



Apparatus Specialists, Inc.

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## *Metro Stock 105' RM Quint Specifications*

### **INTENT OF SPECIFICATIONS**

It is the intent of these specifications to cover the furnishing and delivery to the purchaser of a complete apparatus equipped as herein specified. With a view to obtaining the best results and the most acceptable apparatus for service in the fire department, these specifications cover the general requirements as to the type of construction, together with certain details as to finish, equipment, and appliances with which the successful bidder must conform. Minor details of construction and materials where not otherwise specified are left to the discretion of the contractor, who shall be solely responsible for the design and construction of all features.

Bids shall only be considered from companies that have an established reputation in the field of fire apparatus construction and have been in business for a minimum of 50 years.

Each bidder shall furnish satisfactory evidence of his ability to construct the apparatus specified. The bidder shall also show that they are in a position to render prompt service and furnish replacement parts for said apparatus.

Aerials containing load ratings and capabilities of the highest level within the respective model class shall be accepted. Bids submitted containing medium duty or light duty aerial ladders shall not be considered as meeting minimum requirements and will automatically be rejected.

### **CONTRACTOR'S SPECIFICATIONS**

Each bid shall be accompanied by a set of "Contractor's Specifications" consisting of a detailed description of the apparatus and equipment proposed and to which the apparatus furnished under contract shall conform.

These specifications shall indicate size, type, model, and make of all component parts and equipment.

The submitted bids shall clearly describe the capabilities of the aerial device. Items such as safety factor certification, horizontal reach, vertical reach, scrub chart information, load capabilities, flow ratings, monitor capabilities, short set capabilities, safety interlock information, estimated completed weight information and other pertinent information shall be either submitted with the bid or readily available if requested.

### **TIMELY PROPOSALS**

It is the bidder's responsibility to see that their proposals arrive on time. Late proposals, facsimiles, e-mails, telegram, or telephone bids shall not be considered.

### **DRAWINGS**

All bid drawings shall be stamped PROPOSAL.

- A total of six (6) drawings shall be supplied. The provided drawings can be printed to any

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paper size, but the scale will only be valid when printed to the paper size listed in the title block

- Drawings shall show five (5) views: left (drivers), right (officers), front, rear, and top
- OAL (overall length) in feet and inches. The estimated length shall be rounded up to the nearest inch
- OAH (overall height) in feet and inches. The estimated height shall be rounded up to the nearest inch
- Wheelbase in inches
- Pump house width in inches
- Front of the body to the centerline of the rear axle in inches
- Front and rear overhang in inches
- Angle of approach and departure
- Roll up doors will be shown in open position. Lap doors will be shown in the closed position
- Compartment dimensions shall be shown in a table on the drawing. The table shall display
  1. Clear door opening – The width/height of the clear door opening
  2. Interior dimensions – The interior compartment dimensions excluding any accessories or pockets (i.e., roll up door drums, hard suction hose pans, suspension pockets, etc.)
  3. Divide heights – The measurement where the compartment changes from full depth to shallow depth
  4. Compartment depths – Depth of the compartment with the door closed
- Ground ladders shall be labeled with a letter designation referring to the table for an explanation of the ladder
- No pump panel or instrument panel controls, discharges or inlets shall be shown. The panel space is to be left blank and labeled "Pump Panel"
- Rear plumbing, such as 2-1/2" discharges, rear steamers, and direct tank fills, shall be shown
- Water tank outline (if applicable)

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- Water tank and foam cell fill towers (If applicable)
- Generator outline (if applicable)
- Warning lights
- D.O.T. lights

## **Text Block Items**

- Chassis make/model
- Fire pump make/model
- Water tank capacity (if applicable)
- Foam cell capacity (if applicable)
- Body material
- Hose bed capacity in cubic feet (if applicable)
- Total compartment cubic feet
- Utilize an unique bid number
- Drawings shall be printed on white paper with black ink

## **PURCHASER'S OBLIGATIONS**

The purchaser reserves the right to accept or reject any or all bids on such basis as the purchaser deems to be in its best interest. All bidders shall be advised that the purchaser is not bound in any manner to automatically accept the lowest bid. The purchaser shall only be obligated to purchase the lowest bid that meets these detailed specifications as closely as possible.

## **SPECIALIZATION**

Due to the complexity of the apparatus proposed, it is the desire of the purchaser to obtain equipment that is built by companies that specialize in the construction in accordance with NFPA 1901, current edition compliant aerial devices.

The aerial device shall be engineered and fabricated by a manufacturer with a minimum of 40 years of experience in the aerial field. No exceptions shall be allowed.

No prototype devices or aerials without a proven field record shall be acceptable. The aerial device provided shall be of the highest quality available in the industry.

## **SAFETY REQUIREMENTS**

It is required that the bidder shall meet all State and Federal safety standards and laws that are

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in effect on the date of the bid for the item(s) that are specified and the particular use for which they are meant.

## **ACQUAINTANCE WITH SPECIFICATIONS**

It is the responsibility of the bidder to review all of the bidding requirements. Failure of a bidder to be acquainted with this information shall not relieve them from any obligations of the bid requirements.

## **QUALITY AND WORKMANSHIP**

The design of the apparatus shall embody the latest approved automotive engineering practices. Experimental designs and methods shall not be acceptable.

The workmanship shall be of the highest quality in its respective field. Special consideration shall be given to the following points: accessibility of the various units that require periodic maintenance, ease of operation (including pumping and driving), and symmetrical proportions.

Construction shall be rugged and ample safety factors shall be provided to carry loads as specified.

## **GENERAL CONSTRUCTION**

The complete apparatus, assemblies, sub-assemblies, component parts etc., shall be designed and constructed with due consideration to the nature and distribution of the load to be sustained and to the general character of service which the apparatus is to be subjected when placed in service.

All parts of the apparatus shall be strong enough to withstand the general service under full load. The apparatus shall be so designed that the various parts are readily accessible for lubrication, inspection, adjustment, and repair.

The apparatus shall be designed and constructed, and the equipment mounted, with due consideration to the distribution of the load between the front and rear axles, and side to side loading that all specified equipment, including a full complement of specified ground ladders, full water tank, loose equipment, and firefighters; shall be carried without overloading or damaging the apparatus in accordance with NFPA 1901, current edition requirements.

## **LIABILITY**

The bidder, if their bid is accepted, shall defend any and all suits and assume all liability for the use of any patented process, device or article forming a part of the apparatus or any appliance furnished under the contract.

## **WARRANTY**

A copy of the warranties for the chassis, pump, body, paint, water tank (if applicable), aerial device, waterway, and waterway seals shall be furnished with each bidder's proposal.

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## **INFORMATION REQUIRED UPON DELIVERY**

The manufacturer shall supply at the time of delivery at least two copies of a complete operation and maintenance manual covering the completed aerial device as delivered.

Parts manuals, where possible, shall be cross-referenced to show the actual manufacturer's name, part number and description on all parts and fittings that are commercially available.

## **DESIGN / CONSTRUCTION / TESTING CRITERIA**

The following criteria shall be applicable to this specification to the extent specified herein:

- NFPA 1901, Current Edition
- American Society for Testing and Materials (ASTM A-36)
- Society of Automotive Engineers, Inc. (SAE) "SAE Handbook"
- American Welding Society (AWS) AWSO 14.4-77
- American Welding Society (AWS) D1.1 and D1.2
- American Society of Non-Destructive Testing (ASNT) "ASNT CP-189"

The aerial ladder shall be designed, fabricated, and tested in accordance with the above codes and specifications, as well as all other applicable codes, standards, and specifications that may be referenced by any of the above.

## **NON-DESTRUCTIVE TESTING**

Steel ladders, turntable, stabilizers, and torque box shall have 100% of all welds tested using both magnetic particle method and visual testing method. Aerials that are fabricated of aluminum shall have 100% of all welds tested using dye penetrant method and visual method. All testing shall be performed by certified technicians, which are employees of an independent nationally recognized and certified third-party testing company. Manufacturers who rely on visual inspection (either in-house or by a third party) as the primary method of testing, and magnetic particle or dye penetrant as a secondary or "proving" test method for only suspect areas shall not be acceptable. In any case, welds shall be tested using two (2) separate NDT inspection methods regardless of the material used to construct the aerial device.

## **THIRD PARTY CERTIFICATION**

All bids shall include copies of the certification of testing of the aerial device. The purchaser desires a device that has been tested by a third party for compliance with the minimum 2 to 1 safety factor specified in accordance with NFPA 1901, current edition. Devices that have not been certified by a third party engineering firm that is independent of the manufacturer shall not be acceptable, no exceptions.

## **AERIAL DEVICE SAFETY FACTOR AND RATED CAPACITY**

The purchaser desires to purchase, using these specifications, an aerial device with a minimum

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2.0:1 Safety Factor as required and defined in accordance with NFPA 1901, current edition. Therefore, the aerial manufacturer shall hereby certify, by submitting a bid for these specifications that the aerial device meets or exceeds all requirements and conditions in these specifications, no exceptions.

## **BID FORMS / SPECIFICATIONS**

All bid forms shall be submitted on the attached bid form. The bid form and/or these specifications shall be filled out by checking either the "YES" or "NO" column for each and every section/paragraph. Failure to use this form and/or these specifications shall be cause for immediate rejection of any bid.

## **EXCEPTION TO SPECIFICATIONS**

The following chassis, pump, and body specifications shall be strictly adhered to. Exceptions shall be allowed if they are equal to or superior to that specified and provided they are listed and fully explained on a separate page entitled "EXCEPTIONS TO SPECIFICATIONS". Exception lists shall refer to the specification page number. Each check in the "NO" column shall be listed and fully explained. Where no check is made in a particular paragraph either "YES" or "NO", it shall be assumed the bidder is taking exception to that paragraph. If a paragraph contains an empty column, where the bidder neglected to check the proper "YES" or "NO" column, it is assumed the bidder is not conforming to the requirements of this paragraph. If no explanation is given in the "EXCEPTIONS TO SPECIFICATIONS" document, the bid is subject to immediate rejection.

**PROPOSALS TAKING TOTAL EXCEPTION TO THESE SPECIFICATIONS WILL BE IMMEDIATELY REJECTED.**

The buyer is aware that all bidders shall have to take some exceptions, therefore; **BIDDERS THAT TAKE NO EXCEPTIONS shall BE REQUIRED TO MEET EVERY PARAGRAPH TO THE FULLEST EXTENT SHOULD THEIR BID BE ACCEPTED.** It is the intent of the purchaser to receive bids that do not require telephone calls or other communications to ascertain what a bidder is intending to supply.

Upon delivery, the apparatus shall be inspected against these specifications and not those supplied by the bidder with their proposal. Deviations shall not be acceptable unless noted as exceptions at the time of bid. The apparatus shall be rejected until said deviations are corrected to the satisfaction of the buyer.

Decisions regarding equal to or better than shall be the sole responsibility of the recipient of the bids rather than companies submitting bids. All deviations, regardless of significance, must be explained in the "EXCEPTIONS TO SPECIFICATIONS" section of the bid.

When exceptions are not taken but inconsistencies are noted in the submitted detailed specifications, the bid may be rejected.

## **ROADABILITY**

The apparatus, when fully equipped and loaded, shall be capable of the following performance while on dry paved roads that are in good condition:

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- Accelerating from 0 to 35 mph within 25 seconds on a 0 percent grade
- Attaining a speed of 50 mph on 0 percent grade
- Maintaining a speed of at least 20 mph on any grade up to and including 6 percent
- The maximum top speed of the apparatus shall not exceed the tire manufacturer's maximum speed rating for the tires installed on the apparatus

## **FAILURE TO MEET TESTS**

In the event the apparatus fails to meet the test requirements of these specifications on the first trials, second trials may be made at the option of the bidder within 30 days of the date of the first trials.

Such trials shall be final and conclusive and failure to comply with these requirements shall be cause for rejection. Failure to comply with changes as required to conform to any clause of the specifications within 30 days after notice is given to the bidder of such changes, shall be cause for rejection of the apparatus.

Permission to keep or store the apparatus in any building owned or occupied by the department during the specified period, with the permission of the bidder, shall not constitute acceptance.

## **PROPOSAL SEQUENCE**

Bid specifications shall be submitted in the same sequence as these specifications for ease of checking compliance. No exceptions shall be allowed to this requirement. The apparatus committee intends to be thorough during the evaluation of bids process. In order to maximize efficiency and minimize time to thoroughly evaluate all received bids, this requirement must be strictly enforced.

## **AWARD OF CONTRACT**

All bids submitted shall be valid for a minimum of 30 days during which time bid securities submitted with the proposals shall be held by the purchaser. Criteria for the award shall include, but not be limited to, the following:

- Apparatus Performance And Safety Levels / Considerations
- Completeness of proposal
- Accuracy of accompanying data
- Past performance of bidder
- Compliance with the detailed specifications
- Compliance with purchasers request(s) for personnel qualifications or certifications
- Exceptions and clarifications

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- Financial stability of bidder
- Local representation of the manufacturer
- Serviceability of the proposed apparatus
- Service capabilities of the bidder's local representative
- Compliance with NFPA 1901, current edition
- Any other factor the purchaser deems relevant

After the evaluation and award process is complete, all bidders shall be notified of the results and securities shall be returned.

## **PREREQUISITE BIDDING REQUIREMENTS**

Any manufacturer submitting a proposal or bid, to these specifications, shall meet the following conditions:

- The manufacturer of the apparatus herein specified, shall be wholly owned (100%) and managed by a Company, Corporation, and/or Parent Company that is wholly based and permanently resides in the United States of America.
- The Company, Corporation, and/or Parent Company, and all assets belonging to such, shall be wholly owned and managed (100%) by the entities specified above.

Any proposal, bid, or response to these specifications by any foreign based, owned, or managed (in part or in whole) Company, Corporation, and/or Parent Company shall be cause for immediate rejection. Any proposal, bid, or response to these specifications by any Company, Corporation, and/or Parent Company, that is owned, operated, managed, or held in contract, in part or wholly by a partnership or other agreement, shall be cause for immediate rejection.

Exceptions to these conditions will not be allowed under any circumstances.

## **NFPA 1901-2016**

The National Fire Protection Association "Standard for Automotive Fire Apparatus", 2016 edition, is hereby adopted and made a part of these specifications, the same as if it were written out in full detail, with the exception of the section dealing with "Equipment Recommended for Various Types of Apparatus". Bidders shall provide the equipment requested herein and the buyer shall supply the rest before the apparatus is put into service. It is the intent of the purchaser to purchase an apparatus that meets 100% of the minimum standards defined and outlined in NFPA 1901-2016 edition. There are to be no exceptions to this requirement.

## **INSPECTION CERTIFICATE - NFPA 1901 COMPLIANCE**

An OEM inspection certificate for the apparatus shall be furnished upon delivery. The purpose of this NFPA 1901 compliance inspection shall be to serve as proof to the customer that all applicable standards have been met or exceeded by the responsible manufacturer.



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The following objectives shall be achieved as a result (this listing shall not be construed as being all inclusive):

- Ensure that understanding of all parties respective responsibilities have been addressed by the actual referencing of NFPA 1901 and the amendments in these specifications and the purchase contract and documentation.
- Ensure that only structural materials complying with appropriate standards and codes are used for construction.
- Ensure the applicable standards of design and manufacturing have been met or exceeded.
- Ensure that safety factors have been met or exceeded where required.
- Ensure that applicable standards for testing and inspection have been met or exceeded by personnel with the appropriate qualifications, experience, and certifications.
- Ensure that where applicable components, equipment, and loose equipment carry the appropriate characteristics, classifications, and/or certifications.
- Ensure that in general and as a whole, all applicable requirements set forth in NFPA 1901, and those codes, standards, and specifications referenced by said parties are met, exceeded, and/or addressed.

