

**PUMP TRANSMISSION**

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

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

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

**PUMPING MODE**

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

**AIR PUMP SHIFT**

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

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

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

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

**TRANSMISSION LOCK UP**

Transmission lock up is not required as transmission shall automatically shift to neutral as soon as the parking brake is set.

**AUXILIARY COOLING SYSTEM**

A supplementary heat exchange cooling system shall be provided to allow the use of water from the discharge side of the pump for cooling the engine water. A water-to-coolant heat exchanger shall be used.

**INTAKE RELIEF VALVE**

An Akron relief valve shall be installed on the suction side of the pump preset at 125 psig.

Relief valve shall have a working range of 75 psig to 200 psig.

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

Control shall be located behind an access door at the right (passenger's) side pump panel.

**PRESSURE CONTROLLER**

A Pressure Governor shall be provided. An electric pressure governor shall be provided which is capable of automatically maintaining a desired preset discharge pressure in the water pump. When operating in the pressure control mode, the system shall automatically maintain the discharge pressure set by the operator (within the discharge capabilities of the pump and water supply) regardless of flow, within the discharge capacities of the water pump and water supply.

A pressure transducer shall be installed in the water discharge of the pump. The transducer continuously monitors pump pressure sending a signal to the Electronic Control Module (ECM).

The governor can be used in two (2) modes of operation, RPM mode and pressure modes.
In the RPM mode, the governor can be activated after vehicle parking brake has been set. When in this mode, the governor shall maintain the set engine speed, regardless of engine load (within engine operation capabilities).

In the pressure mode, the governor system can only operate after the fire pump has been engaged and the vehicle parking brake has been set. When in the pressure mode, the pressure controller monitors the pump pressure and varies engine speed to maintain a precise pump pressure. The pressure controller shall use a quicker reacting J1939 database for engine control.

A preset feature allows a predetermined pressure or rpm to be set.

A pump cavitation protection feature is also provided which shall return the engine to idle should the pump cavitate. Cavitation is sensed by the combination of pump pressure below 30 psi and engine speed above 2000 rpm for more than five (5) seconds.

The throttle shall be a vernier style control, with a large control knob for use with a gloved hand. A throttle ready light shall be provided adjacent to the throttle control. A large 0.75” RPM display shall be provided to be visible at a glance.

Check engine, and stop engine indicator lights shall be provided for easy viewing.

Large 0.75” push buttons shall be provided for menu, mode, preset, and silence selections.

The water tank level indicator shall be incorporated in the pressure governor.

A fuel level indicator shall be incorporated in the pressure controller.

A pump hour meter shall be incorporated in the pressure controller.

The pressure controller shall incorporate monitoring for engine temperature, oil pressure, fuel level alarm, and voltage. Pump monitoring shall include, pump gear case temperature, error codes, diagnostic data, pump service reminders, and time stamped data logging, to allow for fast accurate trouble shooting. It shall also notify the driver/engineer of any problems with the engine and the apparatus. Complete understandable messages shall be provided in a 20-character display, providing for fewer abbreviations in the messages. An automatic dim feature shall be included for night operations.

The pressure controller shall include a USB port for easy software upgrades, which can be downloaded through a USB memory stick, eliminating the need for a laptop for software installations.
A complete interactive manual shall be provided with the pressure controller.

**PRIMING PUMP**
The priming pump shall be a Trident Emergency Products compressed air powered, high efficiency, multistage venturi based priming system, conforming to standards outlined in the current edition of NFPA 1901.

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

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

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

**PLUMBING**
All inlet and outlet plumbing, 3.00" and smaller, shall be plumbed with either stainless steel pipe or synthetic rubber hose reinforced with high-tensile polyester braid. Small diameter secondary plumbing such as drain lines shall be stainless steel, brass or hose.

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

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

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

All water carrying gauge lines shall be of flexible polypropylene tubing.
**MAIN PUMP INLETS**
A 6.00" pump manifold inlet shall be provided on each side of the vehicle. The suction inlets shall include screens that are designed to provide cathodic protection for the pump, thus reducing corrosion in the pump.

Main pump inlets shall not be located on the main operator's panel and shall maintain a low connection height by terminating below the top of the chassis frame rail.

**MAIN PUMP INLET CAP**
The main pump inlets shall have National Standard Threads with a long handle chrome cap.

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

**VALVES**
All ball valves shall be Akron® Brass in-line valves. The Akron valves shall be the 8000 series heavy-duty style with a stainless steel ball and a simple two-seat design. No lubrication or regular maintenance is required on the valve.

Valves shall have a ten (10) year warranty.

**LEFT SIDE INLET**
On the left side pump panel shall be one (1) - 2.50" auxiliary inlet, terminating in 2.50" National Standard Hose Thread. The auxiliary inlet shall be provided with a strainer, chrome swivel and plug.

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

**ANODE, INLET**
A pair of sacrificial zinc anodes shall be provided in the water pump inlets to protect the pump from corrosion.

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

TANK TO PUMP
The booster tank shall have a 3.00" outlet and be connected to the intake side of the pump with heavy duty 4.00" piping and a quarter turn 3.00" full flow line valve with the control located at the operator's panel. A rubber coupling shall be included in this line to prevent damage from vibration or chassis flexing.

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

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

LEFT SIDE DISCHARGE OUTLETS
There shall be two (2) discharges with a 2.50" valves on the left side of the apparatus, terminating with a 2.50" (M) National Standard hose thread, chrome plated, 45-degree elbow. Discharges shall be located below the cab, and shall be no higher than the top of the chassis frame rail. Discharges shall not be located on the pump operator's panel. Lever controls shall be provided at the valve.

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

RIGHT SIDE DISCHARGE OUTLETS
There shall be one (1) discharge outlet with a 2.50" valve on the right side of the apparatus, terminating with a male 2.50" National Standard hose thread, chrome plated, 45-degree elbow. The discharge shall be located below the crew cab, and shall be no higher than the top of the chassis frame rail.

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

There shall be a 4.00" discharge outlet with a 4.00" valve body installed on the right side of the apparatus, terminating with a 4.00" (M) National Standard hose thread. The discharge shall be located below the crew cab, and shall be no higher than the top of the chassis frame rail.

There shall be an Akron 9325 Navigator Pro electric valve controller provided at the pump panel. The controller unit shall be of true position feedback design, requiring no clutches in the motor or current limiting. The controller shall be completely sealed with two (2) button open and close valve position capability and a full color LCD display with backlight. In addition to valve position, each controller shall include a pressure display.

**FRONT DISCHARGE OUTLET**

There shall be one (1) 2.50" discharge outlet piped to the front of the apparatus and located on the top of the left side of the front bumper.

Plumbing shall consist of 2.50" piping and flexible hose with a 2.50" full flow valve with control at the pump operator's panel. A fabricated weldment made of stainless steel pipe shall be used in the plumbing where appropriate. The piping shall terminate with a 2.50" NST with 90-degree stainless steel swivel.

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

**DISCHARGE CAPS**

Chrome plated, rocker lug, caps with chains shall be furnished for all side discharge outlets. The cap shall incorporate a thread design to automatically relieve stored pressure in the line when disconnected (no exception).