## **CONSTRUCTION DOCUMENTATION**

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

1. The manufacturer's record of apparatus construction details, including the following information:
  - Owners name and address
  - Apparatus manufacturer, model, and serial number
  - Chassis make, model, and serial number
  - GAWR of front and rear axles
  - Front tire size and total rated capacity in pounds or kilograms
  - Rear tire size and total rated capacity in pounds or kilograms
  - Chassis weight distribution in pounds with water and manufacturer mounted equipment (front and rear)
  - Engine make, model, serial number, rated horsepower and related speed and

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governed speed

- Type of fuel and fuel tank capacity
  - Electrical system voltage and alternator output in amps
  - Battery make, model, and capacity in cold cranking amps (CCA)
  - Chassis transmission make, model, and serial number; and if so equipped, chassis transmission PTO(s) make, model, and gear ratio
  - If applicable, the pump make, model, rated capacity in gallons or liters per minute, and serial number
  - Pump transmission make, model, serial number, and gear ratio, if unit is equipped with a pump
  - If applicable, the auxiliary pump make, model, rated capacity in gallons or liters per minute, and serial number
  - Water tank certified capacity in gallons or liters
  - On aerial apparatus, the device type, rated vertical height in feet or meters, rated horizontal reach in feet or meters, and rated capacity in pounds or kilograms
  - Paint manufacturer and paint number(s)
  - Company name and signature of responsible company representative
2. Certification of slip resistance of all stepping, standing, and walking surfaces
  3. If the apparatus has a fire pump, a copy of the following shall be provided: pump manufacturers certification of suction capability, apparatus manufacturers approval for stationary pumping applications, engine manufacturers certified brake horsepower curve showing the maximum governed speed, pump manufacturers certification of the hydrostatic test, and the certification of inspection and test for the fire pump
  4. If the apparatus has an aerial device, the certification of inspection and test for the aerial device, and all the technical information required for inspections to comply with NFPA 1914, Standard for Testing Fire Department Aerial Devices
  5. If the apparatus has a fixed line voltage power source, the certification of the test for the fixed power source
  6. If the apparatus is equipped with an air system, test results of the air quality, the SCBA fill station, and the air system installation
  7. Weight documents from a certified scale showing actual loading on the front axle, rear axle(s), and overall fire apparatus (with the water tank full but without personnel,

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equipment, and hose)

8. Written load analysis and results of the electrical system performance tests
9. When the apparatus is equipped with a water tank, the certification of water tank capacity

## **OPERATION AND SERVICE DOCUMENTATION**

The contractor shall supply, at the time of delivery, at least two (2) sets of complete operation and service documentation covering the completed apparatus as delivered and accepted. The documentation shall address at least the inspection, service, and operations of the fire apparatus and all major components thereof. The contractor shall also provide documentation of the following items for the entire apparatus and each major operating system or major component of the apparatus:

- Manufacturer's name and address
- Country of manufacturer
- Source of service and technical information
- Parts and replacement information
- Descriptions, specifications, and ratings of the chassis, pump, and aerial device
- Wiring diagrams for low voltage and line voltage systems to include the following information: representations of circuit logic for all electrical components and wiring, circuit identification, connector pin identification, zone location of electrical components, safety interlocks, alternator-battery power distribution circuits, and input/output assignment sheets or equivalent circuit logic implemented in multiplexing systems
- Lubrication charts
- Operating instructions for the chassis, any major components such as a pump or aerial device, and any auxiliary systems
- Precautions related to multiple configurations of aerial devices, if applicable
- Instructions regarding the frequency and procedure for recommended maintenance
- Overall apparatus operating instructions
- Safety considerations
- Limitations of use
- Inspection procedures
- Recommended service procedures

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- Troubleshooting guide
- Apparatus body, chassis, and other component manufacturers warranties
- Special data required by this standard
- Copies of required manufacturer test data or reports, manufacturer certifications, and independent third-party certifications of test results
- A material safety data sheet (MSDS) for any fluid that is specified for use on the apparatus
- One (1) copy of the FAMA Safety Guide

The contractor shall deliver with the apparatus all manufacturers operations and service documents supplied with components and equipment that are installed or supplied by the contractor.

## **STATEMENT OF EXCEPTIONS**

The proposed apparatus as described in this specification document and all related material with the bid package shall meet or exceed all applicable sections for the category of apparatus as defined by NFPA 1901 unless specifically noted within this specification or other official documents associated with this bid.

Should any area, section or portion of the apparatus not meet the intent and applicable requirements, a clearly defined listing or explanation of what and why compliance was not achieved shall be provided to the purchaser at the time of delivery.

## **OWNER'S MANUAL**

An owner's manual containing the construction, operation, and service documentation shall be provided on a USB Drive. One (1) copy of the USB shall be provided with the apparatus.

## **ELECTRICAL MANUAL**

A complete electrical manual for the apparatus shall also be provided on the USB Drive. This manual shall be specifically prepared for this individual unit rather than a generic schematic manual designed to accommodate all apparatus. The electrical manual shall also include electrical schematics, harness layouts, V-Mux specifications (including Node Input/output Spreadsheet and Node Relationship Spreadsheet), and Master Wire Listing. A contact letter shall also be provided by the electrical engineer, who built the manual, with instructions on using the manual and contact information for assistance with electrical manual questions.

## **ELECTRICAL SCHEMATICS**

A section of the electrical manual shall include schematics of the electrical system and components on the apparatus. These schematics shall be specifically prepared for this individual unit rather than a generic schematic designed to accommodate all apparatus.

## **PUMP PLUMBING SCHEMATICS (if applicable)**

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A section of the electrical manual shall include a schematic of the pump plumbing. This schematic shall be specifically prepared for this individual unit rather than a generic schematic designed to accommodate all apparatus.

## **HYDRAULIC SCHEMATICS (if applicable)**

A section of the electrical manual shall include schematics of the hydraulic components on the apparatus including but not limited to:

- Ladder Rack(s) and Hose Bed Door(s) (if applicable)
- Aerial – Retraction/Extension (if applicable)
- Aerial – Rotation (if applicable)
- Tiller – HVAC Hydraulics System (if applicable)

## **FIRE APPARATUS SAFETY GUIDE**

One (1) printed copy of the FAMA Fire Apparatus Safety Guide shall be provided with the apparatus. This guide provides safety instructions for operations of the fire apparatus.

## **AERIAL OPERATION/PARTS/MAINTENANCE MANUALS**

One (1) printed aerial operation and maintenance manual shall be provided with the apparatus at the time of delivery. These manuals shall be written in a "step by step" format for ease of reference. One (1) USB shall be provided with a digital copy of the aerial manuals included with the printed version. Finally, a digital version of the aerial manuals will also be included with the complete Owner's Manual USB for the apparatus.

Information included in the manuals shall include, but no be limited to the following:

1. Manufacturer Defined Terminology; (to help impart full understanding of terminology used in the manuals)
2. Safety Information and Warnings; (to warn of dangerous conditions/personnel injury/equipment damage)
3. Complete Rated Capacities Information; (allowable loads and GPM flows)
4. Complete and Detailed Operating Systems Descriptions; (to impart understanding of operation/capabilities/working principles)
5. Instruction For Manufacturer Recommended Deployment and Operation Of All Systems During All Specific Conditions; (to ensure safer, more efficient operation of the aerial device)
6. Current, Actual Illustrations Of Aerial Components Throughout The Manual; (to aid in location of specific components, being addressed in the manual)

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7. Complete Maintenance Instructions/Methods/Materials/Intervals/Inspections.

## **AERIAL LADDER DEVICE DEMONSTRATION - (3) DAYS**

A factory trained and authorized instructor shall provide three (3) consecutive days of on-site classes after apparatus acceptance.

Topics covered in the class shall include:

- General familiarization and demonstration of aerial device
- Aerial apparatus safety including a review of all safety devices, interlocks, and operational hazards
- Positioning and locating the vehicle for safe operations
- Chassis parking brakes and engagement of hydraulic system
- Deployment of stabilization devices and use of ground pads
- Operation of elevation, extension, and rotation of the aerial device
- Operation of waterway, nozzle, and other firefighting devices of aerial device
- Operation and use of breathing air system
- Specific aerial device maintenance and service areas for operators
- Shutdown and return to service operations
- Operation of tip controls and platform controls if equipped

Classes shall consist of presentations as well as hands-on demonstration.

## **MISCELLANEOUS EQUIPMENT ALLOWANCE**

The Gross Axle Weight Rating (GAWR) and the Gross Combined Weight Rating (GCWR) or Gross Vehicle Weight Rating (GVWR) of the chassis shall be adequate to carry the weight of the unequipped apparatus with the water tank and other tanks full, specified hose load, unequipped personnel weight, ground ladders, and miscellaneous equipment allowance of 2,500 pounds.

## **TILT TABLE TESTING NOT REQUIRED**

The chassis of the apparatus is equipped with Electronic Stability Control (ESC), which is in accordance with NFPA 1901, current edition requirement of maintaining a stability of 26.5 degrees in both directions.

## **VEHICLE STABILITY**

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The apparatus shall comply with the requirements of NFPA 1901 as it applies to vehicle stability. The particular apparatus as described in the specification provided within the bid package shall be classified into one of the following categories:

- The apparatus shall go through actual tilt table testing which shall be determined by the apparatus manufacturer.
- The apparatus shall be equipped with a rollover stability control system as defined in section 4.13.1.2 of NFPA 1901.
- The apparatus shall be deemed a similar apparatus and meeting the intent of section 4.13.1.1.2 of NFPA 1901.

## **INDEPENDENT THIRD PARTY PUMP CERTIFICATION**

The fire pump shall be tested and certified by Underwriter's Laboratories, a nationally recognized independent third party testing company. Tests shall be conducted so that the pump performs as listed below:

- 100% of rated capacity at 150 pounds net pressure
- 70% of rated capacity at 200 pounds net pressure
- 50% of rated capacity at 250 pounds net pressure
- 100% of rated capacity at 165 pounds net pressure

The entire pump, both suction and discharge passages, shall be hydrostatically tested to a pressure of 600 PSI. The pump shall be fully tested at the pump manufacturer's factory to the performance spots as outlined in accordance with NFPA 1901, current edition. The pump shall be free from objectionable pulsation and vibration.

## **PUMP CERTIFICATION**

The pump shall be certified in U.S. gallons per minute (GPM).

## **ONLINE CUSTOMER INTERACTION**

Smeal Holding LLC. shall provide the capability for online access.

The fire department shall be able to view digital photos of their apparatus in the specified phases of construction.

The following phases will be captured and displayed:

- Chassis arrival to the OEM
- Fabrication
- Pump and Plumbing
- Paint

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- Assembly
- Completion of production

The photos shall be uploaded to a secure website, only accessible to the customer and representatives of the OEM.

## **PRE-CONSTRUCTION MEETING**

A pre-construction meeting shall be held at the apparatus manufacturer's factory. Fire department personnel, dealer representative(s) and factory representative(s) shall be present during the pre-construction meeting process. The purpose of conducting this meeting at the factory is to allow the fire department personnel to see various features of or similar components on other apparatus that may be found on the production floor. The pre-construction meeting is the most important meeting during the after-sale production process. The purpose of this meeting is to finalize all aspects of the specifications, discuss and clarify all design details of the apparatus, and to share or provide all information so all parties are in agreement on the apparatus being constructed. The ultimate goal of the pre-construction meeting is for the fire department officials, dealer representative(s), and factory representative(s) to discuss and clarify all aspects of the proposed apparatus and to provide all necessary information to the apparatus manufacturer that will ensure the apparatus is built to the satisfaction of all parties involved.

The apparatus manufacturer shall create and forward to the dealer a "Pre-construction" document containing the following items:

- Complete specifications of the apparatus including the chassis
- Detailed amp draw report
- Listing of clarifications or questions from the manufacturer that require attention (shelf locations, lettering details, etc.)
- A total of six (6) packets of 11" x 17" drawings, each packet complete with a single view drawing for each side of the apparatus shall be supplied
- All drawings shall be drawn and printed to an appropriate scale to maximize the size of the apparatus on each 11" x 17" sheet of paper.

During this pre-construction meeting, any changes or clarifications must be documented on a manufacturer issued change order. The change order shall be signed by the customer and dealership and ultimately by the apparatus manufacturer. The change order becomes an extension of the contract with the official signatures of all three parties. All change order items resulting from the pre-construction meeting shall be implemented into the official shop order document.

## **MID-POINT INSPECTION**

An inspection of the apparatus in production by the customer shall be at the apparatus manufacturer's facility. The customer shall be given the opportunity to visually inspect the



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apparatus so that any discrepancies may be addressed. A company representative shall be present at the inspection to answer all questions. Adequate notice shall be given to the dealer as to when the apparatus will be available for inspection.

## **FINAL INSPECTION**

The department/dealer representative will inspect the final apparatus prior to it leaving the apparatus body manufacturer's facility. This will allow any changes that may be required, to be done so in a timely manner. After leaving the facility, all repairs or alterations will be performed by either the dealer or an OEM-approved service center.

## **MAXIMUM OVERALL HEIGHT**

The overall height of the apparatus shall not exceed 148" (12'-4") from the ground. This measurement shall be taken with the tires properly inflated and with the apparatus in the unloaded condition to ensure a maximum overall height. In order to provide the maximum overall height, proposed units using calculated weight as a means to achieve a lower overall height shall not be accepted. The measurement shall be taken at the highest point of the apparatus.

## **MAXIMUM OVERALL LENGTH**

The overall length of the apparatus shall not exceed 500" (41'-8").

## **WHEELBASE**

The wheelbase of the apparatus shall not exceed 231".

## **ANGLE OF APPROACH**

The angle of approach of the apparatus shall be a minimum of 8 degrees.

## **ANGLE OF DEPARTURE**

The angle of departure of the apparatus shall be a minimum of 10 degrees.

## **MODEL**

The chassis shall be a Gladiator model. The cab and chassis shall include design considerations for multiple emergency vehicle applications, rapid transit and maneuverability. The chassis shall be manufactured for heavy duty service with the strength and capacity to support a fully laden apparatus, one hundred (100) percent of the time.

## **MODEL YEAR**

The chassis shall have a vehicle identification number that reflects a 2022 model year.

## **COUNTRY OF SERVICE**

The chassis shall be put in service in the country of United States of America (USA).

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The chassis will meet applicable U.S.A. federal motor vehicle safety standards per CFR Title 49 Chapter V Part 571 as clarified in the incomplete vehicle book per CFR Title 49 Chapter V Part 568 Section 4 which accompanies each chassis. Spartan Chassis is not responsible for compliance to state, regional, or local regulations. Dealers should identify those regulations and order any necessary optional equipment from Spartan Chassis or their OEM needed to be in compliance with those regulations.

## **CAB AND CHASSIS LABELING LANGUAGE**

The cab and chassis shall include the applicable caution, warning, and safety notice labels with text to be written in English. All applicable caution, warning, and safety notice labels shall be Innovative Controls brand. Where applicable to the location within the specific layout and label package of the cab and chassis, the labels shall include decorative chrome bezels. Designs shall include bezels that fit individual labels or packaged configurations of labels in certain common locations.

The following labels shall be Innovative Controls brand, each including a decorative chrome bezel (where applicable):

- Shoreline
- Aerial Stowed
- Aerial Breakers 2
- Air Conditioner
- Cab Tilt Plate
- Air Compressor Breaker
- Battery Conditioner Breaker
- Helmet Caution
- Horn Tag
- Q2B Tag
- Load Center Plate
- Not a Step Label
- Occupancy Tag
- Do Not Move
- Occupants Must Be Seated
- Do Not Stand

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- Danger Do Not Weld
- Danger--Untrained Operator
- Def Tag, including any additional labels selected in the 2907- subcat
- Battery Direct
- Kneeling
- IFS Air Fault
- Engine Brake
- Retarder
- LR 100 Amp Node
- 300 Amp EPU
- 100 Amp Front O/R Node
- 100 Amp T/T Node
- 100 Amp RR O/R Node
- 10 Amp EPU
- Master Power
- 12 Volt Power
- Aerial Hours
- Pump In Drive
- Windshield Washer Fluid

## **APPARATUS TYPE**

The apparatus shall be a Quint vehicle designed for emergency service use. The apparatus shall include a permanently mounted fire pump which has a minimum rated capacity of 750 gallons per minute (3000 L/min), a water tank, a hose storage area, a compliment of ground ladders, and an aerial ladder or elevating platform with a permanently mounted waterway that shall be rear mounted thus providing the following vehicle benefits:

- Improved mobility vs. mid-ship mounted units, due to shorter overall travel length and wheelbase.
- Increased compartment space, hose load, and water capacity in the body, resulting from

# METRO FIRE APPARATUS

ladder being raised to clear the cab.

- Shorter vehicle wheelbase.
- Shorter overall length of vehicle.

## **VEHICLE TYPE**

The chassis shall be manufactured for use as a straight truck type vehicle and designed for the installation of a permanently mounted apparatus behind the cab. The apparatus of the vehicle shall be supplied and installed by the apparatus manufacturer.

## **VEHICLE ANGLE OF APPROACH PACKAGE**

The angle of approach of the apparatus shall be a minimum of 8.00 degrees.

NFPA1901 Angle of Approach definition:

“To determine the angle of approach, place a thin steel strip against the front of the tires where they touch the ground or stretch a tight string from one front tire to the other at the front where they touch the ground. Determine the lowest point (component or equipment) on the vehicle forward of the front tire that would make the smallest angle of approach. Hang a plumb bob from the lowest point and mark the point on the ground where the point of the plumb bob touches. Measure the vertical distance from the ground to the point where the plumb bob was hung (distance  $V$ ). Measure the horizontal distance from the plumb bob point to the steel strip or string running from front tire to front tire (distance  $H$ ). Divide the vertical distance by the horizontal distance. The ratio of  $V/H$  is the tangent of the angle of approach. If the ratio is known, the angle of approach can be determined from a table of trigonometric functions of angles or from a math calculator. The standard requires a minimum angle of approach of 8.00 degrees: since the tangent of 8.00 degrees is 0.1405, if  $V$  divided by  $H$  is 0.1405 or larger, the angle of approach is 8.00 degrees or greater.”

## **AXLE CONFIGURATION**

The chassis shall feature a 6 x 4 axle configuration consisting of a tandem rear drive axle set with a single front steer axle.

## **GROSS AXLE WEIGHT RATINGS FRONT**

The front gross axle weight rating (GAWR) of the chassis shall be 24,000 pounds.

This front gross axle weight rating shall be adequate to carry the weight of the completed apparatus including all equipment and personnel.

## **GROSS AXLE WEIGHT RATINGS REAR**

The rear gross axle weight rating (GAWR) of the chassis shall be 52,000 pounds.

This rear gross axle weight rating shall be adequate to carry the weight of the completed apparatus including all equipment and personnel.

## **PUMP PROVISION**

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The chassis shall include provisions to mount a drive line pump in the middle of the chassis, behind the cab, more commonly known as the midship location. Chassis driveline pump provisions shall include an interlock feature for automatic setting of the park brake when the vehicle is shifted into pump mode while the transmission is in neutral and the transmission output speed translates to less than 1 mph. When the conditions are met the driver side parking brake valve shall activate. Once shifted to road mode the condition for electric automatic brake engagement is no longer present and the driver's parking brake control valve shall function normally.

## **WATER & FOAM TANK CAPACITY**

The chassis shall include a carrying capacity of up to 750 gallons (2839 liters). The water and/or foam tank(s) shall be supplied and installed by the apparatus manufacturer.

## **CAB STYLE**

The cab shall be a custom, fully enclosed, EMFD model with a 5.00 inch raised roof over the driver, officer, and crew area, designed and built specifically for use as an emergency response vehicle by a company specializing in cab and chassis design for all emergency response applications. The cab shall be designed for heavy-duty service utilizing superior strength and capacity for the application of protecting the occupants of the vehicle. This style of cab shall offer up to eight (8) seating positions.

The cab shall incorporate a fully enclosed design with side wall roof supports, allowing for a spacious cab area with no partition between the front and rear sections of the cab. To provide a superior finish by reducing welds that fatigue cab metal; the roof, the rear wall and side wall panels shall be assembled using a combination of welds and proven industrial adhesives designed specifically for aluminum fabrication for construction.

The cab shall be constructed using multiple aluminum extrusions in conjunction with aluminum plate, which shall provide proven strength and the truest, flattest body surfaces ensuring less expensive paint repairs if needed. All aluminum welding shall be completed to the American Welding Society and ANSI D1.2-96 requirements for structural welding of aluminum.

All interior and exterior seams shall be sealed for optimum noise reduction and to provide the most favorable efficiency for heating and cooling retention.

The cab shall be constructed of 5052-H32 corrosion resistant aluminum plate. The cab shall incorporate tongue and groove fitted 6061-T6 0.13 & 0.19 inch thick aluminum extrusions for extreme duty situations. A single formed, one (1) piece extrusion shall be used for the "A" pillar, adding strength and rigidity to the cab as well as additional roll-over protection. The cab side walls and lower roof skin shall be 0.13 inch thick; the rear wall and raised roof skins shall be 0.09 inch thick; the front cab structure shall be 0.19 inch thick.

The exterior width of the cab shall be 99.40 inches wide with a minimum interior width of 91.00 inches. The overall cab length shall be 137.10 inches with 60.00 inches from the centerline of the front of the axle to the back of the cab.

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The cab interior shall be designed to afford the maximum usable interior space and attention to ergonomics with hip and legroom while seated which exceeds industry standards. The crew cab floor shall be flat across the entire walking area for ease of movement inside the cab.

The cab shall offer an interior height of 57.50 inches from the front floor to the headliner and a rear floor to headliner height of 60.00 inches in the raised roof area, at a minimum. The cab shall offer an interior measurement at the floor level from the rear of the engine tunnel to the rear wall of the cab of 55.88 inches. All interior measurements shall include the area within the interior trimmed surfaces and not to any unfinished surface.

The cab shall include a driver and officer area with two (2) cab doors large enough for personnel in full firefighting gear. The front doors shall offer a clear opening of 40.25 inches wide X 53.50 inches high, from the cab floor to the top of the door opening. The cab shall also include a crew area with up to two (2) cab doors, also large enough for personnel in full firefighting gear. The rear doors shall offer a clear opening of 32.25 inches wide X 51.00 inches high, from the cab floor to the top of the door opening.

The cab shall incorporate a progressive two (2) step configuration from the ground to the cab floor at each door opening. The progressive steps are vertically staggered and extend the full width of each step well allowing personnel in full firefighting gear to enter and exit the cab easily and safely.

The first step for the driver and officer area shall measure approximately 11.50 inches deep X 31.13 inches wide. The intermediate step shall measure approximately 8.50 inches deep X 32.50 inches wide. The height from the first step to the intermediate step and the intermediate step to the cab floor shall not exceed 11.00 inches.

The first step for the crew area shall measure approximately 11.50 inches deep X 20.44 inches wide. The intermediate step shall measure approximately 10.25 inches deep X 22.75 inches wide. The height from the first step to the intermediate step and the intermediate step to the cab floor shall not exceed 12.80 inches.

## **OCCUPANT PROTECTION**

The vehicle shall include the Advanced Protection System™ (APS) which shall secure belted occupants and increase the survivable space within the cab. The APS shall selectively deploy integrated systems to protect against injuries in qualifying frontal impact, side impact, and rollover events. The increase in survivable space and security of the APS shall also provide ejection mitigation protection.

The system components shall include:

- Driver steering wheel airbag
- Driver dual knee air bags (patent pending) with energy management mounting (patent pending) and officer knee airbag.
- Large driver, officer, and crew area side curtain airbags
- APS advanced seat belt system - retractor pre-tensioners tighten the seat belts around the occupants, securing the occupants in seats and load limiters play out some of the seat

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belt webbing to reduce seat belt to chest and torso force upon impact as well as mitigate head and neck injuries

- Heavy truck Restraints Control Module (RCM) - receives inputs from the outboard sensors, selectively deploys APS systems, and records sensory inputs immediately before and during a detected qualifying event
- Integrated outboard crash sensors mounted at the perimeter of the vehicle - detects a qualifying front or side impact event and monitors and communicates vehicle status and real time diagnostics of all critical subsystems to the RCM
- Fault-indicating Supplemental Restraint System (SRS) light on the driver's instrument panel

Frontal impact protection shall be provided by the outboard sensors and the RCM. In a qualifying front impact event the outboard sensors provide inputs to the RCM. The RCM activates the steering wheel airbag, driver side dual knee airbags (patent pending), officer side knee airbag, and advanced seat belts for each occupant in the cab.

Rollover, side impact, and ejection mitigation shall be provided by the outboard sensors and the RCM. In qualifying rollover or side impact events the outboard sensors provide inputs to the RCM. The RCM activates the side curtain airbags and advanced seat belts for each occupant in the cab. The RCM measures roll angle, lateral acceleration, and roll rate to determine if a rollover event or side impact event is imminent or occurring.

In the event of a qualifying offset or other non-frontal impact, the RCM shall determine and intelligently deploy the front impact protection system, the side impact protection system, or both front and side impact protection systems based on the inputs received from the outboard crash sensors.

## **CAB FRONT FASCIA**

The front cab fascia shall be constructed of 5052-H32 Marine Grade, 0.13 of an inch thick aluminum plate which shall be an integral part of the cab.

The cab fascia will encompass the entire front of the aluminum cab structure from the bottom of the windshield to the bottom of the cab and shall be the "Classic" design.

The front cab fascia shall include two (2) molded plastic modules on each side accommodating a total of up to four (4) Hi/Low beam headlights and two (2) turn signal lights or up to four (4) warning lights. A chrome plated molded plastic bezel shall be provided on each side around each set of four lamps.

## **FRONT GRILLE**

The front cab fascia shall include a classic box style, 304 stainless steel front grille. The grille shall measure 55.45 wide X 33.50 inches high X 1.50 inches deep. The upper portion of the grille shall be hinged to provide service access behind the grille. The grille shall include a minimum free air intake of 750.00 square inches.

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## **CAB UNDERCOAT**

There shall be a rubberized undercoating applied to the underside of the cab that provides abrasion protection, sound deadening and corrosion protection.

## **CAB SIDE DRIP RAIL**

There shall be a drip rail along the top radius of each cab side. The drip rails shall help prevent water from the cab roof running down the cab side.

## **CAB PAINT EXTERIOR**

The cab shall be painted prior to the installation of glass accessories and all other cab trim to ensure complete paint coverage and the maximum in corrosion protection of all metal surfaces.

All metal surfaces on the entire cab shall be ground by disc to remove any surface oxidation or surface debris which may hinder the paint adhesion. Once the surface is machine ground a high quality acid etching of base primer shall be applied. Upon the application of body fillers and their preparation, the cab shall be primed with a coating designed for corrosion resistance and surface paint adhesion. The maximum thickness of the primer coat shall be 2.00 mils.

The entire cab shall then be coated with an intermediate solid or epoxy surfacing agent that is designed to fill any minor surface defects, provide an adhesive bond between the primer and the paint and improve the color and gloss retention of the color. The finish to this procedure shall be a sanding of the cab with 360 grit paper followed by sealing the seams with SEM brand seam sealer.

The cab shall then be painted the specific color designated by the customer with an acrylic urethane type system designed to retain color and resist acid rain and most atmospheric chemicals found on the fire ground or emergency scene. The paint shall have a minimum thickness of 2.00 mils, followed by a clear top coat not to exceed 2.00 mils. The entire cab shall then be baked at 180 degrees for one (1) hour to speed the curing process of the coatings.

## **CAB PAINT MANUFACTURER**

The cab shall be painted with Sikkens paint.

## **CAB PAINT PRIMARY/LOWER COLOR**

The primary/lower paint color shall be:

## **CAB PAINT SECONDARY/UPPER COLOR**

The secondary/upper paint color shall be:

## **CAB PAINT EXTERIOR BREAKLINE**



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The upper and lower paint shall meet at a breakline on the cab which shall be located approximately 1.00 inch below the door windows on each side of the cab. The breakline shall curve down at the front cab corners to approximately 5.00 inches below the windshields on the front of the cab.

## **CAB PAINT PINSTRIPE**

Where the upper and lower paint colors meet a temporary 0.50 inch wide black pinstripe shall be applied over this break line to offer a more finished look prior to the final pinstripe being installed by the OEM.

## **CAB PAINT WARRANTY**

The cab and chassis shall be covered by a limited manufacturer paint warranty which shall be in effect for ten (10) years from the first owner's date of purchase or in service or the first 100,000 actual miles, whichever occurs first.

The warranty details can be found in the chassis warranty document.

## **CAB PAINT INTERIOR**

The visible interior cab structure surfaces shall feature a medium gray spray on bedliner coating which shall mold to each surface of the cab interior. The bedliner shall be environmentally friendly and chemically resistant.

## **CAB ENTRY DOORS**

The cab shall include four (4) entry doors, two (2) front doors and two (2) crew doors designed for ease of entering and egress when outfitted with an SCBA. The doors shall be constructed of extruded aluminum with a nominal thickness of 0.13 inch. The exterior skins shall be constructed of 0.13 inch aluminum plate.

The doors shall include a double rolled style automotive rubber seal around the perimeter of each door frame and door edge which ensures a weather tight fit.

All door hinges shall be hidden within flush mounted cab doors for a pleasing smooth appearance and perfect fit along each side of the cab. Each door hinge shall be piano style with a 0.38 inch pin and shall be constructed of stainless steel.

## **CAB ENTRY DOOR TYPE**

All cab entry doors shall be full length in design to fully enclose the lower cab steps. Entry doors shall include Pollak mechanical plunger style switches for electrical component activation.

## **CAB INSULATION**

The cab ceiling and walls shall include a nonwoven polyester fiber insulation. The insulation shall act as a barrier absorbing noise as well as assisting in sustaining the desired climate within the cab interior.

## **CAB STRUCTURAL WARRANTY**

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## Summary of Warranty Terms:

THE FOLLOWING IS SUMMARY OF WARRANTY TERMS FOR INFORMATION ONLY. THE ACTUAL LIMITED WARRANTY TERMS CAN BE FOUND IN THE CHASSIS WARRANTY DOCUMENT, WHICH CONTAINS THE COMPLETE STATEMENT OF THE WARRANTY. SPARTAN'S RESPONSIBILITY IS TO BE ACCORDING TO THE TERMS OF THE COMPLETE LIMITED WARRANTY DOCUMENT.

The cab structure shall be warranted for a period of ten (10) years or one hundred thousand (100,000) miles which ever may occur first. The warranty period shall commence on the date the vehicle is delivered to the first end user.

## **CAB TEST INFORMATION**

The cab shall have successfully completed the preload side impact, static roof load application and frontal impact without encroachment to the occupant survival space when tested in accordance with Section 4 of SAE J2420 COE Frontal Strength Evaluation Dynamic Loading Heavy Trucks, Section 5 of SAE J2422 Cab Roof Strength Evaluation Quasi –Static Loading Heavy Trucks and ECE R29 Uniform Provisions Concerning the Approval of Vehicles with regard to the Protection of the Occupants of the Cab of a Commercial Vehicles Annex 3 Paragraph 5.

The above tests have been witnessed by and attested to by an independent third party. The test results were recorded using cameras, high speed imagers, accelerometers and strain gauges. Documentation of the testing shall be provided upon request.

## **ELECTRICAL SYSTEM**

The chassis shall include a single starting electrical system which shall include a 12 volt direct current multiplexing system, suppressed per SAE J551. The wiring shall be appropriate gauge cross link with 311 degree Fahrenheit insulation. All SAE wires in the chassis shall be color coded and shall include the circuit number and function where possible. The wiring shall be protected by 275 degree Fahrenheit minimum high temperature flame retardant loom. All nodes and sealed Deutsch connectors shall be waterproof.

## **OEM WIRING**

The wiring system shall include a custom J1939 interface harness drop provided by the chassis manufacturer designed to meet the requirements provided by the OEM.

The wiring system shall also include a prewire for ECM park brake input and engine ground return circuits located behind the switch panel. The circuits shall include an extra 2 feet of wire and shall be labeled "ECM Park Brake Input".

## **MULTIPLEX DISPLAY**

The multiplex electrical system shall include a Weldon Vista IV display which shall be located on the left side of the dash in the switch panel. The Vista IV shall feature a full color LCD display screen which includes a message bar displaying the time of day and important messages requiring acknowledgement by the user which shall all be displayed on the top of the screen in the order they are received. There shall be eight (8) push button virtual controls, four (4) on each

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side of the display for the on-board diagnostics. The display screen shall be video ready for back-up cameras, thermal cameras, and DVD.

The Vista IV display shall offer varying fonts and background colors. The display shall be fully programmable to the needs of the customer and shall offer virtually infinite flexibility for screen configuration options.

## **LOAD MANAGEMENT SYSTEM**

The apparatus load management shall be performed by the included multiplex system. The multiplex system shall also feature the priority of sequences and shall shed electrical loads based on the priority list specifically programmed.

## **DATA RECORDING SYSTEM**

The chassis shall have a Weldon Vehicle Data Recorder (VDR) system installed. The system shall be designed to meet NFPA 1901 and shall be integrated with the Weldon Multiplex electrical system. The following information shall be recorded:

- Vehicle Speed
- Acceleration
- Deceleration
- Engine Speed
- Engine Throttle Position
- ABS Event
- Seat Occupied Status
- Seat Belt Status
- Master Optical Warning Device Switch Position
- Time
- Date

Each portion of the data shall be recorded at the specified intervals and stored for the specified length of time to meet NFPA 1901 guidelines and shall be retrievable by connecting a laptop computer to the VDR system.

## **ACCESSORY POWER**

The electrical distribution panel shall include two (2) power studs. The studs shall be size #10 and each of the power studs shall be circuit protected with a fuse of the specified amperage. One (1) power stud shall be capable of carrying up to a 40 amp battery direct load. One (1) power stud shall be capable of carrying up to a 15 amp ignition switched load. The two (2)

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power studs shall share one (1) #10 ground stud. A 225 amp battery direct power and ground stud shall be provided and installed on the chassis near the left hand battery box for OEM body connections.

## **AUXILIARY ACCESSORY POWER**

An auxiliary six (6) position Blue Sea Systems 5025 blade type fuse panel shall be installed behind the switch panel. The fuse panel shall be protected by a 40 amp fuse. The panel shall be capable of carrying up to a maximum 40 amp battery direct load.

## **ADDITIONAL ACCESSORY POWER**

An additional six (6) position Blue Sea Systems 5025 blade type fuse panel shall be installed on the side wall of the engine tunnel behind the officer's seat. The fuse panel shall be protected by a 40 amp fuse. The panel shall be capable of carrying up to a maximum 40 amp battery direct load.

## **EXTRA ACCESSORY POWER**

An extra six (6) position Blue Sea Systems 5025 blade type fuse panel shall be provided and installed on the lower center rear wall of the cab. The fuse panel shall be protected by a 40 amp fuse. The panel shall be capable of carrying up to a maximum 40 amp battery direct load.

## **EXTERIOR ELECTRICAL TERMINAL COATING**

All terminals exposed to the elements will be sprayed with a high visibility protective rubberized coating to prevent corrosion.

## **ENGINE**

The chassis engine shall be a Cummins X15 engine. The X15 engine shall be an in-line six (6) cylinder, four cycle diesel powered engine. The engine shall offer a rating of 565 horsepower at 1800 RPM and shall be governed at 2100 RPM. The torque rating shall feature 1850 foot pounds of torque at 1000 RPM with 912 cubic inches (14.9 liter) of displacement.

The X15 engine shall feature a VGT™ Turbocharger, a high pressure common rail fuel system, fully integrated electronic controls with an electronic governor, and shall be EPA certified to meet the 2021 emissions standards using cooled exhaust gas recirculation and selective catalytic reduction technology.

The engine shall include an engine mounted combination full flow/by-pass oil filter with replaceable spin on cartridge for use with the engine lubrication system. The engine shall include Citgo brand Citgard 500, or equivalent 15W40 CK-4 low ash engine oil which shall be utilized for proper engine lubrication.