**OUTLET BLEEDERS**

A 0.75" bleeder valve shall be provided for each outlet 1.50" or larger. Automatic drain valves are acceptable with some outlets if deemed appropriate with the application. The valves shall be located behind the panel with a swing style handle control extended to the outside of the side pump panel. The handles shall be chrome plated and provide a visual indication of valve position. The swing handle shall provide an ergonomic position for operating the valve without twisting the wrist and provides excellent leverage. Bleeders shall be located at the bottom of the pump panel. They shall be properly labeled identifying the discharge they are plumbed in to. The water discharged by the bleeders shall be routed below the chassis frame rails.
DISCHARGE OUTLET CONTROLS
The discharge outlets shall incorporate a quarter-turn ball valve with the control located at the pump operator's panel. The valve operating mechanism shall indicate the position of the valve or an indicator shall be provided to show when the valve is closed.

The passenger side discharges shall be controlled by an electric valve controller with the manual override located on the passenger side pump panel. The controller unit shall be of true position feedback design, requiring no clutches in the motor or current limiting. The controller shall be completely sealed with two (2) button open and close valve position capability and a full color LCD display with backlight. In addition to valve position, each controller shall include a pressure display.

All other outlets shall have manual swing handles that operate in a vertical up and down motion. These handles shall be able to lock in place to prevent valve creep under pressure.

AERIAL OUTLET
The aerial waterway shall be plumbed from the pump to the water tower line with 4.00" pipe and a 4.00" valve. The control for the waterway valve shall be located at the pump operator's panel.

An indicator shall be provided to show when the valve is in the open or closed position.

CROSS LAY HOSE BEDS
Two (2) cross lays with 1.50" outlets shall be provided. Each bed to be capable of carrying 200 feet of 1.75" double jacketed hose and shall be plumbed with 2.00" i.d. schedule 10 304L welded or formed stainless steel pipe and gated with a 2.00" quarter turn ball valve. Threaded pipe shall not be acceptable. Cross lays shall be low mounted with the bottom of both cross lay trays no more than 11.00" above the frame rails for simple, safe reloading and deployment.

Outlets to be equipped with a 1.50" National Standard hose thread 90-degree swivel located in the hose bed so that hose may be removed from either side of apparatus.
The cross lay controls shall be at the pump operator's panel.

A removable tray shall be provided for the cross lay hose bed. The cross lay tray shall be constructed of black poly to provide a lightweight sturdy tray. Two (2) hand holes shall be in the floor and additional hand holes shall be provided in the sides for easy removal and installation from the compartment. The floor of the trays shall be perforated to allow for drainage and hose drying. Trays shall be held in place by a mechanical spring loaded stainless steel latch that automatically deploys upon loading the trays to hold the trays in place during transit.

**CROSS LAY HOSE BED, 2.50''**

One (1) cross lay with a 2.50" outlet shall be provided. The bed to be capable of carrying 200' of 2.5" hose and shall be plumbed with 2.50" i.d. schedule 10 304L welded or formed stainless steel pipe and gated with a 2.50" quarter turn ball valve. Threaded pipe shall not be acceptable.

The outlet to be equipped with a 2.50" National Standard hose thread 90-degree swivel located above the hose bed so that hose may be removed from either side of apparatus.

The cross lay shall be mounted above the lower 1.5" cross lays. The cross lay controls shall be at the pump operator's panel.

A removable tray shall be provided for the cross lay hose bed. The cross lay tray shall be constructed of black poly to provide a lightweight sturdy tray. Two (2) hand holes shall be in the floor and additional hand holes shall be provided in the sides for easy removal and installation from the compartment. The floor of the trays shall be perforated to allow for drainage and hose drying. Tray shall be held in place by a mechanical spring loaded stainless steel latch that automatically deploys upon loading the tray to hold the trays in place during transit.

**CROSS LAY HOSE RESTRAINT**

There shall be a black vinyl end flap provided across each end of three (3) cross lay(s) to secure the hose during travel. Each vinyl end flap shall be permanently attached at the front of the cross lay opening. 1.00" web straps shall loop through footman loops located at the opposite end of the permanently attached vinyl. They shall be attached with 1.00" cam buckle fasteners.
STOKES BASKET COMPARTMENT
A stokes basket compartment shall be built beside the 2 ½ cross lay and above the 1 ¾ cross lays. The compartment shall be 86” L x 24” W x 8” H. A single belt type safety strap shall be installed on each side to prevent shifting of the basket.

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

The pump module shall be mounted on the chassis frame rails with standard body angles in four places to allow for chassis frame twist.

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

PUMP CONTROL PANELS (LEFT SIDE CONTROL)
Pump controls and gauges shall be located mid ship at the left (driver's) side of the apparatus and properly identified.

The main pump operator's control panel shall be completely enclosed and located immediately forward of the front stabilizer. There shall be a roll up door to protect against road debris and weather elements. The pump operator's panels shall be no more than 31.00” wide, and made in four (4) sections with the center section easily removable with simple hand tools. For the safety of the pump operator, there shall be no discharge outlets or pump inlets located on the main pump operators panel.

Layout of the pump control panel shall be ergonomically efficient and systematically organized. The upper section shall contain the master gauges. This section shall be angled down for easy visibility. The center section shall contain the pump controls aligned in two horizontal rows. The pressure control device, engine monitoring gauges, electrical switches, and foam controls (if applicable) shall be located on or adjacent to the center panel, on the side walls for easy operation and visibility. The lower section shall contain the outlet drains.

Manual controls shall be easy moving 8" long lever style controls that operate in a vertical, up and down swing motion. These handles shall have a 2.25" diameter knob and be able to lock in place to prevent valve creep under any pressure. Bright
finish bezels shall encompass the opening, be securely mounted to the pump operator's panel, and shall incorporate the discharge gauge bezel. Bezels shall be bolted to the panel for easy removal and gauge service. The driver's side discharges shall be controlled directly at the valve. There shall be no push-pull style control handles.

Identification tags for the discharge controls shall be recessed within the same bezel. The discharge identification tags shall be color coded, with each discharge having its own unique color.

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

All discharge outlets shall be color coded and labeled to correspond with the discharge identification tag.

The pump panels for the discharge and intake ports shall be located ahead of the pump module with no side discharge or intake higher than the frame rail. The pump panels shall be easily removable with simple hand tools.

A recessed cargo area shall be provided at the front of the body, ahead of the water tank above the plumbing.

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

**PUMP OPERATOR'S PLATFORM**
A pull out, flip down platform shall be provided at the pump operator's control panel. The front edge and the top surface of the platform shall be made of DA finished aluminum with a Morton Cass insert.

The platform shall be wired to the "step not stowed" indicator in the cab.

**PUMP OPERATOR'S PLATFORM PERIMETER LIGHT**
There shall be an On Scene Solutions, Model Night Stick Access, 20.00" white 12-volt DC LED strip light provided to illuminate the ground area.
**PUMP AND GAUGE PANEL**
The pump operator's panel and gauge panels shall be constructed of stainless steel with a brushed finish.

The side control panels shall be constructed of stainless steel with a brushed finish for durability and ease of maintenance.

**PUMP AND PLUMBING ACCESS**
Simple access to the plumbing shall be provided through the front of the body area by raising the cab for complete plumbing service and valve maintenance. Access to valves shall not require removal of operator panels or pump panels. Access for rebuilding of the pump shall not require removal of more than the tank to pump line and a single discharge line. This access shall allow for fast, easy valve or pump rebuilding, making for reduced out of service times. Steps shall be provided for access to the top of the pump.