A wiring harness shall be supplied ending at the back of the cab. The harness shall include a connector which shall allow an optional harness for the pump panel. The included circuits shall be provided for a tachometer, oil pressure, engine temperature, hand throttle, high idle and a PSG system. A circuit for J1939 data link shall also be provided at the back of the cab.

## **CAB ENGINE TUNNEL**

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The cab interior shall include an integrated engine tunnel constructed of 5052-H32 Marine Grade 0.19 of an inch thick aluminum alloy plate. The tunnel shall be a maximum of 46.50 inches wide X 29.00 inches high.

## **DIESEL PARTICULATE FILTER CONTROLS**

There shall be two (2) controls for the diesel particulate filter. One (1) control shall be for regeneration and one (1) control shall be for regeneration inhibit.

## **ENGINE PROGRAMMING HIGH IDLE SPEED**

The engine high idle control shall maintain the engine idle at approximately 1250 RPM when engaged.

## **ENGINE HIGH IDLE CONTROL**

The vehicle shall be equipped with a virtual Vista button and an automatic high-idle speed control. It shall be pre-set so when activated, it will operate the engine at the appropriate RPM to increase alternator output. This device shall operate only when the engine is running and the transmission is in neutral with the parking brake set. The device shall disengage when the operator depresses the brake pedal, or the transmission is placed in gear, and shall be available to manually or automatically re-engage when the brake is released, or when the transmission is placed in neutral. There shall be an indicator on the Vista display and control screen for the high idle speed control.

## **ENGINE PROGRAMMING ROAD SPEED GOVERNOR**

The engine shall include programming which will govern the top speed of the vehicle.

## **AUXILIARY ENGINE BRAKE**

A compression brake, for the six (6) cylinder engine shall be provided. A cutout relay shall be installed to disable the compression brake when in pump mode or when an ABS event occurs. The engine compression brake shall activate upon 0% accelerator when in operation mode and actuate the vehicle's brake lights.

The engine shall utilize a variable geometry turbo (VGT) as an integrated auxiliary engine brake to offer a variable rate of exhaust flow, which when activated in conjunction with the compression brake shall enhance the engine's compression braking capabilities.

## **AUXILIARY ENGINE BRAKE CONTROL**

An engine compression brake control device shall be included. The electronic control device shall monitor various conditions and shall activate the engine brake only if all of the following conditions are simultaneously detected:

- A valid gear ratio is detected.
- The driver has requested or enabled engine compression brake operation.

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- The throttle is at a minimum engine speed position.
- The electronic controller is not presently attempting to execute an electronically controlled final drive gear shift.

The compression brake shall be controlled via an off/low/high virtual button through the Vista display and control screen. The multiplex system shall remember and default to the last engine brake control setting when the vehicle is shut off and re-started.

## **FLUID FILLS**

The front of the chassis shall accommodate fluid fill for the engine oil through the grille. This area shall also accommodate a check for the engine oil. The transmission, power steering, and coolant fluid fills and checks shall be under the cab. The windshield washer fill shall be accessible through the front left side mid step.

## **ENGINE DRAIN PLUG**

The engine shall include an original equipment manufacturer installed oil drain plug.

## **ENGINE WARRANTY**

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

## **REMOTE THROTTLE HARNESS**

An apparatus interface wiring harness for the engine and transmission pump interlocks shall be supplied with the chassis. The harness shall include a connector for connection to a chassis pump panel harness supplied by the body builder and shall terminate in the left frame rail behind the cab for connection by the body builder. The harness shall include circuits deemed for a pump panel and shall contain circuits for a hand throttle, and a multiplexed gauge. Separate circuits shall also be included for a pump control switch, "Pump Engaged" and "OK to Pump" indicator lights, open compartment ground, start signal, park brake ground, ignition signal, master power, clean power, customer ignition, air horn solenoid switch, high idle switch and high idle indicator light. The harness shall contain interlocks that will prevent shifting to road or pump mode unless the transmission output speed translates to less than 1 mph and the transmission is in neutral. The shift to pump mode shall also require the park brake be set.

## **ENGINE PROGRAMMING REMOTE THROTTLE**

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

## **ENGINE PROGRAMMING IDLE SPEED**

The engine low idle speed will be programmed at 700 rpm.

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## **ENGINE AIR INTAKE**

The engine air intake system shall include an ember separator. This ember separator shall be designed to protect the downstream air filter from embers using a combination of unique flat and crimped metal screens packaged in a heavy duty galvanized steel frame. This multilayered screen shall trap embers and allow them to burn out before passing through the pack.

The engine air intake system shall also include an air cleaner mounted above the radiator. This air cleaner shall utilize a replaceable dry type filter element designed to prevent dust and debris from being ingested into the engine. A service cover shall be provided on the housing, reducing the chance of contaminating the air intake system during air filter service.

The air intake system shall include a restriction indicator light in the warning light cluster on the instrument panel, which shall activate when the air cleaner element requires replacement.

## **ENGINE FAN DRIVE**

The engine cooling system fan shall incorporate a thermostatically controlled, Horton fully variable type fan drive with SmartClutch J-1939 CAN controller.

The variable speed fan clutch only engages at the amount needed for proper cooling to facilitate improved vehicle performance, cab heating in cold climates, and fuel economy. The fan clutch design shall be fail-safe so that if the clutch drive fails the fan shall engage to prevent engine overheating due to the fan clutch failure. The fan speed shall include a J-1939 CAN clutch controller to receive signal from the engine control module to activate at variable rates of speed. Variable speeds shall be set through thermostatic and engine speed signals to run as efficiently and quietly as required to maintain temperature.

## **ENGINE COOLING SYSTEM**

There shall be a heavy-duty aluminum cooling system designed to meet the demands of the emergency response industry. The cooling system shall have the capacity to keep the engine properly cooled under all conditions of road and pumping operations. The cooling system shall be designed and tested to meet or exceed the requirements specified by the engine and transmission manufacturer and all EPA requirements. The complete cooling system shall be mounted to isolate the entire system from vibration or stress. The individual cores of the cooling system shall be mounted in a manner to allow expansion and contraction at various rates without inducing stress into the adjoining cores.

The cooling system shall be comprised of a charge air cooler to radiator serial flow package that provides the maximum cooling capacity for the specified engine as well as serviceability. The main components shall include a surge tank, a charge air cooler bolted to the front of the radiator, recirculation shields, a shroud, a fan, and required tubing.

The radiator shall be a down-flow design constructed with aluminum cores, plastic end tanks, and a steel frame. The radiator shall be equipped with a drain cock to drain the coolant for serviceability.

The cooling system shall include a one piece injected molded polymer fan with a three (3) piece fiberglass fan shroud.

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The cooling system shall be equipped with a surge tank that is capable of removing entrained air from the system. The surge tank shall be equipped with a low coolant probe and rearward oriented sight glass to observe coolant in the system. A cold fill and observation line shall be included within the frame mounted translucent recovery bottle to monitor the level of the coolant. The surge tank shall have a dual seal cap that meets the engine manufacturer's pressure requirements and allows for expansion and recovery of coolant into a separate integral expansion chamber.

All radiator tubes shall be formed from aluminized steel tubing. Recirculation shields shall be installed where required to prevent heated air from reentering the cooling package and affecting performance.

The charge air cooler shall be a cross-flow design constructed completely of aluminum with cast tanks. All charge air cooler tubes shall be formed from aluminized steel tubing and installed with silicone hump hoses and stainless steel "constant torque" style clamps meeting the engine manufacturer's requirements.

The radiator and charge air cooler shall be removable through the bottom of the chassis.

## **ENGINE COOLING SYSTEM PROTECTION**

The engine cooling system shall include a recirculation shield designed to act as a light duty skid plate below the radiator to provide additional protection for the engine cooling system from light impacts, stones, and road debris. The skid plate shall be painted to match the frame components.

## **ENGINE COOLANT**

The cooling package shall include Extended Life Coolant (ELC). The use of ELC provides longer intervals between coolant changes over standard coolants providing improved performance. The coolant shall contain a 50/50 mix of ethylene glycol and de-ionized water to keep the coolant from freezing to a temperature of -34 degrees Fahrenheit.

Proposals offering supplemental coolant additives (SCA) shall not be considered, as this is part of the extended life coolant makeup.

## **ENGINE COOLANT FILTER**

An engine coolant filter with a shut-off valve for the inlet and outlet shall be installed on the chassis. The location of the filter shall allow for easy maintenance.

Proposals offering engines equipped with coolant filters shall be supplied with standard non-chemical type particulate filters.

## **ELECTRONIC COOLANT LEVEL INDICATOR**

The instrument panel shall feature a low engine coolant indicator light which shall be located in the center of the instrument panel. An audible tone alarm shall also be provided to warn of a low coolant incident.



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## **ENGINE PUMP HEAT EXCHANGER**

A single bundle type coolant to water heat exchanger shall be installed between the engine and the radiator. The heat exchanger shall be designed to prohibit water from the pump from coming in contact with the engine coolant. This shall allow the use of water from the discharge side of the pump to assist in cooling the engine.

## **COOLANT HOSES**

The cooling systems hose shall be formed silicone hose and formed aluminized steel tubing and include stainless steel constant torque band clamps.

## **ENGINE COOLANT OVERFLOW BOTTLE**

A remote engine coolant overflow expansion bottle shall be provided in the case of over filling the coolant system. The overflow bottle shall capture the expansion fluid or overfill rather than allow the fluid to drain on the ground.

## **ENGINE EXHAUST SYSTEM**

The exhaust system shall include an end-in end-out horizontally mounted single module after treatment device, and downpipe from the charge air cooled turbo. The single module shall include four temperature sensors, diesel particulate filter (DPF), urea dosing module (UL2), and a selective catalytic reduction (SCR) catalyst to meet current EPA standards. The selective catalytic reduction catalyst utilizes a diesel exhaust fluid solution consisting of urea and purified water to convert NOx into nitrogen, water, and trace amounts of carbon dioxide. The solution shall be mixed and injected into the system through the DPF and SCR.

The system shall utilize 0.07 inch thick stainless steel exhaust tubing between the engine turbo and the DPF. Zero leak clamps seal all system joints between the turbo and DPF.

The single module after treatment through the end of the tailpipe shall be connected with zero leak clamps. The discharge shall terminate horizontally on the right side of the vehicle ahead of the rear tires.

The exhaust system after treatment module shall be mounted below the frame in the inboard position. The mounting brackets shall be mounted on the inside of the frame.

## **DIESEL EXHAUST FLUID TANK**

The exhaust system shall include a molded cross linked polyethylene tank for Diesel Exhaust Fluid (DEF). The tank shall have a capacity of six (6) usable gallons and shall be mounted on the left hand side of the chassis frame behind the batteries below the frame.

The DEF tank shall be designed with capacity for expansion in case of fluid freezing. Engine coolant, which shall be thermostatically controlled, shall be run through lines in the tank to help prevent the DEF from freezing and to provide a means of thawing the fluid if it should become frozen.

The tank fill tube shall be routed under the rear of the cab with the fill neck and splash guard accessible in the top rear step.

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## **ENGINE EXHAUST ACCESSORIES**

An exhaust temperature mitigation device shall be shipped loose for installation by the body manufacturer on the vehicle. The temperature mitigation device shall lower the temperature of the exhaust by combining ambient air with the exhaust gasses at the exhaust outlet.

## **ENGINE EXHAUST WRAP**

The exhaust tubing between the engine turbo and the diesel particulate filter (DPF) shall be wrapped with a thermal cover in order to retain the necessary heat for DPF regeneration. The exhaust wrap shall also help protect surrounding components from radiant heat which can be transferred from the exhaust.

The exhaust flex joint shall not include the thermal exhaust wrap.

## **TRANSMISSION**

The drive train shall include an Allison model EVS 4000 torque converting, automatic transmission which shall include electronic controls. The transmission shall feature two (2) 10-bolt PTO pads located on the converter housing.

The transmission shall include two (2) internal oil filters which shall offer Castrol TranSynd™ synthetic TES 295 transmission fluid which shall be utilized in the lubrication of the EVS transmission. An electronic oil level sensor shall be included with the readout located in the shift selector.

The transmission gear ratios shall be:

1 <sup>st</sup>	3.51:1
2 <sup>nd</sup>	1.91:1
3 <sup>rd</sup>	1.43:1
4 <sup>th</sup>	1.00:1
5 <sup>th</sup>	0.74:1
6 <sup>th</sup>	0.64:1 (if applicable)
Rev	4.80:1

## **TRANSMISSION MODE PROGRAMMING**

The transmission, upon start-up, will automatically select a four (4) speed operation. The fifth speed over drive shall be available with the activation of the mode button on the shifting pad.

## **TRANSMISSION FEATURE PROGRAMMING**

The Allison Gen V-E transmission EVS group package number 127 shall contain the 198 vocational package in consideration of the duty of this apparatus as a pumper. This package shall incorporate an automatic neutral with selector override. This feature commands the transmission to neutral when the park brake is applied, regardless of drive range requested on the shift selector. This requires re-selecting drive range to shift out of neutral for the override.

This package shall be coupled with the use of a split shaft PTO and incorporate pumping circuits. These circuits shall be used allowing the vehicle to operate in the fourth range lockup while

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operating the pump mode due to the 1 to 1 ratio through the transmission, therefore the output speed of the engine is the input speed to the pump. The pump output can be easily calculated by using this input speed and the drive ratio of the pump itself to rate the gallons of water the pump can provide.

A transmission interface connector shall be provided in the cab. This package shall contain the following input/output circuits to the transmission control module. The Gen V-E transmission shall include prognostic diagnostic capabilities. These capabilities shall include the monitoring of the fluid life, filter change indication, and transmission clutch maintenance.

<u>Function ID</u>	<u>Description</u>	<u>Wire assignment</u>
Inputs		
C	PTO Request	142
J	Fire Truck Pump Mode (4th Lockup)	122 / 123
Outputs		
C	Range Indicator	145 (4th)
G	PTO Enable Output	130
	Signal Return	103

## **ELECTRONIC TRANSMISSION OIL LEVEL INDICATOR**

The transmission fluid shall be monitored electronically and shall send a signal to activate a warning in the instrument panel when levels fall below normal.

## **TRANSMISSION SHIFT SELECTOR**

An Allison pressure sensitive range selector touch pad shall be provided and located to the right of the driver within clear view and easy reach. The shift selector shall have a graphical Vacuum Florescent Display (VFD) capable of displaying two lines of text. The shift selector shall provide mode indication and a prognostic indicator (wrench symbol) on the digital display. The prognostics monitor various operating parameters and shall alert you when a specific maintenance function is required.

## **TRANSMISSION PRE-SELECT WITH AUXILIARY BRAKE**

When the auxiliary brake is engaged, the transmission shall automatically shift to second gear to decrease the rate of speed assisting the secondary braking system and slowing the vehicle.

## **TRANSMISSION COOLING SYSTEM**

The transmission shall include a water to oil cooler system located in the cooling loop between the radiator and the engine. The transmission cooling system shall meet all transmission manufacturer requirements. The transmission cooling system shall feature continuous flow of engine bypass water to maintain uninterrupted transmission cooling.

## **TRANSMISSION DRAIN PLUG**

The transmission shall include an original equipment manufacturer installed magnetic transmission fluid drain plug.

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## **TRANSMISSION WARRANTY**

The Allison EVS series transmission shall be warranted for a period of five (5) years with unlimited mileage. Parts and labor shall be included in the warranty.

## **LH PTO**

A PTO shall be installed on the transmission by the OEM.

## **LH PTO MODEL**

A ten (10) bolt Chelsea model 280-GGFJP-B5XD heavy duty transmission driven PTO shall be installed. The clutched shifted PTO is designed specifically for the Allison world transmission and provides an intermittent and continuous torque rating of 360 lb. ft.

## **PTO LOCATION**

The transmission shall have two (2) power take off (PTO) mounting locations, one (1) in the 8:00 o'clock position and one (1) in the 1:00 o'clock position.

## **LH PTO CONTROL**

The left hand power take off shall be prewired to be controlled by the transmission. It will use a virtual button on the Vista display and control screen with text messages. Disable is displayed when the switch is off. Enable is displayed when the switch is turned on. Active is displayed when the switch is on with positive engagement of the power take off.

Required operating conditions for enabling this function are:

- Throttle position is low
- Engine speed is within customer specified constant limits
- Transmission output speed is within customer specified constant limits
- Park brake set

## **DRIVELINE**

All drivelines shall be heavy duty metal tube and equipped with MSI 1810 series universal joints for the main drivelines, and 1710 series for the inter-axle shaft. The shafts shall be dynamically balanced prior to installation to alleviate future vibration. In areas of the driveline where a slip shaft is required, the splined slip joint shall be coated with Glide Coat®. The drivelines shall include Meritor brand u-joints with thrust washers.

## **MIDSHIP PUMP / GEARBOX**

A temporary jackshaft driveline shall be installed by the chassis manufacturer to accommodate the mid-ship split shaft pump as specified by the apparatus manufacturer. Holes shall be provided in the frame as specified by the OEM for mounting a Smeal aerial pump module.

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See PDF for specific hole pattern.

## **MIDSHIP PUMP / GEARBOX MODEL**

The midship pump/gearbox provisions shall be for a Waterous CSUC20 pump.

## **MIDSHIP PUMP GEARBOX DROP**

The Waterous pump gearbox shall have a “B” (short) drop length.

## **MIDSHIP PUMP RATIO**

The ratio for the midship pump shall be 2.27:1.

## **MIDSHIP PUMP LOCATION C/L SUCTION TO C/L REAR AXLE**

The midship pump shall be located so the dimension from the centerline of the suction to the centerline of the rear axle is 111.00 inches.

## **PUMP SHIFT CONTROLS**

One (1) Waterous air pump shift control panel shall be located on the left hand side of the engine tunnel, integrated with the shifter pod. The following shall be provided on the panel: a three (3) position control lever; a PUMP ENGAGED identification LED; and an OK TO PUMP identification LED. The pump shift control panel shall be white with a black border and shall include pump instructions. An instruction plate describing the transmission shift selector position used for pumping shall be provided and located so it can be read from the driver's position per NFPA **16.10.1.3**. The road mode shall be selected when the control lever is in the forward position and pump mode shall be selected when the control lever is in the rearward position.

The control lever center position shall exhaust air from both pump and road sides of the pump gear box shift cylinder.

## **PUMP SHIFT CONTROL PLUMBING**

Air connections shall be provided from the air supply tank to the pump shift control valve and from the pump shift control valve to the frame mounted bracket. The frame mounted bracket shall include labeling identifying the pump and road connection points with threaded 0.25 inch NPT fittings on the solenoid for attaching the customer installed pump. The air supply shall be pressure protected from service brake system.

## **FUEL FILTER/WATER SEPARATOR**

The fuel system shall have a Racor GreenMAX 6600R fuel filter/water separator as a primary filter. The fuel filter shall have a drain valve and a see-through cover to allow visual inspection of fuel and filter condition. The Racor 6600R shall meet engine requirements for particulate size, collection capacity, removal efficiency, and water removal efficiency. The filter shall be capable of handling a maximum flow rate of 150 gallons per hour.

A secondary fuel filter shall be included as approved by the engine manufacturer.

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An instrument panel lamp and audible alarm which indicates when water is present in the fuel-water separator shall also be included.

## **FUEL LINES**

The fuel system supply and return lines installed from the fuel tank to the engine shall be black textile braided lines which are reinforced with braided high tensile steel wire. The fuel lines shall be connected with reusable steel fittings.

## **FUEL SHUTOFF VALVE**

There shall be two (2) fuel shutoff valves which shall be installed, one (1) in the fuel draw line at the primary fuel filter and one (1) in the fuel outlet line at the primary fuel filter to allow the fuel filters to be changed without loss of fuel to the fuel pump.

A third fuel shutoff valve shall be installed in the fuel draw line, near the fuel tank to allow maintenance to be performed with minimal loss of fuel.

## **ELECTRIC FUEL PRIMER**

Integral to the engine assembly is an electric lift pump that serves the purpose of pre-filter fuel priming.

## **FUEL COOLER**

An aluminum cross flow air to fuel cooler shall be provided to lower fuel temperature allowing the vehicle to operate at higher ambient temperatures. The fuel cooler shall be located behind the rear axle.

## **FUEL TANK**

The fuel tank shall have a capacity of fifty (50) gallons and shall measure 35.00 inches in width X 15.00 inches in height X 24.00 inches in length.

The baffled tank shall have a vent port to facilitate venting to the top of the fill neck for rapid filling without "blow-back" and a roll over ball check vent for temperature related fuel expansion and draw.

The tank is designed with dual draw tubes and sender flanges. The tank shall have 2.00 inch NPT fill ports for right or left hand fill. A 0.50 inch NPT drain plug shall be centered in the bottom of the tank.

The fuel tank shall be mounted below the frame, behind the rear axle. Two (2) three-piece strap hanger assemblies with "U" straps bolted midway on the fuel tank front and rear shall be utilized to allow the tank to be easily lowered and removed for service purposes. Rubber isolating pads shall be provided between the tank and the upper tank mounting brackets. Strap mounting studs through the rail, hidden behind the body shall not be acceptable.

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## **FUEL TANK MATERIAL AND FINISH**

The fuel tank shall be constructed of 12 gauge aluminized steel. The exterior of the tank shall be powder coated black and then painted to match the frame components.

All powder coatings, primers and paint shall be compatible with all metals, pretreatments and primers used. The cross hatch adhesion test per ASTM D3359 Method B, results to be 5B minimum. The pencil hardness test per ASTM D3363 shall have a final post-curved pencil hardness of H-2H. The direct impact resistance test per ASTM D2794, results to be 5B minimum.

Any proposals offering painted fuel tanks with variations from the above process shall not be accepted. The film thickness of vendor supplied parts shall also be sufficient to meet the performance standards as stated above.

## **FUEL TANK STRAP MATERIAL**

The fuel tank straps shall be constructed of ASTM A-36 steel. The fuel tank straps shall be powder coated black and then painted to match the frame components if possible.

## **FUEL TANK MISCELLANEOUS OPTIONS**

The fuel tank shall be temporarily mounted, to be permanently relocated by the OEM. The tank and mounting straps as specified shall be included with the chassis along with components for permanent standard installation.

## **FUEL TANK FILL PORT**

The fuel tank fill ports shall be offset with the left fill port located in the rearward position and the right fill port located in the middle position on the fuel tank.

## **FUEL TANK SERVICEABILITY PROVISIONS**

The chassis fuel lines and sender wiring shall have additional length provided so the tank can be easily lowered and removed for service purposes. The additional 12.00 feet of length shall be located above the fuel tank and shall be coiled and secured. The fuel line fittings shall be pointed towards the right side (curbside) of the chassis.

## **FUEL TANK DRAIN PLUG**

A 0.5 inch NPT magnetic drain plug shall be centered in the bottom of the fuel tank.

## **FRONT AXLE**

The front axle shall include an independent front suspension (IFS) offering superior ride and improved handling.

The suspension shall utilize fully independent double wishbone arms with carrier and kingpin for optimized scrub radius. Air springs are tuned for ride and help reduce suspension weight. The IFS reduces turn radius with improved wheel cut over beam axles. The hydraulic damper shall feature rebound control to ensure the maximum load stability and superior driver comfort. The IFS system shall improve handling and offer better braking because of improved ground to tire

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ratio. This design shall allow for independent adjustment of the vehicle's alignment settings. The IFS shall include an auxiliary transverse leaf spring.

Proposals offering independent front axles comprised of torsion bar style suspensions shall not be considered.

## **FRONT AXLE WARRANTY**

The front axle shall be warranted by Tuthill for three (3) years or 150,000 miles, whichever comes first. Details of the Tuthill warranty are provided on the PDF document attached to this option.

## **FRONT WHEEL BEARING LUBRICATION**

The front axle wheel bearings shall be lubricated with oil. The oil level can be visually checked via clear inspection windows in the front axle hubs.

## **FRONT SHOCK ABSORBERS**

Two (2) Koni shock absorbers shall be provided and installed as part of the front suspension system. Each shock shall deliver improved road handling and durability.

## **FRONT SUSPENSION**

The chassis shall include an independent front suspension (IFS) system. The known advantages of IFS systems can be improved handling and better braking due to the increase in tire surface to ground contact area. The suspension travel of the IFS shall be approximately 6.50 inches, providing 3.00 inches bounce and 3.50 inches rebound of the suspension. The IFS front axle shall be rated between 21,000 and 24,000 pounds.

## **STEERING COLUMN/ WHEEL**

The cab shall include a Douglas Autotech steering column which shall include a seven (7) position tilt, a 2.25 inch telescopic adjustment, and an 18.00 inch, four (4) spoke steering wheel located at the driver's position. The steering wheel shall be covered with black polyurethane foam padding.

The steering column shall contain a horn button, self-canceling turn signal switch, four-way hazard switch and headlamp dimmer switch.

## **ELECTRONIC POWER STEERING FLUID LEVEL INDICATOR**

The power steering fluid shall be monitored electronically and shall send a signal to activate an audible alarm and visual warning in the instrument panel when fluid level falls below normal.

## **POWER STEERING PUMP**

The hydraulic power steering pump shall be a TRW PS and shall be gear driven from the engine. The pump shall be a balanced, positive displacement, sliding vane type. The power steering system shall include an oil to air passive cooler.



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## **FRONT AXLE CRAMP ANGLE**

The chassis shall have a front axle cramp angle of 48-degrees to the left and right.

## **POWER STEERING GEAR**

The power steering gear shall be a TRW model TAS 85/RCS 85.

## **CHASSIS ALIGNMENT**

The chassis frame rails shall be measured to insure the length is correct and cross checked to make sure they run parallel and are square to each other. The front and rear axles shall be laser aligned. The front tires and wheels shall be aligned and toe-in set on the front tires by the chassis manufacturer.

## **REAR AXLE**

The rear axle shall be a Meritor model RT-52-185 tandem drive axle. The axle shall include precision forged, single reduction differential gearing, and shall have a fire service rated capacity of 54,000 pounds.

The axle shall be built of superior construction and quality components to provide the rugged dependability needed to stand up to the fire industry's demands. The axle shall include rectangular shaped, hot-formed housing with a standard wall thickness of 0.56 of an inch for extra strength and rigidity and a rigid differential case for high axle strength and reduced maintenance.

The axle shall have heavy-duty Hypoid gearing for longer life, greater strength and quieter operation. Industry-standard wheel ends for compatibility with both disc and drum brakes, and unitized oil seal technology to keep lubricant in and help prevent contaminant damage will be used.

## **REAR AXLE DIFFERENTIAL LUBRICATION**

The rear axle differential shall be lubricated with oil.

## **REAR AXLE WARRANTY**

The rear axle shall be warranted by Meritor for five (5) years with unlimited miles under the general service application. Details of the Meritor warranty are provided on the PDF document attached to this option.

## **REAR WHEEL BEARING LUBRICATION**

The rear axle wheel bearings shall be lubricated with oil.

## **REAR AXLE DIFFERENTIAL CONTROL**

The tandem axle chassis shall include an inter-axle differential lock which shall allow both axles to be engaged as drive axles. The inter-axle differential lock shall be controlled by a virtual button on the Vista display and control screen. The Vista display shall indicate when positive engagement of the inter-axle differential lock has occurred.

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## **VEHICLE TOP SPEED**

The top speed of the vehicle shall be approximately 60 MPH +/-2 MPH at governed engine RPM.

## **REAR SUSPENSION**

The tandem rear axle shall feature a Raydan Air-Link AL-520 air suspension. The Air-Link AL-520 shall offer a unique air ride and walking beam suspension design which combines a super smooth ride with durability. The suspension shall offer (2) moving parts which shall provide long wear and low maintenance. The rear tandem suspension shall include 54.00 inch axle centers.

Dual air height control valves shall be installed to ensure equal frame height on both sides of the vehicle regardless of the load.

The rear suspension is run flat compatible at reduced speeds.

The rear suspension capacity shall be rated at 40,000 to 52,000 pounds.

## **REAR SHOCK ABSORBERS**

Shock absorbers shall be supplied by the suspension manufacturer and installed on the rear axle suspension.

## **SUSPENSION CONTROLS**

The front suspension shall incorporate an air retention system which shall activate when the park brake is engaged. The air retention system shall retain air in the front suspension air bags when the chassis is raised off the ground by the aerial outriggers. There shall be an air retention system low pressure indicator within the driver's instrumentation panel.

The rear suspension shall incorporate a kneeling feature which, when activated, will deplete the air in the air bag to lower the rear of the chassis.

The kneeling system shall include a button on the Vista display and control screen to control the rear kneeling feature. The system shall include a park brake interlock and an instrument panel mounted red indicator lamp, which shall illuminate when the system is activated.

## **TIRE INTERMITTENT SERVICE RATING**

The chassis shall be rated using Intermittent Service ratings provided to the emergency vehicle market by the tire manufacturers as the basis for determining the maximum vehicle load and speed.

## **FRONT TIRE**

The front tires shall be Michelin 425/65R22.5 "L" tubeless radial XFE regional tread.

The front tire stamped load capacity shall be 22,800 pounds per axle with a nominal speed rating of 65 miles per hour when properly inflated to 120 pounds per square inch.

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The Michelin Intermittent Service Rating maximum load capacity shall be 24,396 pounds per axle with a maximum speed of 65 miles per hour when properly inflated to 120 pounds per square inch.

The Michelin Intermittent Service Rating maximum speed capacity shall be 22,800 pounds per axle with a speed rating of 75 miles per hour when properly inflated to 120 pounds per square inch.

The Michelin Intermittent Service Rating limits the operation of the emergency vehicle to no more than fifty (50) miles of continuous operation under maximum recommended payload, or without stopping for at least twenty (20) minutes. The emergency vehicle must reduce its speed to no more than 50 MPH after the first fifty (50) miles of travel.

## **REAR TIRE**

The rear tires shall be Michelin 12R-22.5 16PR "H" tubeless radial XZE regional tread.

The rear tire stamped load capacity shall be 27,120 pounds per axle with a speed rating of 75 miles per hour when properly inflated to 120 pounds per square inch.

The Michelin Tire Intermittent Service Rating load capacity shall be 28,880 pounds per axle with a speed rating of 75 miles per hour when properly inflated to 120 pounds per square inch. The Michelin Intermittent Service Rating limits the operation of the emergency vehicle to one (1) hour of loaded travel with a one (1) hour cool down prior to another loaded run.

## **REAR AXLE RATIO**

The rear axle ratio shall be 5.38:1.

## **TIRE PRESSURE INDICATOR**

There shall be electronic chrome LED valve caps shipped loose for installation by the OEM which shall illuminate with a red LED when tire pressure drops 8psi provided. The valve caps are self-calibrating and set to the pressure of the tire upon installation.

## **FRONT WHEEL**

The front wheels shall be Alcoa hub piloted, 22.50 inch X 12.25 inch LvL One™ polished aluminum wheels. The hub piloted mounting system shall provide easy installation and shall include two-piece flange nuts. The wheels shall feature one-piece forged strength and shall include Alcoa's Dura-Bright® finish as an integral part of the wheel surface. Alcoa Dura-Bright® wheels keep their shine without polishing. Brake dust, grime and road debris are easily removed by simply cleaning the wheels with soap and water.

## **REAR WHEEL**

The rear wheels shall be Alcoa hub piloted, 22.50 inch X 8.25 inch LvL One™ aluminum wheels with a polished outer surface and Alcoa Dura-Bright® wheel treatment as an integral part of the wheel. The hub piloted mounting system shall provide easy installation and shall include two-piece flange nuts.

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## **BALANCE WHEELS AND TIRES**

All of the wheels and tires, including any spare wheels and tire assemblies, shall be dynamically balanced.

## **WHEEL TRIM**

The front wheels shall include stainless steel lug nut covers and stainless steel baby moons shipped loose with the chassis for installation by the apparatus builder. The baby moons shall have cutouts for oil seal viewing when applicable.

The rear wheels shall include stainless steel lug nut covers and band mounted spring clip stainless steel high hats shipped loose with the chassis for installation by the apparatus builder.

The lug nut covers, baby moons, and high hats shall be RealWheels® brand constructed of 304L grade, non-corrosive stainless steel with a mirror finish. Each wheel trim component shall meet D.O.T. certification.

## **BRAKE SYSTEM**

A rapid build-up air brake system shall be provided. The air brakes shall include, at a minimum, a three (3) air tank, four (4) reservoir system with a total of 6236 cubic inch of air capacity. A floor mounted treadle valve shall be mounted inside the cab for graduated control of applying and releasing the brakes. An inversion valve shall be installed to provide a service brake application in the unlikely event of primary air supply loss. All air reservoirs provided on the chassis shall be labeled for identification.

The tandem rear axle spring brakes shall automatically apply in any situation when the air pressure falls below 25 PSI and shall include a mechanical means for releasing the spring brakes when necessary. An audible alarm shall designate when the system air pressure is below 60 PSI.

A six (6) sensor, six (6) modulator Anti-lock Braking System (ABS) shall be installed on the front and tandem rear axles in order to prevent the brakes from locking or skidding while braking during hard stops or on icy or wet surfaces. This in turn shall allow the driver to maintain steering control under heavy braking and in most instances, shorten the braking distance. The electronic monitoring system shall incorporate diagonal circuitry which shall monitor wheel speed during braking through a sensor and tone ring on each wheel. A dash mounted ABS lamp shall be provided to notify the driver of a system malfunction. The ABS system shall automatically disengage the auxiliary braking system device when required. The speedometer screen shall be capable of reporting all active defaults using PID/SID and FMI standards.

Additional safety shall be accommodated through Automatic Traction Control (ATC) which shall be installed on the tandem rear axle. The ATC system shall apply the ABS when the drive wheels loose traction. The system shall scale the electronic engine throttle back to prevent wheel spin while accelerating on ice or wet surfaces.

A virtual style switch shall be provided and properly labeled "mud/snow". When the switch is pressed once, the system shall allow a momentary wheel slip to obtain traction under extreme mud and snow conditions. During this condition the ATC light shall blink continuously notifying the driver of activation. Pressing the switch again shall deactivate the mud/snow feature.