Access to the pump shall be provided by raising the cab. The pump shall be positioned such that all maintenance and overhaul work can be performed above the frame and under the tilted cab. The service and overhaul work on the pump shall not require the removal of operator panels or pump panels. Complete pump casing and gear case removal shall require no more than removal of the intake and discharge manifolds, driveline, coolers and a single discharge line. The pump case and gear case shall be able to be removed by lifting upward without interference from piping and be removable in less than 3 hours.

**PUMP COMPARTMENT LIGHT**
There shall be one (1) Whelen 3.00" white 12-volt DC LED light(s) with Whelen, flange(s) installed in the plumbing area.

The light(s) shall be activated by a toggle switch located in the pump compartment area.

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

**AIR HORN BUTTON**
An air horn control button shall be provided at the pump operator's control panel. This button shall be red in color and properly labeled and put within easy reach of the operator.
COLOR CODED NAME TAGS
There shall be nine (9) outlet discharges with special color coded name tags. These tags shall be used for labeling the discharge pressure gauges, controls, outlets and drains. To be determined at the pre-construction meeting.

VACUUM AND PRESSURE GAUGES
The pump vacuum and pressure gauges shall be liquid filled.

The gauges shall be a minimum of 6" in diameter and shall have white faces with black lettering, with a pressure range of 30.00"-0-600#.

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

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

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

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

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

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

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

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

WATER LEVEL GAUGE
An electric water level gauge shall be incorporated in the pressure controller that registers water level by means of nine (9) LEDs. They shall be at 1/8 level increments with a tank empty LED. The LEDs shall be a bright type that is readable in sunlight, and have a full 180-degree of clear viewing.
To further alert the pump operator, the gauge shall have a warning flash when the tank volume is less than 25 percent, and shall have down chasing LEDs when the tank is almost empty.

**SIDE CONTROL PUMP OPERATOR'S/PUMP PANEL LIGHTING**
Illumination shall be provided for controls, switches, essential instructions, gauges, and instruments necessary for the operation of the apparatus and the equipment provided on it. External illumination shall be a minimum of five (5) foot-candles on the face of the device. Internal illumination shall be a minimum of four (4) footlamberts.

The pump panels shall be illuminated by a light on each side of the back of the cab. The pump operator's panel shall utilize strip lighting at the forward doorframe and an overhead light.

**FOAM SYSTEM**

**FOAM PROPORTIONER**
A foam proportioning system shall be provided that is an on demand, automatic proportioning, single point, direct injection system suitable for all types of Class "A" & "B" foam concentrates, including the high viscosity (6000 cps), alcohol resistant Class B foams. Operation shall be based on direct measurement of water flow, and remain consistent within the specified flows and pressures. The system shall automatically balance and proportion foam solution at rates from 0.1% to 9.9% regardless of variations in water pressure and flow, up to the maximum rated capacity of the foam concentrate pump.

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

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

- 200GPM @ 6%
- 400GPM @ 3%
1200 GPM @ 1%

Class A foam setting in .1 % increments from .1% to 1%. Typical settings of 1%, .5% and .3% (Maximum capacity shall be limited to the plumbing and water pump capacity)

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

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

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

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

**LOW LEVEL, FOAM TANK**
The control head shall display a warning message when the foam tank in use is below a quarter tank.

**FOam TANK**
The foam tank shall be an integral portion of the polypropylene water tank. The cell shall have a capacity of 30 gallons of foam with the intended use of Class A foam. The foam cell shall not reduce the capacity of the water tank. The foam cell shall have a screen in the fill dome and a breather in the lid.
**FOAM TANK DRAIN**
The foam tank drain shall be a 1.00" drain valve located inside the pump compartment accessible through a door on the passenger's side pump panel.

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

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

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

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

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

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

Hydraulic oil cooler shall be provided to automatically prevent overheating of the hydraulic oil, which is detrimental to system components. The oil/water cooler shall be designed to allow continuous system operation without allowing hydraulic oil temperature to exceed the oil specifications.
The hydraulic oil reservoir shall be of four (4) gallons minimum capacity and shall also be of sufficient size to minimize foaming and be located to facilitate checking oil level or adding oil without spillage or the need to remove access panels.

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

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

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

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

**PANEL MOUNTED STRAINER / EXTERNAL PICK-UP CONNECTION**
A bronze body strainer / connector unit shall be provided. The unit shall be mounted to the pump panel. The external foam pick-up shall be one (1) - 1.00" male connection with chrome-plated cap integrated to a 2.00" strainer cleanout cap. A check valve shall be installed in the pick-up portion of the cleanout cap. A basket style stainless steel screen shall be installed in the body of the strainer / connector unit. Removal of the 2.00" cleanout cap shall be all that is required to gain access to and remove the stainless steel basket screen. The strainer / connector unit shall be ahead of the foam concentrate pump inlet port to insure that all agent reaching the foam pump has been strained.
**PICK-UP HOSE**
A 1.00" flexible hose with an end for insertion into foam containers shall be provided. The hose shall be supplied with a 1.00” female swivel NST thread swivel connector. The hose shall be shipped loose.

**DISCHARGES**
The foam system shall be plumbed to two (2) discharges. The discharges capable of dispensing foam shall be the bumper line and the passenger side 2 ½ discharge.

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

**TANK SELECTOR**
An electric valve shall be used for the foam supply valve. The foam supply valve shall be controlled at the foam system control head for ease of operation. The supply valve shall be electric, remote controlled, to eliminate air pockets in the foam tank supply hose.

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

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

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

**AIR HORN SYSTEM**
There shall be two (2) Grover, air horns provided and located in the front bumper, recessed to the outside of the frames. The horn system shall be piped to the air brake system wet tank utilizing 0.38" tubing. A pressure protection valve shall be installed in-line to prevent loss of air in the air brake system.

**AIR HORN CONTROL**
The air horns shall be actuated by two (2) lanyard rope pull controls, one (1) within reach of the driver and one (1) within reach of the officer. The air horns shall also be actuated by horn button in the steering wheel.

**ELECTRONIC SIREN**
A Whelen HF295, electronic siren with noise canceling microphone shall be provided.

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

Electronic siren head shall be recessed in the overhead console above the engine tunnel on the driver side.

The electronic siren shall be controlled on the siren head only. No horn button or foot switches shall be required.

**SPEAKER**
There shall be one (1) speaker, Whelen Model, with chrome finish provided. Connection shall be connected to the siren amplifier.

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

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

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

The mechanical siren shall be mounted on the front grille, partially recessed. The motor shall be mounted behind the front grille and shall include a reinforcement plate for mounting.

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

**LIGHT BARS (CAB ROOF)**

There shall be two (2) 24.00" Whelen Freedom LED light bars mounted on the cab roof, one (1) on each side, above the driver's and passenger's door, facing forward.

Each light bar shall include the following:

- One (1) red flashing LED module facing forward.
- Two (2) red flashing corner LED module, one (1) in each front corner.
- One (1) red flashing LED module on the end facing to the side.

All the lenses shall be clear.

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

**OPTICAL PREEMPTOR TRAFFIC LIGHT CONTROLLER**

- One (1) 795 LED traffic light controller set to national standard high priority in the left side position.

There shall be a switch located in the cab on the switch panel to control the light bar.
**LIGHTS, FRONT ZONE LOWER**
Two (2) pairs Whelen model M6*C LED flashing warning lights shall be installed on the cab face above the headlights, in a common bezel.

The driver's side front warning lights shall be red super LED/clear lens.

The passenger's side front warning light shall be red super LED/clear lens.