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The Electronic Stability Control (ESC) unit is a functional extension of the electronic braking system. It is able to detect any skidding of the vehicle about its vertical axis as well as any rollover tendency. The control unit comprises an angular-speed sensor that measures the vehicle's motion about the vertical axis, caused, for instance, by cornering or by skidding on a slippery road surface. An acceleration sensor measures the vehicle's lateral acceleration. The Controller Area Network (CAN) bus provides information on the steering angle. On the basis of lateral acceleration and steering angle, an integrated microcontroller calculates a theoretical angular speed for the stable vehicle condition.

## **FRONT BRAKES**

The front brakes shall be Knorr/Bremse SN7 disc brakes with 17.00 inch vented rotors.

## **REAR BRAKES**

The rear brakes shall be Meritor EX225 Disc Plus disc brakes with 17.00 inch vented rotors.

## **PARK BRAKE**

Upon application of the push-pull valve in the cab, the rear brakes will engage via mechanical spring force. This is accomplished by dual chamber rear brakes, satisfying the FMVSS parking brake requirements.

## **SUPPLEMENTAL BRAKE**

A supplemental brake engagement shall be supplied that can only be engaged while the rear spring brakes are engaged. In addition to the mechanical rear brake engagement, the front service brakes shall also be engaged via air pressure, providing additional braking capability. Front service brake activation shall be accomplished with activation of the rear mechanical park brake valve.

## **PARK BRAKE CONTROL**

A Meritor-Wabco manual hand control push-pull style valve shall operate the parking brake.

The parking brake actuation valve shall be mounted to the left side of the engine tunnel integrated into the transmission shift pod console within easy access of the driver. The control shall include a protective guard which shall prevent accidental activation of the parking brake and still allow proper actuation of the control.

## **AIR DRYER**

The brake system shall include a Wabco System Saver 1200 air dryer with an integral 100 watt heater with a Metri-Pack sealed connector. The air dryer incorporates an internal turbo cutoff valve that closes the path between the air compressor and air dryer purge valve during the compressor "unload" cycle. The turbo cutoff valve allows purging of moisture and contaminants without the loss of turbo boost pressure. The air dryer shall be located on the right hand frame rail forward of the front wheel behind the right hand cab step.

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## **FRONT BRAKE CHAMBERS**

The front brakes shall be provided with type 24 brake chambers as supplied with the independent front suspension axle.

## **REAR BRAKE CHAMBERS**

The rear axle shall include MGM 24/24 brake chambers shall convert the energy of compressed air into mechanical force and motion. This shall actuate the brake camshaft, which in turn shall operate the foundational brake mechanism forcing the brake pads against the brake rotor.

## **AIR COMPRESSOR**

The air compressor provided for the engine shall be a Wabco® SS318 single cylinder pass-through drive type compressor which shall be capable of producing 18.7 CFM at 1200 engine RPMs. The air compressor shall feature a higher delivery efficiency translating to more air delivery per horsepower absorbed. The compressor shall include an aluminum cylinder head which shall improve cooling, reduce weight and decrease carbon formation. Superior piston and bore finishing technology shall reduce oil consumption and significantly increasing the system component life.

## **AIR GOVERNOR**

An air governor shall be provided to control the cut-in and cut-out pressures of the engine mounted air compressor. The governor shall be calibrated to meet FMVSS requirements. The air governor shall be located on the air dryer bracket.

## **AUXILIARY AIR RESERVOIR**

One (1) auxiliary air reservoir with a 2084 cubic inch capacity shall be installed on the chassis to act as an additional reserve supply to the air system for air horn, air tool, or other non-service brake use. The reservoir shall be isolated with a 90 PSI pressure protection valve on the reservoir supply side to prevent depletion of the air to the air brake system.

## **MOISTURE EJECTORS**

Heated, automatic moisture ejectors with a manual drain provision shall be installed on all reservoirs of the air supply system. The manual drain provision shall include an actuation pull cable coiled and tied at each drain valve. The supplied cables when extended shall be sufficient in length to allow each drain to be activated from the side of the apparatus.

## **AIR SUPPLY LINES**

The air system on the chassis shall be plumbed with color coded reinforced nylon tubing air lines. The primary (rear) brake line shall be green, the secondary (front) brake line red, the parking brake line orange and the auxiliary (outlet) will be blue.

Brass compression type fittings shall be used on the nylon tubing. All drop hoses shall include fiber reinforced neoprene covered hoses.

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## **REAR AIR TANK MOUNTING**

If a combination of wheelbase, air tank quantity, or other requirements necessitate the location of one or more air tanks to be mounted rear of the fuel tank, these tank(s) will be mounted perpendicular to frame.

## **WHEELBASE**

The chassis wheelbase shall be 231.00 inches.

## **REAR OVERHANG**

The chassis rear overhang shall be 64.00 inches.

## **FRAME**

The frame shall consist of double rails running parallel to each other with cross members forming a ladder style frame. The frame rails shall be formed in the shape of a "C" channel, with the outer rail measuring 10.25 inches high X 3.50 inches deep upper and lower flanges X 0.38 inches thick with an inner channel of 9.44 inches high X 3.13 inches deep and 0.38 inches thick. Each rail shall be constructed of 110,000 psi minimum yield high strength low alloy steel. Each double rail section shall be rated by a Resistance Bending Moment (RBM) minimum of 3,213,100 inch pounds and have a minimum section modulus of 29.21 cubic inches. The frame shall measure 35.00 inches in width.

Proposals calculating the frame strength using the "box method" shall not be considered.

Proposals including heat treated rails shall not be considered. Heat treating frame rails produces rails that are not uniform in their mechanical properties throughout the length of the rail. Rails made of high strength, low alloy steel are already at the required yield strength prior to forming the rail.

A minimum of seven (7) fully gusseted 0.25 inch thick cross members shall be installed. The inclusion of the body mounting, or bumper mounting shall not be considered as a cross member. The cross members shall be attached using zinc coated grade 8 fasteners. The bolt heads shall be flanged type, held in place by distorted thread flanged lock nuts. Each cross member shall be mounted to the frame rails utilizing a minimum of 0.25 inch thick gusset reinforcement plates at all corners balancing the area of force throughout the entire frame.

Any proposals not including additional reinforcement for each cross member shall not be considered.

All relief areas shall be cut in with a minimum 2.00 inch radius at intersection points with the edges ground to a smooth finish to prevent a stress concentration point.

## **FRAME WARRANTY**

Summary of Warranty Terms:

THE FOLLOWING IS SUMMARY OF WARRANTY TERMS FOR INFORMATION ONLY. THE ACTUAL LIMITED WARRANTY TERMS CAN BE FOUND IN THE CHASSIS WARRANTY

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DOCUMENT, WHICH CONTAINS THE COMPLETE STATEMENT OF THE WARRANTY. SPARTAN'S RESPONSIBILITY IS TO BE ACCORDING TO THE TERMS OF THE COMPLETE LIMITED WARRANTY DOCUMENT.

The frame and cross members shall carry a limited lifetime warranty to the original purchaser. The warranty period shall commence on the date the vehicle is delivered to the first end user.

## **MISCELLANEOUS FRAME OPTIONS**

The frame shall include drillings which shall be specific to mounting a Smeal 105RM, 100RM, 125RM, or 100MM substructure.

See PDF for OEM Specified pattern.

## **FRAME CLEAR AREA**

The chassis frame shall be left clear of chassis mounted components inside or outside the frame rails within the first 30.00 inches behind the cab to allow space for OEM installed components. Cross members may be installed in the clear area if required for proper frame or driveline configuration.

## **FRAME PAINT**

The frame rails shall be hot dip galvanized prior to assembly and attachment of any components. The components that shall be galvanized shall include:

- Main frame "C" channel or channels

The frame parts which are not galvanized shall be powder coated prior to any attachment of components. Parts which shall be powder coated shall include but are not limited to:

- Steering gear bracket
- Front splayed rails and fish plates
- Bumper extensions
- Cross members
- Cross member gussets
- Fuel tank mounting brackets
- Fuel tank straps (unless material/finish is specified in 3130 subcat)
- Air tanks (unless color coded tanks are specified in 3205 subcat)
- Air tank mounting brackets
- Exhaust mounting brackets



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- Air cleaner skid plate
- Radiator skid plate
- Battery supports, battery trays and battery covers

Other non-galvanized under carriage components which are received from the suppliers with coatings already applied shall include but are not limited to:

- Suspension components
- Front and rear axles

All powder coatings, primers and paint used on the non-galvanized components shall be compatible with all metals, pretreatments and primers used. The cross hatch adhesion test per ASTM D3359 shall not have a fail of more than ten (10) squares. The pencil hardness test per ASTM D3363 shall have a final post-cured pencil hardness of H-2H. The direct impact resistance test per ASTM D2794 shall have an impact resistance of 120.00 inches per pound at 2 mils.

## **FRONT BUMPER**

The chassis shall be equipped with a severe duty front bumper constructed from structural steel channel. The bumper material shall be 0.38 thick ASTM A36 steel which shall measure 12.00 inches high with a 3.05 inch flange and shall be 104.50 inches wide with angled front corners.

The bumper shall be primed and painted as specified.

## **FRONT BUMPER EXTENSION LENGTH**

The front bumper shall be extended approximately 21.00 inches ahead of the cab.

## **FRONT BUMPER PAINT**

The front bumper shall be painted the same as the lower cab color.

## **FRONT BUMPER APRON**

The 21.00 inch extended front bumper shall include an apron constructed of 0.19 inch thick embossed aluminum tread plate.

The apron shall be installed between the bumper and the front face of the cab affixed using stainless steel bolts attaching the apron to the top bumper flange.

## **FRONT BUMPER DISCHARGE**

The bumper apron shall include a 2.50 inch diameter plumbed line intended for use as a discharge trash line. The discharge line shall be routed through the right side bumper apron down the right handrail to the area rear of the front axle, ahead of the battery box. The discharge shall terminate vertically through the right side apron position with a, 2.50 inch NPT (national pipe thread) x 2.50 inch NST (national standard thread) SST (stainless steel thread), Chicksan swivel to accommodate deployment of hose in different directions. The bumper apron shall feature an aluminum diamond

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plate Chicksan guard with two (2) rubber bump stops to prevent the Chicksan from contacting the cab. The smooth side of the guard shall feature a DA finish.

The discharge pipe shall be a 2.50 inch stainless steel schedule 10 tube. The discharge shall include a Victaulic groove for connecting to the pump on the end of the tube.

The apparatus manufacturer shall plumb the discharge pipe to the pump and shall provide all valves as required.

## **FRONT BUMPER COMPARTMENT CENTER**

The front bumper shall include a compartment in the bumper apron located in the center between the frame rails which may be used as a hose well. The compartment shall be constructed of 0.13 inch 5052-H32 grade aluminum and shall include drain holes in the bottom corners to allow excess moisture to escape. The compartment shall be the full size of available space in the apron from the cab fascia to the bumper and 38.00 inches wide X 10.88 inches deep. The clear opening shall be 37.75 inches wide. The compartment shall include a notched cover constructed of 0.19 inch thick bright embossed aluminum tread plate. The notch shall be located in the right front portion of the cover and shall be 4.00 inches in length with a 2.00 inches wide radius.

## **FRONT BUMPER COMPARTMENT COVER HARDWARE**

The front bumper compartment cover(s) shall include gas cylinder stays which shall hold the cover open. Each cover shall be held in the closed position via a D-ring style latch.

## **MECHANICAL SIREN**

The front bumper shall include an electromechanical Federal Q2B™ siren, which shall be streamlined, chrome-plated and shall produce 123 decibels of sound at 10.00 feet. The Q2B™ siren produces a distinctive warning sound that is recognizable at long distances. A unique clutch design provides a longer coast down sound while reducing the amp draw to 100 amps. The siren shall measure 10.50 inches wide X 10.00 inches high X 14.00 inches deep. The siren shall include a pedestal mount to surface mount on a horizontal surface.

## **MECHANICAL SIREN LOCATION**

The siren shall be pedestal mounted on the bumper apron on the furthest outboard section of the bumper on the driver side.

## **AIR HORN**

The chassis shall include two (2) Grover brand Stutter Tone air horns which shall measure 24.50 inches long with a 6.00 inch round flare. The air horns shall be trumpet style with a chrome finish.

## **AIR HORN LOCATION**

The air horns shall be recess mounted in the front bumper face, one (1) on the right side of the bumper in the inboard position relative to the right hand frame rail and one (1) on the left side of the bumper in the inboard position relative to the left hand frame rail.

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## **AIR HORN RESERVOIR**

One (1) air reservoir, with a 2084 cubic inch capacity, shall be installed on the chassis to act as a supply tank for operating air horns. The reservoir shall be isolated with a 90 PSI pressure protection valve on the reservoir supply side to prevent depletion of the air to the air brake system.

## **ELECTRONIC SIREN SPEAKER**

There shall be two (2) Whelen Engineering Inc. model SA314A, 100 watt speakers provided. Each speaker shall measure 6.40 inches tall X 6.17 inches wide X 3.14 inches deep. Each speaker shall have a natural cast aluminum finish and shall be installed using a polished custom Spartan grille.

## **ELECTRONIC SIREN SPEAKER LOCATION**

The two (2) electronic siren speakers shall be located on the front bumper face outboard of the frame rails with one (1) on the right side and one (1) on the left side in the outboard positions.

## **FRONT BUMPER TOW HOOKS**

Two (2) heavy duty tow hooks, painted to match the frame components, shall be installed in the rearward position out of the approach angle area, bolted directly to the side of each chassis frame rail with grade 8 bolts.

## **CAB TILT SYSTEM**

The entire cab shall be capable of tilting approximately 45-degrees to allow for easy maintenance of the engine and transmission. The cab tilt pump assembly shall be located on the right side of the chassis above the battery box.

The electric-over-hydraulic lift system shall include an ignition interlock and red cab lock down indicator lamp on the tilt control which shall illuminate when holding the "Down" button to indicate safe road operation.

It shall be necessary to activate the master battery switch and set the parking brake in order to tilt the cab. As a third precaution the ignition switch must be turned off to complete the cab tilt interlock safety circuit.

Two (2) spring-loaded hydraulic hold down hooks located outboard of the frame shall be installed to hold the cab securely to the frame. Once the hold-down hooks are set in place, it shall take the application of pressure from the hydraulic cab tilt lift pump to release the hooks.

Two (2) cab tilt cylinders shall be provided with velocity fuses in each cylinder port. The cab tilt pivots shall be 1.90 inch ball and be anchored to frame brackets with 1.25 inch diameter studs.

A steel safety channel assembly, painted safety yellow shall be installed on the right side cab lift cylinder to prevent accidental cab lowering. The safety channel assembly shall fall over the lift cylinder when the cab is in the fully tilted position. A cable release system shall also be provided to retract the safety channel assembly from the lift cylinder to allow the lowering of the cab.

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## **CAB TILT AUXILIARY PUMP**

A manual cab tilt pump module shall be attached to the cab tilt pump housing.

## **CAB TILT LIMIT SWITCH**

A cab tilt limit switch shall be installed. The switch will effectively limit the travel of the cab when being tilted. The limit adjustment of the switch shall be preset by the chassis manufacturer to prevent damage to the cab or any bumper mounted option mounted in the cab tilt arc. Further adjustment to the limit by the apparatus manufacturer shall be available to accommodate additional equipment.

## **CAB TILT CONTROL RECEPTACLE**

The cab tilt control cable shall include a receptacle which shall be temporarily located on the right hand chassis rail rear of the cab to provide a place to plug in the cab tilt remote control pendant. The tilt pump shall include 8.00 feet of cable with a six (6) pin Deutsch receptacle with a cap.

The remote control pendant shall include 20.00 feet of cable with a mating Deutsch connector. The remote control pendant shall be shipped loose with the chassis.

## **CAB TILT LOCK DOWN INDICATOR**

The cab dash shall include a message located within the dual air pressure gauge which shall alert the driver when the cab is unlocked and ajar. The alert message shall cease to be displayed when the cab is in the fully lowered position and the hold down hooks are secured and locked to the cab mounts.

In addition to the alert message an audible alarm shall sound when the cab is unlocked and ajar and the parking brake is released.

## **CAB WINDSHIELD**

The cab windshield shall have a surface area of 2969.88 square inches and be of a two (2) piece wraparound design for maximum visibility.

The glass utilized for the windshield shall include standard automotive tint. The left and right windshield shall be fully interchangeable thereby minimizing stocking and replacement costs.

Each windshield shall be installed using black self-locking window rubber.

## **GLASS FRONT DOOR**

The front cab doors shall include a window which is 27.00 inches in width X 26.00 inches in height. These windows shall have the capability to roll down completely into the door housing. This shall be accomplished manually utilizing a crank style handle on the inside of the door. A reinforced window regulator assembly shall be provided for severe duty use.

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There shall be an irregular shaped fixed window which shall measure 2.50 inches wide at the top, 8.00 inches wide at the bottom X 26.00 inches in height, more commonly known as “cozy glass” ahead of the front door roll down windows.

The windows shall be mounted within the frame of the front doors trimmed with a black anodized ring on the exterior.

## **GLASS TINT FRONT DOOR**

The windows located in the left and right front doors shall include a dark gray automotive tint which shall allow forty-five percent (45%) light transmittance. The dark tint shall aid in cab cooling and help protect passengers from radiant solar energy.

## **GLASS REAR DOOR RH**

The rear right hand side door shall include a window which is 27.00 inches in width X 26.00 inches in height. This window shall roll up and down manually utilizing a crank style handle on the inside of the door. A reinforced window regulator assembly shall be provided for severe duty use.