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

**DAYTIME RUNNING LIGHTS (HEADLIGHTS)**
The low-beam headlights used as daytime running lights shall be activated with the following measures:

- Ignition switch is turned on.
- Parking brake is released.

These lights shall be deactivated with any one of the following measures:

- Headlight switch is turned on.
- High-beam flash is turned on.
- Parking brake is set.

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

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

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

**SIDE ZONE LOWER LIGHTING**
There shall be six (6) Whelen®, Model M6C, flashing LED lights installed per the following:

- Two (2) lights located, one (1) each side on the bumper extension. The red Super LED/clear lens each side.
- Two (2) lights located, one (1) each side of cab rearward of crew cab doors. The red Super LED/clear lens each side.
• Two (2) lights located, one (1) each side above rear wheels. The red Super LED/clear lens each side.
• These lights shall be installed with three (3) pairs of flange kits.
There shall be a switch in the cab on the switch panel to control the lights.

**REAR ZONE LOWER LIGHTING**
There shall be two (2) Whelen, Model M6C red Super LED/clear lens lights located at the rear of the apparatus.

Each light shall be mounted in a housing.

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

**REAR OF HOSE BED WARNING LIGHTS**
There shall be two (2) Whelen, L31HRFN beacon warning lights provided at the rear of the truck, one (1) each side.

The rear upper light(s) on the driver's side to be blue beacon clear.

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

There shall also be two (2) Whelen M6C LED lights one (1) on each side under the M9LZC scene lights on the rear of the apparatus.

Driver side M6C shall be Red clear.

Passenger side M6C shall be yellow clear.

**GENERATOR**
The apparatus shall be equipped with a complete AC (alternating current) electrical power system. The generator shall be an Onan, 8,000-watt hydraulic driven unit with vertical exhaust.

The generator shall be driven by a transmission power take off unit, through a hydraulic pump and motor.

The hydraulic engagement supply shall be operational at any time (no interlocks).

An electric/hydraulic valve shall supply hydraulic fluid to the clutch engagement unit provided on the chassis PTO drive.
**GENERATOR INSTRUMENTS AND CONTROLS**
To properly monitor the generator performance, a combination ac volt, frequency Hz. and amp display for line 1 and 2 shall be furnished near the pressure controller, in the pump panel.

**GENERATOR LOCATION**
The generator shall be mounted in the in the area over the pump on the left side. The flooring in this area shall be either reinforced or constructed in such a manner that it shall handle the additional weight of the generator.

**GENERATOR START**
There shall be a switch provided on the cab instrument panel to engage the generator.

**CIRCUIT BREAKER PANEL**
The circuit breaker panel shall be located in the compartment above the driver's side front stabilizer.

**ELECTRIC CORD REEL**
Furnished with the 120/240-volt AC electrical system shall be an Akron cord reel. The reel shall be provided with a 12-volt electric rewind switch that is guarded to prevent accidental operation and labeled for its intended use. The switch shall be protected with a fuse and installed at a height not to exceed 72.00" above the operators standing position.

The reel shall be capable of holding 200' of 10/4, 600-volt cable.

The exterior finish of the reel(s) shall be painted job color matching the body exterior.

A Nylatron guide to be provided to aid in the payout and loading of the reel. A ball stop shall be provided to prevent the cord from being wound on the reel.

A label shall be provided in a readily visible location adjacent to the reel. The label shall indicate current rating, current type, phase, voltage and total cable length.

A total of two (2) cord reels shall be provided one (1) above the pump area, opposite side of the generator and one (1) to be determined.
The cord reel should be configured with four (4) conductors.

**Reel Warranty**
The electric reel shall come with a **five (5)-year** warranty provided by the reel manufacturer.

**CORD**
Provided for electric distribution shall be one (1) length installed on the reel of 200 feet of yellow 10/4 electrical cord. No connector shall be installed on the end of the cord.

**PORTABLE JUNCTION BOX**
There shall be a total of one (2) electrical junction box(s), listed for use in wet locations and provided with light to indicate power on. Each box shall be designed to keep the exterior electrical components above 2.00” of standing water, protected from corrosion, and capable of being carried with a gloved hand.

There shall be a cable strain relief and direct connection, no plug provided for each box. Each box shall be yellow. There shall be two circuits, 4 wire, with a common trip provided to each box.

Each Akron, EJBX, box shall be provided with the following receptacles:

- Four (4) 120 volt, 3 prong house receptacles.

**ELECTRICAL SYSTEM GENERAL DESIGN FOR ALTERNATING CURRENT**
The following guidelines shall apply to the 120/240 VAC system installation:

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

Except where superseded by the requirements of NFPA 1901, all components, equipment and installation procedures shall conform to NFPA 70, National Electrical Code (herein referred to as the NEC).

Line voltage electrical system equipment and materials included on the apparatus shall be listed and installed in accordance with the manufacturer's instructions. All products shall be used only in the manner for which they have been listed.
**Grounding**

Grounding shall be in accordance with Section 250-6 "Portable and Vehicle Mounted Generators" of the NEC. Ungrounded systems shall not be used. Only stranded or braided copper conductors shall be used for grounding and bonding.

An equipment grounding means shall be provided in accordance with Section 250-91 (Grounding Conductor Material) of the NEC.

The grounded current carrying conductor (neutral) shall be insulated from the equipment grounding conductors and from the equipment enclosures and other grounded parts. The neutral conductor shall be colored white or gray in accordance with Section 200-6 (Means of Identifying Grounding Conductors) of the NEC.

In addition to the bonding required for the low voltage return current, each body and driving or crew compartment enclosure shall be bonded to the vehicle frame by a copper conductor. This conductor shall have a minimum amperage rating of 115 percent of the nameplate current rating of the power source specification label as defined in Section 310-15 (amp capacities) of the NEC. A single conductor properly sized to meet the low voltage and line voltage requirements shall be permitted to be used.

All power source system mechanical and electrical components shall be sized to support the continuous duty nameplate rating of the power source.

**Operation**

Instructions that provide the operator with the essential power source operating instructions, including the power-up and power-down sequence, shall be permanently attached to the apparatus at any point where such operations can take place.

Provisions shall be made for quickly and easily placing the power source into operation. The control shall be marked to indicate when it is correctly positioned for power source operation. Any control device used in the drive train shall be equipped with a means to prevent the unintentional movement of the control device from its set position.

A power source specification label shall be permanently attached to the apparatus near the operator's control station. The label shall provide the operator with the information detailed in Figure 19-4.10.

Direct drive (PTO) and portable generator installations shall comply with Article 445 (Generators) of the NEC.
Overcurrent protection
The conductors used in the power supply assembly between the output terminals of the power source and the main over current protection device shall not exceed 144.00" (3658 mm) in length.

For fixed power supplies, all conductors in the power supply assembly shall be type THHW, THW, or use stranded conductors enclosed in nonmetallic liquid tight flexible conduit rated for a minimum of 194 degree Fahrenheit (90 degrees Celsius).

For portable power supplies, conductors located between the power source and the line side of the main overcurrent protection device shall be type SO or type SEO with suffix WA flexible cord rated for 600-volts at 194 degrees Fahrenheit (90 degrees Celsius).

Wiring Methods
Fixed wiring systems shall be limited to the following:

- Metallic or nonmetallic liquid tight flexible conduit rated at not less than 194 degrees Fahrenheit (90 degrees Celsius)
- or
- Type SO or Type SEO cord with a WA suffix, rated at 600 volts at not less than 194 degrees Fahrenheit (90 degrees Celsius)

Electrical cord or conduit shall not be attached to chassis suspension components, water or fuel lines, air or air brake lines, fire pump piping, hydraulic lines, exhaust system components, or low voltage wiring. In addition, the wiring shall be run as follows:

- Separated by a minimum of 12.00" (305 mm), or properly shielded, from exhaust piping
- Separated from fuel lines by a minimum of 6.00" (152 mm) distance

Electrical cord or conduit shall be supported within 6.00" (152 mm) of any junction box and at a minimum of every 24.00" (610 mm) of continuous run. Supports shall be made of nonmetallic materials or corrosion protected metal. All supports shall be of a design that does not cut or abrade the conduit or cable and shall be mechanically fastened to the vehicle.

Wiring Identification
All line voltage conductors located in the main panel board shall be individually and permanently identified. The identification shall reference the wiring schematic or indicate the final termination point. When prewiring for future power sources or devices, the unterminated ends shall be labeled showing function and wire size.
**Wet Locations**
All wet location receptacle outlets and inlet devices, including those on hardwired remote power distribution boxes, shall be of the grounding type provided with a wet location cover and installed in accordance with Section 210-7 "Receptacles and Cord Connections" of the NEC.

All receptacles located in a wet location shall be not less than 24.00" (610 mm) from the ground. Receptacles on off-road vehicles shall be a minimum of 30.00" (762 mm) from the ground.

The face of any wet location receptacle shall be installed in a plane from vertical to not more than 45 degrees off vertical. No receptacle shall be installed in a face up position.

**Dry Locations**
All receptacles located in a dry location shall be of the grounding type. Receptacles shall be not less than 30.00" (762 mm) above the interior floor height.

All receptacles shall be marked with the type of line voltage (120-volts or 240-volts) and the current rating in amps. If the receptacles are direct current, or other than single phase, they shall be so marked.

**Listing**
All receptacles and electrical inlet devices shall be listed to UL 498, Standard for Safety Attachment Plugs and Receptacles, or other appropriate performance standards. Receptacles used for direct current voltages shall be rated for the appropriate service.

**Electrical System Testing**
The wiring and associated equipment shall be tested by the apparatus manufacturer or the installer of the line voltage system.

The wiring and permanently connected devices and equipment shall be subjected to a dielectric voltage withstand test of 900-volts for one (1) minute. The test shall be conducted between live parts and the neutral conductor, and between live parts and the vehicle frame with any switches in the circuit(s) closed. This test shall be conducted after all body work has been completed.
Electrical polarity verification shall be made of all permanently wired equipment and receptacles to determine that connections have been properly made.

**Operational Test per Current NFPA 1901 Standard**
The apparatus manufacturer shall perform the following operation test and ensure that the power source and any devices that are attached to the line voltage electrical system are properly connected and in working order. The test shall be witnessed and the results certified by an independent third-party certification organization.

The prime mover shall be started from a cold start condition and the line voltage electrical system loaded to 100 percent of the nameplate rating.

The power source shall be operated at 100 percent of its nameplate voltage for a minimum of two (2) hours unless the system meets category certification as defined in the current NFPA 1901 standard.

Where the line voltage power is derived from the vehicle's low voltage system, the minimum continuous electrical load as defined in the current NFPA 1901 standard shall be applied to the low voltage electrical system during the operational test.

**EXTENSION LADDER**
There shall be a 35' three (3) section aluminum Duo-Safety Series 1225-A extension ladder provided.

**EXTENSION LADDER**
There shall be two (2) 24' two (2) section aluminum Duo Safety Series 900-A extension ladder(s) provided and located in the ladder storage compartment.

**ROOF LADDERS**
There shall be two (2) 16' aluminum Duo-Safety Series 875-A roof ladders provided.

**AERIAL FOLDING LADDER**
There shall be one (1) 10' aluminum Duo-Safety Series 585-A folding ladder(s) provided and located in the ladder storage compartment.
**GROUND LADDER STORAGE**

Ladder tunnels shall be provided at the rear of the apparatus on either side of the turntable.

Tunnels shall be capable of holding up to two (2) two-section pumper style ladders on each side not in excess of 22.00” wide or 5-13/16” in thickness.

The ladders shall be held captive top and bottom by stainless steel tracks. A polyethylene wear plate shall be provided to prevent ladders from being scuffed by contacting metal parts. The plate shall be mounted to the bottom of the entrance area of the ladder tunnels.

All ladders shall be removable individually without having to remove any other ladder.

A Velcro® strap shall be provided to help contain the ladders.

A smooth aluminum door shall be provided on each ladder tunnel.

**ROOF LADDER MOUNTED TO FLY**

There shall be a 14’ Duo Safety roof ladder mounted to the fly section of the ariel, passenger’s side.

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

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

The board shall be mounted on adjustable tracks from front to back within the compartment.

**TOOLS**

The following tools shall be provided for re-torquing of all specified bolts as recommended by the manufacturer:

- Torque Wrench
- All Required Extensions, Sockets and Adapters
- 4-to-1 Multiplier
MANUALS
Two (2) operator maintenance manuals and two (2) wiring diagrams pertaining to the aerial device shall be provided with the apparatus at time of pick-up.

INITIAL INSTRUCTION
On initial delivery of the fire apparatus, the contractor shall supply a qualified representative to demonstrate the apparatus and provide initial instruction to the fire department regarding the operation, care, and maintenance of the apparatus for a period of four (4) consecutive days.

CO2 EXTINGUISHER
One (1) extinguisher, 20 pound, CO2, shall be provided.

DRY CHEMICAL EXTINGUISHER
There shall be One (1) extinguisher, 20 lb dry chemical extinguisher(s) provided.

WATER EXTINGUISHER
Two (2) extinguisher, 2.50 gallon pressurized water, shall be provided.

PAINT
The exterior custom cab and body painting procedure shall consist of a seven (7) step finishing process as follows:

1. Manual Surface Preparation - All exposed metal surfaces on the custom cab and body shall be thoroughly cleaned and prepared for painting. Imperfections on the exterior surfaces shall be removed and sanded to a smooth finish. Exterior seams shall be sealed before painting. Exterior surfaces that shall not be painted include; chrome plating, polished stainless steel, anodized aluminum and bright aluminum tread plate.
2. Chemical Cleaning and Pretreatment - All surfaces shall be chemically cleaned to remove dirt, oil, grease, and metal oxides to ensure the subsequent coatings bond well. The aluminum surfaces shall be properly cleaned and treated using a high pressure, high temperature 4 step Acid Etch process. The steel and stainless surfaces shall be properly cleaned and treated using a high temperature 3 step process specifically designed for steel or stainless. The chemical treatment converts the metal surface to a passive condition to help prevent corrosion. A final pure water rinse shall be applied to all metal surfaces.
3. Temperature 3 step process specifically designed for steel or stainless. The chemical treatment converts the metal surface to a passive condition to help prevent corrosion. A minimum thickness of 2 mils of Surfcaser Primer is applied to surfaces that require a Critical aesthetic
finish. The Surfacer Primer is a two-component high solids urethane that has excellent sanding properties and an extra smooth finish when sanded.

5. **Finish Sanding** - The Surfacer Primer shall be sanded with a fine grit abrasive to achieve an ultra-smooth finish. This sanding process is critical to produce the smooth mirror like finish in the topcoat.