## **GLASS TINT REAR DOOR RIGHT HAND**

The window located in the right hand side rear window shall include a dark gray automotive tint which shall allow forty-five percent (45%) light transmittance. The dark tint shall aid in cab cooling and help protect passengers from radiant solar energy.

## **GLASS REAR DOOR LH**

The rear left hand side door shall include a window which is 27.00 inches in width X 26.00 inches in height. This window shall roll up and down manually utilizing a crank style handle on the inside of the door. A reinforced window regulator assembly shall be provided for severe duty use.

## **GLASS TINT REAR DOOR LEFT HAND**

The window located in the left hand side rear door shall include a dark gray automotive tint which shall allow forty-five percent (45%) light transmittance. The dark tint shall aid in cab cooling and help protect passengers from radiant solar energy.

## **GLASS SIDE MID RH**

The cab shall include a window on the right side behind the front and ahead of the crew door which shall measure 16.00 inches wide X 26.00 inches high. This window shall be fixed within this space and shall be rectangular in shape. The window shall be mounted using self-locking window rubber. The glass utilized for this window shall include a green automotive tint unless otherwise noted.

# METRO FIRE APPARATUS

## **GLASS TINT SIDE MID RIGHT HAND**

The window located on the right hand side of the cab between the front and rear doors shall include a dark gray automotive tint which shall allow forty-five percent (45%) light transmittance. The dark tint shall aid in cab cooling and help protect passengers from radiant solar energy.

## **GLASS SIDE MID LH**

The cab shall include a window on the left side behind the front door and ahead of the crew door and above the wheel well which shall measure 16.00 inches wide X 26.00 inches high. This window shall be fixed within this space and shall be rectangular in shape. The window shall be mounted using self-locking window rubber. The glass utilized for this window shall include a green automotive tint unless otherwise noted.

## **GLASS TINT SIDE MID LEFT HAND**

The window located on the left hand side of the cab between the front and rear doors shall include a dark gray automotive tint which shall allow forty-five percent (45%) light transmittance. The dark tint shall aid in cab cooling and help protect passengers from radiant solar energy.

## **CLIMATE CONTROL**

A ceiling mounted combination defroster and cabin heating and air conditioning system shall be located above the engine tunnel area. The system covers and plenums shall be of severe duty design made of aluminum which shall be coated with a customer specified interior paint. The design of the system's covers shall provide quick access to washable air intake filters as well as easy access to other serviceable items.

The air delivery plenums provide targeted airflow directly to the vehicle occupants. Six (6) adjustable louvers will provide comfort for the front seat occupants and ten (10) adjustable louvers will provide comfort for the rear crew occupants.

The system shall be capable of producing up to 12 FPM of air velocity at all occupant seating positions. Separate front and rear blower motors shall be of brushless design and shall be controlled independently. It shall be capable of reducing the interior cabin air temperature from 122° F (+/- 3° F) to 80° F in thirty minutes with 50% relative humidity and full solar load as described in SAE J2646.

The system shall also provide heater pull up performance which meets or exceeds the performance requirements of SAE J1612 as well as defrost performance that meets or exceeds the performance requirements of SAE J381.

A gravity drain system shall be provided that is capable of evacuating condensate from the vehicle while on a slope of up to a 13% grade in any direction.

The air conditioning system plumbing shall be a mixture of custom bent zinc coated steel fittings and Aeroquip flexible hose with Aeroquip EZ-Clip fittings.

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The overhead heater/defroster plumbing shall include an electronic flow control valve that re-directs hot coolant away from the evaporator, via a bypass loop, as the temperature control is moved toward the cold position.

Any component which needs to be accessed to perform system troubleshooting shall be accessible by one person using basic hand tools. Regularly serviced items shall be replaceable by one person using basic hand tools.

***\*\*Spartan Motors Inc. recommends that the overall climate system performance be based off third-party testing in accordance to Society of Automotive Engineering standards as a complete system.***

***Individual component level BTU ratings is not an accurate indicator of the performance capability of the completed system. System individual component BTU ratings:***

- Air conditioning evaporator total BTU/HR: 82,000
- Air conditioning condenser total BTU/HR: 59,000
- Heater coil total BTU/HR: 98,000

***Performance data specified is based on testing performed by an independent third-party test facility using a medium four-door 10" Raised roof Gladiator chassis equipped with an ISL engine.***

## **CLIMATE CONTROL DRAIN**

The climate control system shall include a gravity drain for water management. The gravity drain shall remove condensation from the air conditioning system without additional mechanical assistance.

## **CLIMATE CONTROL ACTIVATION**

The heating, defrosting and air conditioning controls shall be in the center dash center switch panel, in a position which is easily accessible to the driver. The climate control shall be activated by a rotary switch.

## **HVAC OVERHEAD COVER PAINT**

The overhead HVAC cover shall be painted with a multi-tone silver gray texture finish.

## **A/C CONDENSER LOCATION**

A roof mounted A/C condenser shall be installed on the left side of the cab, mid-roof.

## **A/C COMPRESSOR**

The air-conditioning compressor shall be a belt driven, engine mounted compressor. The compressor shall be compatible with R134-a refrigerant.

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***\*\*Spartan Motors Inc. recommends that the overall climate system performance be based off third-party testing in accordance to Society of Automotive Engineering standards as a complete system.***

***Individual component level ratings are not an accurate indicator of the performance capability of the completed system.***

Refrigerant Compressor displacement: 19.1 cubic inches per revolution.

## **UNDER CAB INSULATION**

The underside of the cab tunnel surrounding the engine shall be lined with multi-layer insulation, engineered for application inside diesel engine compartments.

The insulation shall act as a noise barrier, absorbing noise thus keeping the decibel level in the cab well within NFPA recommendations. As an additional benefit, the insulation shall assist in sustaining the desired temperature within the cab interior.

The engine tunnel insulation shall measure approximately 0.30 inch thick including a multi-layer foil faced glass cloth and polyester fiber layer. The foil surface acts as protection against heat, moisture and other contaminants. The insulation shall meet or exceed FMVSS 302 flammability test.

The cab floor insulation shall measure 0.56 inch thick including a 1.0#/sf PVC barrier and a moisture and heat reflective foil facing, reinforced with fiberglass strands. The foil surface acts as protection against moisture and other contaminants. The insulation shall meet or exceed FMVSS 302 flammability test.

The insulation shall be cut precisely to fit each section and sealed for additional heat and sound deflection. The insulation shall be held in place by acrylic pressure sensitive adhesive. In addition, the insulation on the underside of the cab floor shall have aluminum pins with hard hat, hold in place fastening heads and an expanded metal overlay to assist in retaining the insulation tight against the cab. The insulation inside the tunnel shall have a removable aluminum overlay installed to protect the insulation and assist in retaining the insulation tight against the engine tunnel surfaces.

## **INTERIOR TRIM FLOOR**

The floor of the cab shall be covered with a multi-layer mat consisting of 0.25 inch thick sound absorbing closed cell foam with a 0.06 inch thick non-slip vinyl surface with a pebble grain finish. The covering shall be held in place by a pressure sensitive adhesive and aluminum trim molding. All exposed seams shall be sealed with silicone caulk matching the color of the floor mat to reduce the chance of moisture and debris retention.

## **INTERIOR TRIM**

The cab interior shall include trim on the front ceiling, rear crew ceiling, and the cab walls. It shall be easily removable to assist in maintenance. The trim shall be constructed of insulated vinyl over a hard board backing.



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## **REAR WALL INTERIOR TRIM**

The rear wall of the cab shall be trimmed with vinyl.

## **HEADER TRIM**

The cab interior shall feature header trim over the driver and officer dash constructed of 5052-H32 Marine Grade, 0.13 inch thick aluminum.

## **TRIM CENTER DASH**

The main center dash area shall be constructed of 5052-H32 Marine Grade, 0.13 inch thick aluminum plate. There shall be four (4) holes located on the top of the dash near each outer edge of the electrical access cover for ventilation. The center dash electrical access cover shall include a gas cylinder stay which shall hold the cover open during maintenance.

## **TRIM LH DASH**

The left hand dash shall be constructed of 5052-H32 Marine Grade, 0.13 inch thick aluminum plate for a perfect fit around the instrument panel. For increased occupant protection the extreme duty left hand dash utilizes patent pending break away technology to reduce rigidity in the event of a frontal crash. The left hand dash shall offer lower vertical surface area to the left and right of the steering column to accommodate control panels.

## **TRIM RH DASH**

The right hand dash shall be constructed of 5052-H32 Marine Grade, 0.13 of an inch thick aluminum plate and shall include a glove compartment with a hinged door and a Mobile Data Terminal (MDT) provision. The glove compartment size will measure 14.00 inches wide X 6.38 inches high X 5.88 inches deep. The MDT provision shall be provided above the glove compartment.

## **ENGINE TUNNEL TRIM**

The cab engine tunnel shall be covered with a multi-layer mat consisting of 0.25 inch closed cell foam with a 0.06 inch thick non-slip vinyl surface with a pebble grain finish. The mat shall be held in place by pressure sensitive adhesive. The engine tunnel mat shall be trimmed with anodized aluminum stair nosing trim for an aesthetically pleasing appearance.

## **POWER POINT DASH MOUNT**

The cab shall include two (2) dual universal serial bus (USB) charging receptacles in the cab dash switch panel to provide a power source for USB chargeable electrical equipment. Each dual USB receptacle shall include two ports and shall be capable of up to a 5 Volt 2.1 amp output. Port 1 is optimized for fast charging at 1 amp. Port 2 is optimized for fast charging up to 2.1 amps, when used individually. The receptacles shall be wired battery direct.

## **STEP TRIM**

Each cab entry door shall include a three step entry. The first step closest to the ground shall be constructed of SAE 304 stainless steel with embossed perforations and diamond shaped cutout.

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The perforations and cutouts shall allow water and other debris to flow through rather than becoming trapped within the stepping surface. The step shall feature a splash guard to reduce water and debris from splashing in to the step. The splash guard shall have drainage holes beneath the back of the step to allow debris and water to flow through rather than becoming trapped within the stepping surface. The stainless steel material shall have a number 8 mirror finish. The lower step shall be mounted to a frame which is integral with the construction of the cab for rigidity and strength. The middle step shall be integral with the cab construction and shall be trimmed in 0.08 inch thick 3003-H22 embossed aluminum tread plate.

## **STEP TRIM KICKPLATE**

The cab steps shall include a kick plate in the rise of each step. The risers shall be trimmed in 3003-H22 bright aluminum tread-plate which is 0.07 inch thick.

## **UNDER CAB ACCESS DOOR**

The cab shall include an aluminum access door in the left crew step riser painted to match the cab interior paint with a push and turn latch. The under cab access door shall provide access to the diesel exhaust fluid fill.

## **INTERIOR DOOR TRIM**

The interior trim on the doors of the cab shall consist of an aluminum panel constructed of Marine Grade 5052-H32 0.13 of an inch thick aluminum plate. The door panels shall include a painted finish.

## **DOOR TRIM CUSTOMER NAMEPLATE**

The interior door trim on the front doors shall include a customer nameplate which states the vehicle was custom built for their Department.

## **CAB DOOR TRIM REFLECTIVE**

In accordance with the current standards of NFPA, the body builder shall provide 96.00 square inches of reflective material on the interior of each cab door.

## **INTERIOR GRAB HANDLE "A" PILLAR**

There shall be two (2) rubber covered 11.00 inch grab handles installed inside the cab, one on each "A" post at the left and right door openings. The left handle shall be located 7.88 inches above the bottom of the door window opening and the right handle shall be located 2.88 inches above the bottom of the door window opening. The handles shall assist personnel in entering and exiting the cab.

## **INTERIOR GRAB HANDLE FRONT DOOR**

Each front door shall include one (1) ergonomically contoured 9.00 inch cast aluminum handle mounted horizontally on the interior door panels. The handles shall feature a textured black powder coat finish to assist personnel entering and exiting the cab.

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## **INTERIOR GRAB HANDLE REAR DOOR**

A black powder coated cast aluminum assist handle shall be provided on the inside of each rear crew door. A 30.00 inch long handle shall extend horizontally the width of the window just above the window sill. The handle shall assist personnel in exiting and entering the cab.

## **INTERIOR SOFT TRIM COLOR**

The cab interior soft trim surfaces shall be gray in color.

## **INTERIOR TRIM SUN VISOR**

The header shall include two (2) 7.00 inches high X 18.00 inches wide impact resistant, transparent acrylic polycarbonate sun visors with a smoke gray tint shall be provided and installed on the header above the driver and officer.

The see thru visors are designed for maximum flexibility of positioning utilizing an arm with virtually unlimited adjustability with 13.50 inch long lateral travel of the tinted visor at the end of the arm which can be locked in place by a thumbscrew.

The visors are easily adjusted and can be placed into a chosen position with one hand. The sun visors will help protect vehicle occupants from solar glare without obscuring their vision.

## **INTERIOR FLOOR MAT COLOR**

The cab interior floor mat shall be gray in color.

## **CAB PAINT INTERIOR**

The inner door panel surfaces shall feature a medium gray spray on bedliner coating.

## **HEADER TRIM INTERIOR PAINT**

The metal surfaces in the header area shall feature a medium gray spray on bedliner coating.

## **TRIM CENTER DASH INTERIOR PAINT**

The entire center dash and any accessory pods attached to the dash shall feature a medium gray spray on bedliner coating.

## **TRIM LEFT HAND DASH INTERIOR PAINT**

The left hand dash shall feature a medium gray spray on bedliner coating.

## **TRIM RIGHT HAND DASH INTERIOR PAINT**

The right hand dash shall feature a medium gray spray on bedliner coating.

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## **DASH PANEL GROUP**

The main center dash area shall include three (3) aluminum removable panels located one (1) to the right of the driver position, one (1) in the center of the dash and one (1) to the left of the officer position. The panels shall be coated with a black texture finish. The center panel shall be within comfortable reach of both the driver and officer.

## **SWITCHES CENTER PANEL**

The center dash panel shall include no rocker switches or legends.

## **SWITCHES LEFT PANEL**

The left dash panel shall include one (1) windshield wiper/washer control switch located in the left hand side of the panel. The switch shall have backlighting provided.

## **SWITCHES RIGHT PANEL**

The right dash panel shall include six (6) rocker switch positions in a three (3) over three (3) switch configuration.

A rocker switch with a blank legend installed directly above shall be provided for any position without a switch and legend designated by a specific option. The non-specified switches shall be two-position, black switches with a green indicator light. Each blank switch legend can be custom engraved by the body manufacturer. All switch legends shall have backlighting provided.

## **SEAT BELT WARNING**

A Weldon seat belt warning system, integrated with the Vehicle Data Recorder system, shall be installed for each seat within the cab. The system shall provide a visual warning indicator in the Vista display and control screen(s).

The warning system shall activate when any seat is occupied with a minimum of 60 pounds, the corresponding seat belt remains unfastened, and the park brake is released. The warning system shall also activate when any seat is occupied, the corresponding seat belt was fastened in an incorrect sequence, and the park brake is released. Once activated, the visual indicators and applicable audible alarm shall remain active until all occupied seats have the seat belts fastened.

## **SEAT MATERIAL**

The Bostrom Firefighter seats shall include a covering of extra high strength, wear resistant fabric made of durable low seam Durawear Plus™ ballistic polyester. A PVC coating shall be bonded to the back side of the material to help protect the seats from UV rays and from being saturated or contaminated by fluids. Durawear Plus™ meets or exceeds specification of the common trade name Imperial 1800. The material meets FMVSS 302 flammability requirements.

*If applicable, Theatre style seats located in the cab shall be high strength, wear resistant fabric made of durable ballistic polyester. A PVC coating shall be bonded to the back side of the material to help protect the seats from UV rays and from being saturated or contaminated by fluids. Common trade names for this material are Imperial 1200 and Durawear.*

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## **SEAT COLOR**

All seats supplied with the chassis shall be gray in color. All seats shall include red seat belts.

## **SEAT BACK LOGO**

The seat back shall include the "Spartan" logo. The logo shall be centered on the standard headrest of the seat back and on the left side of a split headrest.

## **SEAT DRIVER**

The driver's seat shall be an H.O. Bostrom 500 Series Firefighter Sierra model seat. The seat shall feature eight-way electric positioning. The eight positions shall include up and down, fore and aft with 8.00 inches of travel, back angle adjustment and seat rake adjustment. The seat shall feature integral springs to isolate shock.

The seat shall feature an all belts to seat (ABTS) style of safety restraint. The ABTS feature shall include a three-point shoulder harness with the lap belt, automatic retractor and buckle as an integral part of the seat assembly. The ABTS feature shall also include the RiteHite™ shoulder adjustment feature to provide enhanced comfort and safety by allowing customized seat belt fit.

The minimum vertical dimension from the seat H-point to the ceiling for this belted seating position shall be 35.00 inches measured with the seat height adjusted to the lowest position of travel.

This model of seat shall have successfully completed the static load tests set forth by FMVSS 207, 209, and 210 in effect at the time of manufacture. This testing shall include a simultaneous forward load of 3000 pounds each on the lap and shoulder belts and twenty (20) times the weight through the center of gravity.

The materials used in construction of the seat shall also have successfully completed testing with regard to the flammability of materials used in the occupant compartments of motor vehicles as outlined in FMVSS 302, of which dictates the allowable burning rate of materials in the occupant compartments of motor vehicles.