6. **Sealer Primer** - The Sealer Primer is applied prior to the Basecoat in all areas that have not been previously primed with the Surfacer Primer. The Sealer Primer is a two-component high solids urethane that goes on smooth and provides excellent gloss hold out when top coated.

7. **Basecoat Paint** - Two coats of a high performance, two component high solids polyurethane basecoat shall be applied. The Basecoat shall be applied to a thickness that shall achieve the proper color match. The Basecoat shall be used in conjunction with a urethane clear coat to provide protection from the environment.

8. **Clear Coat** - Two (2) coats of Clear Coat shall be applied over the Basecoat color. The Clear Coat is a two-component high solids urethane that provides superior gloss and durability to the exterior surfaces. Lap style and roll-up doors shall be Clear Coated to match the body. Paint warranty for the roll-up doors shall be provided by the roll-up door manufacture.

All removable items such as brackets, compartment doors, door hinges, and trim shall be removed and separately if required, to ensure paint behind all mounted items. Body assemblies that cannot be finish painted after assembly shall be finish painted before assembly.

The cab shall be two-tone, with the upper section painted #101 black and lower section of the cab and body painted #90 red.

**ROTATION MOTOR PAINT COLOR**
The aerial rotation motor shall be painted to match the aerial device.

**AERIAL DEVICE PAINT COLOR**
The aerial device paint procedure shall consist of a six (6) step finishing process as follows:

1. **Manual Surface Preparation** - All exposed metal surfaces on the aerial device structural components above the rotation point shall be thoroughly cleaned and mechanically shot-blasted to remove metal impurities and prepare the aerial for painting.

2. **Primer/Surfacer Coats** - A two (2) component urethane primer/surfacer shall be hand applied to the chemically treated metal surfaces to provide a strong corrosion protective base coat and to smooth out the surface. All seams shall be caulked before painting.
3. **Hand Sanding** - The primer/surfacer coat shall be lightly sanded to an ultra-smooth finish.

4. **Sealer Primer Coat** - A two (2) component sealer primer coat shall be applied over the sanded primer.

5. **Topcoat Paint** - Urethane base coat shall be applied to opacity for correct color matching.

6. **Clear coat** - Two (2) coats of an automotive grade two (2) component urethane shall be applied.

Surfaces that shall not be painted include all chrome plated, polished stainless steel, anodized aluminum and bright aluminum tread plate.

All buy out components, such as monitor, nozzle, gauges, etc. shall be supplied as received from the vendor.

Removable items such as brackets shall be removed and painted separately to ensure paint coverage behind all mounted items.

The aerial device (turntable and ladder sections) shall be painted #101 **black** using the six (6) step finishing process. The support structure, rotation motor, components below the rotation point and the stabilizers shall be cleaned, caulked, primed and painted high gloss **black**.

The stabilizer beams, pedestal and torque box (including water tank cradle) shall be treated with epoxy E-coat prior to painting to help provide resistance to corrosion and chemicals.

The tip of the ladder shall be painted a contrasting color for high visibility.

**PAINTED AIR CONDITIONING COVER AND MOUNTS**

The cover of the air conditioning condenser and the mounting feet shall be painted to match the color of the cab roof.

**COMPARTMENT INTERIOR PAINT**

The interior of compartmentation shall be painted with a gray spatter type paint.

**REFLECTIVE STRIPES**

Three (3) reflective stripes shall be provided across the front of the vehicle and along the sides of the body. The reflective band shall consist of a 1.00” white stripe at the top with a 1.00” gap then a 6.00” white stripe with a 1.00” gap and a 1.00”
white stripe on the bottom.

The reflective band provided on the cab face shall be at the headlight level.

**CHEVRON STRIPING, REAR**
There shall be alternating chevron striping located on the rear-facing vertical surface of the apparatus. The rear surface, excluding the rear compartment door, shall be covered.

The colors shall be red and fluorescent yellow green diamond grade.

Each stripe shall be 6.00" in width.

This shall meet the requirements of NFPA 1901, 2009 edition, which states that 50% of the rear surface shall be covered with chevron striping.

**REFLECTIVE STRIPE, CAB DOORS**
A 6.00" x 16.00" black reflective stripe shall be provided across the interior of each cab door. The stripe shall be located approximately 1.00" up from the bottom, on the door panel.

This stripe shall meet the NFPA 1901 requirement.

**REFLECTIVE STRIPE ON STABILIZERS**
There shall be a 4.00" wide fluorescent yellow green diamond grade reflective stripe provided on the forward and rear facing side of all aerial stabilizers.

**LETTERING**
The lettering shall be totally encapsulated between two (2) layers of clear vinyl.

**LETTERING**
One hundred Forty-one (141) to one hundred sixty (160) genuine gold leaf lettering, 3.00" high,

with outline and shade shall be provided.

**LADDER PANEL LETTERING**
The ladder panel lettering shall have the city seal “Ladder 45” and the fire department logo. lettering shall be painted red #90.
**RUSTPROOFING/UNDERCOATING**

The apparatus cab shall be properly treated by an authorized Ziebart dealer.

The rust proofing material shall be a transparent coating of an organic based corrosion inhibitor for long-term protection against corrosion.

The rust proofing material utilized shall be formulated to resist corrosion.

Coating texture shall be waxy and pliable after drying so it shall not chip, crack, or peel off during normal vehicle operations. Minimum dry film thickness shall be in the range of 3.00 to 4.00 mils.

The underside of the apparatus shall be undercoated with an asphalt petroleum based material, dark in color.

The undercoating material utilized on the apparatus shall be formulated to resist corrosion and deaden unwanted sound or road noise.

Coating texture shall appear firm, flexible, and resistant to abrasion. Minimum dry film thickness shall be in the range of 8.00 to 12.00 mils. The material shall be applied to the following areas:

- Interior of all double panel style body doors.
- Body and cab wheel well fender liners, on the back side only.
- Underside of body and cab sheet metal, and structural components.
- Underside and vertical sides of all sheet metal compartmentation, including support angles. Structural support members under running boards, rear platforms, battery boxes, walkways, etc. Inside surfaces of the pump heat enclosure, (when installed).

**UNDERCOATING FUEL TANK**

The apparatus fuel tank shall be fully undercoated by an authorized Ziebart dealer.

The fuel tank shall be undercoated with an asphalt petroleum based material, dark in color.

The undercoating material utilized on the tank shall be formulated to resist corrosion and deaden unwanted sound or road noise.

Coating texture shall appear firm, flexible, and resistant to abrasion. Minimum dry film thickness shall be in the range of 8.00 to 12.00 mils.
The material shall be applied to the fuel tank prior to tank installation on the apparatus.

**RUST PROOF, TORQUE BOX**
A coating shall be applied to the bottom and the two (2) sides of the torque box. The coating texture shall be waxy and pliable after drying so it shall not chip, crack, or peel off during normal vehicle operations.

The rust proofing material shall be black, and is a coating of a corrosion inhibitor for long-term protection against corrosion.

**FIRE APPARATUS PARTS CD MANUAL**
There shall be two (2) custom parts manuals for the complete fire apparatus provided in CD format with the completed unit.

The manuals shall contain the following:
- Job number
- Part numbers with full descriptions
- Table of contents
- Parts section sorted in functional groups reflecting a major system, component, or assembly
- Parts section sorted in alphabetical order
- Instructions on how to locate parts

The manuals shall be specifically written for the chassis and body model being purchased. It shall not be a generic manual for a multitude of different chassis and bodies.

**SERVICE PARTS INTERNET SITE**
The service parts information included in these manuals are also available on the factory website. The website offers additional functions and features not contained in this manual, such as digital photographs and line drawings of select items. The website also features electronic search tools to assist in locating parts quickly

**CHASSIS SERVICE CD MANUALS**
There shall be two (2) CD format chassis service manuals containing parts and service information on major components provided with the completed unit.

The manual shall contain the following sections:
- Job number
- Table of contents
- Troubleshooting
• Front Axle/Suspension
• Brakes
• Engine
• Wheels/Tires
• Cab
• Electrical, DC
• Ariel
• Air Systems
• Plumbing
• Appendix

The manual shall be specifically written for the chassis model being purchased. It shall not be a generic manual for a multitude of different chassis and bodies.

**CHASSIS OPERATION CD MANUALS**
There shall be two (2) CD format chassis operation manuals provided.

**ALL WARRANTIES ON SHALL BEGIN UPON TRANSFER OF THE TITLE, CERTIFICATION OF ORIGIN TO THE CITY OF SOUTH PORTLAND.**

**ONE (1) YEAR MATERIAL AND WORKMANSHIP**
Each new piece of apparatus shall be provided with a minimum one (1) year basic apparatus material and workmanship limited warranty. The warranty shall cover such portions of the apparatus built by the manufacturer as being free from defects in material and workmanship that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package.

**ENGINE WARRANTY**
A Cummins five (5) year limited engine warranty shall be provided. A copy of the warranty certificate shall be submitted with the bid package.

**STEERING GEAR WARRANTY**
A Sheppard three (3) year limited steering gear warranty shall be provided. A copy of the warranty certificate shall be submitted with the bid package.

**FIFTY (50) YEAR STRUCTURAL INTEGRITY**
The chassis frame shall be provided with a fifty (50) year material and workmanship limited warranty. The warranty shall cover the chassis frame as being free from defects in material and workmanship that would arise under normal use.
and service.

A copy of the warranty certificate shall be submitted with the bid package.

**FRONT AXLE THREE (3) YEAR MATERIAL AND WORKMANSHIP WARRANTY**

Independent front suspension shall be provided with a **three (3) year** material and workmanship limited warranty. The manufacturer's warranty shall provide that the independent front suspension and steering gears be free from any defect related to material and workmanship on the portion of the apparatus built by the manufacturer that would arise under normal use and service. A copy of the warranty certificate shall be submitted with the bid package.

**REAR AXLE TWO (2) YEAR MATERIAL AND WORKMANSHIP WARRANTY**

A Meritor™ Axle **two (2) year** limited warranty shall be provided.

**ABS BRAKE SYSTEM THREE (3) YEAR MATERIAL AND WORKMANSHIP WARRANTY**

A Meritor Wabco™ ABS brake system **three (3) year** limited warranty shall be provided.

**TEN (10) YEAR STRUCTURAL INTEGRITY**

The new cab shall be provided with a **ten (10) year** material and workmanship limited warranty. The warranty shall cover such portions of the cab built by the manufacturer as being free from structural failures caused by defects in material and workmanship that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package.

**TEN (10) YEAR PAINT AND CORROSION**

Each new piece of apparatus shall be provided with a ten (10) year paint and corrosion limited warranty on the apparatus cab. The warranty shall cover painted exterior surfaces of the body to be free from blistering, peeling, corrosion, or any other adhesion defect caused by defective manufacturing methods or paint material selection that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package.
**FIVE (5) YEAR MATERIAL AND WORKMANSHIP**
The electronic modules and display(s) shall be provided with a five (5) year material and workmanship limited warranty. The warranty shall cover electronic modules to be free from failures caused by defects in material and workmanship. A copy of the warranty certificate shall be submitted with the bid package.

**CAMERA SYSTEM WARRANTY**
A fifty-four (54) month warranty shall be provided for the camera system.

**TRANSMISSION WARRANTY**
The transmission shall have a **five (5) year/unlimited mileage** warranty covering 100 percent parts and labor. The warranty is to be provided by Allison Transmission and not the apparatus builder.

**TRANSMISSION COOLER WARRANTY**
The transmission cooler shall carry a five (5) year parts and labor warranty (exclusive to the transmission cooler). In addition, a collateral damage warranty shall also be in effect for the first three (3) years of the warranty coverage and shall not exceed $10,000 per occurrence. A copy of the warranty certificate shall be submitted with the bid package.

**WATER TANK WARRANTY**
The UPF poly water tank shall be provided with a lifetime material and workmanship limited warranty.

A copy of the warranty certificate shall be submitted with the bid package.

**TEN (10) YEAR STRUCTURAL INTEGRITY**
Each new piece of apparatus shall be provided with a **ten (10) year** material and workmanship limited warranty on the apparatus body. The warranty shall cover such portions of the apparatus built by the manufacturer as being free from defects in material and workmanship that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package.
ROLL UP DOOR MATERIAL AND WORKMANSHIP WARRANTY
An AMDOR roll-up door limited warranty shall be provided. The roll-up door shall be warranted against manufacturing defects for a period of ten (10) years. A five (5) year limited warranty shall be provided on painted roll up doors.

A copy of the warranty certificate shall be submitted with the bid package.

SIX (6) YEAR MATERIAL AND WORKMANSHIP
The pump and its components shall be provided with a six (6) year material and workmanship limited warranty. The manufacturer’s warranty shall provide that the pump and its components shall be free from failures caused by defects in material and workmanship that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package.

TEN (10) YEAR PUMP PLUMBING WARRANTY
The stainless steel plumbing components and ancillary brass fittings used in the construction of the water/foam plumbing system shall be warranted for a period of ten (10) years or 100,000 miles. This covers structural failures caused by defective design or workmanship, or perforation caused by corrosion, provided the apparatus is used in a normal and reasonable manner. This warranty is extended only to the original purchaser for a period of ten years from the date of delivery.

A copy of the warranty certificate shall be submitted with the bid package.

TWELVE (12) YEAR PAINT AND CORROSION
Each new piece of apparatus shall be provided with a twelve (12) year paint and corrosion limited warranty on the apparatus body. The warranty shall cover painted exterior surfaces of the body to be free from blistering, peeling, corrosion, or any other adhesion defect caused by defective manufacturing methods or paint material selection that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package.

TWENTY (20) YEAR AERIAL DEVICE STRUCTURAL INTEGRITY WARRANTY
The aerial device shall be provided with a twenty (20) year material and workmanship limited warranty. The warranty shall cover such portions of the apparatus built by the manufacturer as being free from defects in material and workmanship that would arise under normal use and service. This warranty shall
be limited to the torque box, turntable, aerial sections and other structural components.

A copy of the warranty certificate shall be submitted with the bid package.

**AERIAL SWIVEL WARRANTY**
A five (5) year limited swivel warranty shall be provided. A copy of the warranty certificate shall be submitted with the bid package.

**HYDRAULIC SYSTEM COMPONENTS WARRANTY**
Aerial hydraulic system components shall be provided with a five (5) year material and workmanship limited warranty.

**HYDRAULIC SEAL WARRANTY**
Aerial hydraulic seals shall be provided with a three (3) year material and workmanship limited warranty.

A copy of the warranty certificates shall be submitted with the bid package.

**AERIAL WATERWAY WARRANTY**
A ten (10) year limited waterway warranty shall be provided. A copy of the warranty certificate shall be submitted with the bid package.

**FOUR (4) YEAR PRO-RATED PAINT AND CORROSION**
The aerial device shall be provided with a four (4) year pro-rated paint and corrosion limited warranty. The warranty shall cover exterior painted surfaces of the aerial device to be free from blistering, peeling, corrosion, or any other adhesion defect caused by defective manufacturing methods or paint material selection that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package.

**TWO (2) YEAR GENERATOR MATERIAL AND WORKMANSHIP WARRANTY**
A two (2) year generator limited warranty shall be provided.
**THREE (3) YEAR MATERIAL AND WORKMANSHIP**
The gold leaf lamination shall be provided with a three (3) year material and workmanship limited warranty. The warranty shall cover the gold leaf lamination as being free from defects in material and workmanship that would arise under normal use and service.

A copy of the warranty certificate shall be submitted with the bid package (no exception).

**TWO (2) YEAR EXTENDED**
Each new piece of apparatus shall be provided with a two (2) year basic apparatus material and workmanship limited warranty on the apparatus body. The manufacturer's warranty shall provide for repairs to correct any defect related to material and workmanship on the portion of the apparatus built by the manufacturer that would arise under normal use and service. A copy of the warranty certificate shall be submitted with the bid package (No Exception).

**VEHICLE STABILITY CERTIFICATION**
The fire apparatus manufacturer shall provide a certification stating the apparatus complies with NFPA 1901, current edition, section 4.13, Vehicle Stability. The certification shall be provided at the time of bid.

**ENGINE INSTALLATION CERTIFICATION**
The fire apparatus manufacturer shall provide a certification, along with a letter from the engine manufacturer stating they approve of the engine installation in the vendor's chassis. The certification shall be provided at the time of bid.

**POWER STEERING CERTIFICATION**
The fire apparatus manufacturer shall provide a certification stating the power steering systems installed meets the requirements of the component supplier. The certification shall be provided at the time of bid.

**CAB INTEGRITY CERTIFICATION**
The fire apparatus manufacturer shall provide a cab crash test certification with this proposal. The certification states that the cab must meet or exceed the requirements below:

- European Occupant Protection Standard ECE Regulation No.29
- SAE J2422 Cab Roof Strength Evaluation - Quasi-Static Loading Heavy Trucks
- SAE J2420 COE Frontal Strength Evaluation - Dynamic Loading Heavy Trucks
- Roof Crush
The cab shall be subjected to a roof crush force of 100,000 lb. This value shall be 450 percent of the ECE 29 criteria, which must be equivalent to the front axle rating up to a maximum of ten (10) metric tons.

- Side Impact

The cab shall be subjected to dynamic preload with a 13,275-lb moving barrier slammed into the side of the cab at 5.50 mph, striking with an impact of 13,000 ft-lb of energy. This test shall closely represent the forces a cab shall see in a rollover incident.

- Frontal Impact

The cab shall withstand a frontal force produced from 65,200 ft-lb of energy using a swing-bob type platen.

The same cab shall withstand all tests without any measurable intrusion into the survival space of the occupant area.

There shall be no exception to any portion of the cab integrity certification. Nonconformance shall lead to immediate rejection of bid.

**CAB DOOR DURABILITY CERTIFICATION**

Robust cab doors help protect occupants. Cab doors shall survive a 200,000 cycle door slam test where the slamming force exceeds 20 G's of deceleration. The vendor shall certify that the sample doors similar to those provided on the apparatus have been tested and have met these criteria without structural damage, latch malfunction, or significant component wear.

**WINDSHIELD WIPER DURABILITY CERTIFICATION**

Visibility during inclement weather is essential to safe apparatus performance. Windshield wipers shall survive a 3 million cycle durability test in accordance with section 6.2 of SAE J198 Windshield Wiper Systems - Trucks, Buses and Multipurpose Vehicles. The vendor shall certify that the wiper system design has been tested and that the wiper system has met these criteria.

**SEAT BELT ANCHOR STRENGTH**

Seat belt attachment strength is regulated by Federal Motor Vehicle Safety Standards and should be validated through testing. Each seat belt anchor design shall withstand 3000 lb. of pull on both the lap and shoulder belt in accordance with FMVSS 571.210 Seat Belt Assembly Anchorages.

The vendor shall certify that each anchor design was pull tested to the required force and met the appropriate criteria.
SEAT MOUNTING STRENGTH
Seat attachment strength is regulated by Federal Motor Vehicle Safety Standards and should be validated through testing. Each seat mounting design shall be tested to withstand 20 G’s of force in accordance with FMVSS 571.207 Seating Systems. The vendor shall certify that each seat mount and cab structure design was pull tested to the required force and met the appropriate criteria.

CAB DEFROSTER CERTIFICATION
Visibility during inclement weather is essential to safe apparatus performance. The defroster system shall clear the required windshield zones in accordance with SAE J381 Windshield Defrosting Systems Test Procedure and Performance Requirements - Trucks, Buses, and Multipurpose Vehicles. The vendor shall certify that the defrost system design has been tested in a cold chamber and passes the SAE J381 criteria.

CAB HEATER CERTIFICATION
Good cab heat performance and regulation provides a more effective working environment for personnel, whether in-transit, or at a scene. The cab heaters shall warm the cab 77 degrees Fahrenheit from a cold-soak, within 30 minutes when tested using the coolant supply methods found in SAE J381. The vendor shall certify that a substantially similar cab has been tested and has met these criteria.

CAB AIR CONDITIONING PERFORMANCE CERTIFICATION
Good cab air conditioning temperature and air flow performance keeps occupants comfortable, reduces humidity, and provides a climate for recuperation while at the scene. The cab air conditioning system shall cool the cab from a heat-soaked condition at 100 degrees Fahrenheit to an average of 78 degrees Fahrenheit in 30 minutes. The vendor shall certify that a substantially similar cab has been tested and has met these criteria.

AMP DRAW REPORT
The vendor shall provide, at the time of bid and delivery, an itemized print out of the expected amp draw of the entire vehicle's electrical system.

The manufacturer of the apparatus shall provide the following:

- Documentation of the electrical system performance tests.
- A written load analysis, which shall include the following:
  - The nameplate rating of the alternator.
  - The alternator rating under the conditions specified per:
    - Applicable NFPA 1901 or 1906 (Current Edition).
  - The minimum continuous load of each component that is
specified per:
  • Applicable NFPA 1901 or 1906 (Current Edition).
  o Additional loads that, when added to the minimum continuous load, determine the total connected load.
  o Each individual intermittent load.

All of the above listed items shall be provided by the vendor per the applicable NFPA 1901 or 1906 (Current Edition).
Appendix C – EXCEPTIONS AND DEPARTURES

Proposer ______________________
Option # ______________________

If the Proposer takes exception to any of the requirements, terms or conditions contained in the RFP Documents please identify all such exceptions here. Proponents may add additional lines to the table below if required.

Reference should be made in each case to the relevant provision(s) of the RFP Documents to which the exception applies and, to the extent possible, Proponent should submit the wording it would propose.

**Note:** Exceptions not identified and submitted below may not be considered at a later date.

As of the date of this Proposal, we advise that we have the ability to meet all of the above requirements **except as follows** (list in order of priority, if any):

<table>
<thead>
<tr>
<th>Reference #</th>
<th>Alternate or Exception Description</th>
<th>Rationale</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>