## **SEAT BACK DRIVER**

The driver's seat shall include a standard seat back incorporating the all belts to seat feature (ABTS). The seat back shall feature a contoured head rest.

## **SEAT MOUNTING DRIVER**

The driver's seat shall be installed in an ergonomic position in relation to the cab dash.

## **OCCUPANT PROTECTION DRIVER**

The driver's position shall be equipped with the Advanced Protection System™ (APS). The APS shall selectively deploy integrated systems to protect against injuries in qualifying frontal impact, side impact, and rollover events. The increase in survivable space and security of the APS shall also provide ejection mitigation protection.

The driver's seating area APS shall include:

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- Advanced seat belt system - retractor pre-tensioner tightens the seat belt around the driver, securing the occupant in the seat and the load limiter plays out some of the seat belt webbing to reduce seat belt to chest and torso force upon impact as well as mitigate head and neck injuries.
- Large side curtain airbag - protects the driver's head, neck, and upper body from dangerous cab side surfaces and contact points with intrusive surfaces as a result of a collision as well as provides ejection mitigation protection to the driver in a qualifying event by covering the window and the upper portion of the door.
- Dual knee airbags (patent pending) with energy management mounting (patent pending) - protects the driver's lower body from dangerous surface contact injuries, acceleration injuries, and from intrusion as well as locks the lower body in place so the upper body shall be slowed by the load limiting seat belt.
- Steering wheel airbag - protects the driver's head, neck, and upper torso from contact injuries, acceleration injuries, and contact points with intrusive surfaces as a result of a collision.

## **SEAT OFFICER**

The officer's seat shall be a H.O. Bostrom 500 Series Sierra seat model. The seat shall feature a tapered and padded seat, and cushion. The seat shall be mounted in a fixed position.

The seat shall feature an all belts to seat (ABTS) style of safety restraint. The ABTS feature shall include a three-point shoulder harness with the lap belt and automatic retractor as an integral part of the seat assembly. The buckle portion of the seat belt shall extend from the seat base towards the driver position within easy reach of the occupant. The ABTS feature shall also include the RiteHite™ shoulder adjustment feature to provide enhanced comfort and safety by allowing customized seat belt fit.

The minimum vertical dimension from the seat H-point to the ceiling for this belted seating position shall be 35.00 inches.

This model of seat shall have successfully completed the static load tests by FMVSS 207/210. This testing shall include a simultaneous forward load of 3000 pounds each on the lap and shoulder belts and twenty (20) times the weight through the center of gravity. This model of seat installed in the cab model, as specified, shall have successfully completed the dynamic sled testing using FMVSS 208 as a guide with the following accommodations. In order to reflect the larger size outfitted firefighters, the test dummy used shall be a 95th percentile hybrid III male weighing 225 pounds rather than the 50th percentile male dummy weighing 165 pounds as referenced in FMVSS 208. The model of seats shall also have successfully completed the flammability of materials used in the occupant compartments of motor vehicles as outlined in FMVSS 302, of which decides the burning rate of materials in the occupant compartments of motor vehicles.

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## **SEAT BACK OFFICER**

The officer's seat shall feature a SecureAll™ SCBA locking system which shall be one bracket model and store most U.S. and International SCBA brands and sizes while in transit or for storage within the seat back. The bracket shall be easily adjustable for all SCBA brands and cylinder diameters. All adjustment points shall utilize similar hardware and adjustments shall be made with one tool.

The bracket shall be adjustable to compensate for different cylinder lengths without the use of tools. The adjustment shall be made by raising a lever and moving the top clamp vertically.

The bracket system shall be free of straps and clamps that may interfere with auxiliary equipment on SCBA units. The center guide fork shall keep the SCBA tank in place for a safe and comfortable fit in the seat back cavity. The SCBA unit simply needs to be pushed against the pivot arm to engage the patented auto-locking system. Once the lock is engaged, the top clamp shall surround the top of the SCBA tank for a secure fit in all directions.

The SecureAll™ shall include a release handle which shall be integrated into the seat cushion for quick and easy release. This shall eliminate the need for straps or pull cords to interfere with other SCBA equipment.

The seat back shall include a removable padded cover which shall be provided over the SCBA cavity.

## **SEAT MOUNTING OFFICER**

The officer's seat shall offer a special mounting position which is 4.00 inches rearward of the standard location offering increased leg room for the occupant.

## **OCCUPANT PROTECTION OFFICER**

The officer's position shall be equipped with the Advanced Protection System™ (APS). The APS shall selectively deploy integrated systems to protect against injuries in qualifying frontal impact, side impact, and rollover events. The increase in survivable space and security of the APS shall also provide ejection mitigation protection.

The officer's seating area APS shall include:

- Advanced seat belt system - retractor pre-tensioner tightens the seat belt around the officer, securing the occupant in the seat and the load limiter plays out some of the seat belt webbing to reduce seat belt to chest and torso force upon impact as well as mitigate head and neck injuries.
- Large side curtain airbag - protects the officer's head, neck, and upper body from dangerous cab side surfaces and contact points with intrusive surfaces as a result of a collision as well as provides ejection mitigation protection to the officer in a qualifying event by covering the window and the upper portion of the door.
- Knee airbags - protects the officer's lower body from dangerous surface contact injuries, acceleration injuries, and from contact points with intrusive surfaces as a result of a

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collision as well as locks the lower body in place so the upper body shall be slowed by the load limiting seat belt.

## **POWER SEAT WIRING**

The power seat or seats installed in the cab shall be wired directly to battery power.

## **SEAT BELT ORIENTATION CREW**

The crew position seat belts shall follow the standard orientation which extends from the outboard shoulder extending to the inboard hip.

## **SEAT REAR FACING OUTER LOCATION**

The crew area shall include two (2) rear facing crew seats, which include one (1) located directly behind the left side front seat and one (1) located directly behind the right side front seat.

## **SEAT CREW REAR FACING OUTER**

The crew area shall include a seat in the rear facing outboard position which shall be a H.O. Bostrom 500 Series Firefighter model seat. The seat shall feature a tapered and padded seat, and cushion. The seat shall be mounted in a fixed position.

The seat shall feature an all belts to seat (ABTS) style of safety restraint. The ABTS feature shall include a three-point shoulder harness with the lap belt and automatic retractor as an integral part of the seat assembly. The buckle portion of the seat belt shall extend from the seat base towards the driver position within easy reach of the occupant. The ABTS feature shall also include the RiteHite™ shoulder adjustment feature to provide enhanced comfort and safety by allowing customized seat belt fit.

The minimum vertical dimension from the seat H-point to the ceiling for this belted seating position shall be 35.00 inches.

This model of seat shall have successfully completed the static load tests by FMVSS 207/210. This testing shall include a simultaneous forward load of 3000 pounds each on the lap and shoulder belts and twenty (20) times the weight through the center of gravity. This model of seat installed in the cab model, as specified, shall have successfully completed the dynamic sled testing using FMVSS 208 as a guide with the following accommodations. In order to reflect the larger size outfitted firefighters, the test dummy used shall be a 95th percentile hybrid III male weighing 225 pounds rather than the 50th percentile male dummy weighing 165 pounds as referenced in FMVSS 208. The model of seats shall also have successfully completed the flammability of materials used in the occupant compartments of motor vehicles as outlined in FMVSS 302, of which decides the burning rate of materials in the occupant compartments of motor vehicles.

## **SEAT BACK REAR FACING OUTER**

The rear facing outboard seat shall feature a Bostrom SecureAll™ self-contained breathing apparatus (SCBA) locking system which shall store most U.S. and International SCBA brands and bottle sizes while in transit or for storage within the seat back. The bracket shall be easily



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adjustable for all SCBA brands and cylinder diameters. All adjustment points shall utilize similar hardware and adjustments shall be made with one tool.

The bracket shall be adjustable to compensate for different cylinder lengths without the use of tools. The adjustment shall be made by raising a lever and moving the top clamp vertically.

The bracket system shall be free of straps that may interfere with auxiliary equipment on SCBA units. The center guide fork shall keep the SCBA tank in place for a safe and comfortable fit in the seat back cavity. The SCBA unit simply needs to be pushed against the pivot arm to engage the patented auto-locking system. Once the lock is engaged, the top clamp shall surround the top of the SCBA tank for a secure fit in all directions.

The SecureAll™ shall include a release handle which shall be integrated into the center of the bottom seat cushion for easy access and to eliminate hooking the release handle with clothing or other equipment.

The seat back shall include a removable padded cover which shall be provided over the SCBA cavity.

## **SEAT MOUNTING REAR FACING OUTER**

The right hand rear facing outer seat shall offer a special mounting position which shall be 3.75 inches rearward of the standard mounting location offering additional room ahead of the seat.

## **OCCUPANT PROTECTION RFO**

The rear facing outer seat position(s) shall be equipped with the Advanced Protection System™ (APS). The APS shall selectively deploy integrated systems to protect against injuries in qualifying frontal impact, side impact, and rollover events. The increase in survivable space and security of the APS shall also provide ejection mitigation protection.

Each rear facing outer seating position APS shall include:

- APS advanced seat belt system - retractor pre-tensioners tighten the seat belts around each occupant, securing the occupants in seats and load limiters play out some of the seat belt webbing to reduce seat belt to chest and torso force upon impact as well as mitigate head and neck injuries.
- Side curtain airbag - protects each occupant's head, neck, and upper body from dangerous cab side surfaces and contact points with intrusive surfaces as a result of a collision as well as provides ejection mitigation protection to each occupant in a qualifying event by covering the windows and walls adjacent to each seating position with an airbag custom designed for each cab configuration.

## **SEAT FORWARD FACING CENTER LOCATION**

The crew area shall include two (2) forward facing center crew seats with both located at the center of the rear wall.

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## **SEAT CREW FORWARD FACING CENTER**

The forward facing center seat shall be a H.O. Bostrom 500 Series Firefighter model seat. The seat shall feature a tapered and padded seat, and cushion. The seat shall be mounted in a fixed position. The seat and cushion shall be hinged and compact in design for additional room. The seat shall include a "Fold and Hold" feature so that the cushion shall remain in the seated position and simply touched to flip up.

The seat shall feature an all belts to seat (ABTS) style of safety restraint. The ABTS feature shall include a three-point shoulder harness with the lap belt and automatic retractor as an integral part of the seat assembly. The buckle portion of the seat belt shall extend from the seat base towards the driver position within easy reach of the occupant. The ABTS feature shall also include the RiteHite™ shoulder adjustment feature to provide enhanced comfort and safety by allowing customized seat belt fit.

The minimum vertical dimension from the seat H-point to the ceiling for each belted seating position shall be 35.00 inches.

This model of seat shall have successfully completed the static load tests by FMVSS 207/210. This testing shall include a simultaneous forward load of 3000 pounds each on the lap and shoulder belts and twenty (20) times the weight through the center of gravity. This model of seat installed in the cab model, as specified, shall have successfully completed the dynamic sled testing using FMVSS 208 as a guide with the following accommodations. In order to reflect the larger size outfitted firefighters, the test dummy used shall be a 95th percentile hybrid III male weighing 225 pounds rather than the 50th percentile male dummy weighing 165 pounds as referenced in FMVSS 208. The model of seats shall also have successfully completed the flammability of materials used in the occupant compartments of motor vehicles as outlined in FMVSS 302, of which decides the burning rate of materials in the occupant compartments of motor vehicles.

## **SEAT BACK FORWARD FACING CENTER**

The forward facing center seat shall feature a SecureAll™ self-contained breathing apparatus (SCBA) locking system which shall be one bracket model and store most U.S. and International SCBA brands and sizes while in transit or for storage within the seat back. The bracket shall be easily adjustable for all SCBA brands and cylinder diameters. All adjustment points shall utilize similar hardware and adjustments shall be made with one tool.

The bracket shall be adjustable to compensate for different cylinder lengths without the use of tools. The adjustment shall be made by raising a lever and moving the top clamp vertically.

The bracket system shall be free of straps and clamps that may interfere with auxiliary equipment on SCBA units. The center guide fork shall keep the SCBA tank in place for a safe and comfortable fit in the seat back cavity. The SCBA unit simply needs to be pushed against the pivot arm to engage the patented auto- locking system. Once the lock is engaged, the top clamp shall surround the top of the SCBA tank for a secure fit in all directions.

The SecureAll™ shall include a release handle which shall be integrated into the seat cushion for quick and easy release. This shall eliminate the need for straps or pull cords to interfere with other SCBA equipment.

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The seat back shall include a removable padded cover which shall be provided over the SCBA cavity.

## **OCCUPANT PROTECTION FFC**

The forward facing center seat position(s) shall be equipped with the Advanced Protection System™ (APS). The APS shall selectively deploy integrated systems to protect against injuries in qualifying frontal impact, side impact, and rollover events. The increase in survivable space and security of the APS shall also provide ejection mitigation protection.

Each forward facing center seating position APS shall include:

- APS advanced seatbelt system - retractor pre-tensioners tighten the seat belts around each occupant, securing the occupants in seats and load limiters play out some of the seat belt webbing to reduce seat belt to chest and torso force upon impact as well as mitigate head and neck injuries.
- Side curtain airbag - provides ejection mitigation protection to each occupant in a qualifying event by covering the windows and walls adjacent to crew seating with an airbag custom designed for each cab configuration.

## **SEAT FRAME FORWARD FACING**

The forward facing center seating positions shall include an enclosed seat frame located and installed on the rear wall. The seat frame shall measure 42.38 inches wide X 12.38 inches high X 22.00 inches deep. The seat frame shall be constructed of Marine Grade 5052-H32 0.19 inch thick aluminum plate. The seat box shall be painted with the same color as the remaining interior.

## **SEAT FRAME FORWARD FACING STORAGE ACCESS**

There shall be two (2) access points to the seat frame storage area, one (1) on each side of the seat frame. Each access point shall be covered by a hinged door which measures 15.00 inches in width X 10.63 inches in height.

## **SEAT MOUNTING FORWARD FACING CENTER**

The forward facing center seats shall offer a special mounting. The seats shall be installed 6.00 inches apart offering additional room for each occupant.

## **CAB FRONT UNDERSEAT STORAGE ACCESS**

The left and right under seat storage areas shall have a solid aluminum hinged door with non-locking latch.

## **SEAT COMPARTMENT DOOR FINISH**

All underseat storage compartment access doors shall feature a medium gray spray on bedliner coating.

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## **WINDSHIELD WIPER SYSTEM**

The cab shall include a triple arm linkage wiper system which shall clear the windshield of water, ice and debris. There shall be two (2) windshield wipers; each shall be affixed to a radial arm. The wiper motor shall be activated by an intermittent wiper control located within easy reach of the driver's position. The windshield wipers shall be interlocked with the park brake allowing activation only when the park brake is released.

## **ELECTRONIC WINDSHIELD FLUID LEVEL INDICATOR**

The windshield washer fluid level shall be monitored electronically. When the washer fluid level becomes low the yellow "Check Message Center" indicator light on the instrument panel shall illuminate and the message center in the dual air pressure gauge shall display a "Check Washer Fluid Level" message.

## **CAB DOOR HARDWARE**

The cab entry doors shall be equipped with exterior pull handles, suitable for use while wearing firefighter gloves. The handles shall be made of aluminum with a chrome plated finish.

The interior exit door handles shall be flush paddle type with a black finish, which are incorporated into the upper door panel.

All cab entry doors shall include locks which are keyed alike. The door locks shall be designed to prevent accidental lockout.

## **DOOR LOCKS**

Each cab entry door shall include a manually operated door lock. Each door lock may be actuated from the inside of the cab by means of a red knob located on the paddle handle of the respective door or by using a TriMark key from the exterior. The door locks are designed to prevent accidental lock out.

## **GRAB HANDLES**

The cab shall include one (1) 18.00 inch three-piece knurled aluminum anti-slip exterior grab handle behind each cab door. The Hansen Lit Anti-Slip Rails shall be mounted in bright anodized aluminum 4000 Series II stanchions, complete with weep holes to prevent the buildup of moisture.

The grab rails shall include a 12 volt, 17.00 inch long clear LED light to provide an increased margin of safety for night time cab entry and egress. The grab handles shall also include red reflective tape. The lights shall be activated when the parking brake is set and master power is on.

## **AUXILIARY GRAB HANDLE**

There shall be a 7.00 inch molded stainless steel grab handle with a bright finish attached to the front fascia of the cab in the center below the windshield.

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## **REARVIEW MIRRORS**

Retrac Aerodynamic West Coast style dual vision mirror heads model 613305 shall be provided and installed on each of the front cab doors.

The mirrors shall be mounted via 1.00 inch diameter tubular stainless steel arms to provide a rigid mounting to reduce mirror vibration.

The mirrors shall measure 8.00 inches wide X 19.00 inches high and shall include an integral convex mirror installed in the mirror head below the flat glass to provide a wider field of vision. The flat and convex mirrors shall be motorized with remote horizontal and vertical adjustment. The control switches shall be mounted within easy reach of the driver. The flat and convex mirrors shall be heated for defrosting in severe cold weather conditions.

The mirrors shall be constructed of a vacuum formed chrome plated ABS plastic housing that is corrosion resistant and shall include the finest quality non-glare glass.

## **REARVIEW MIRROR HEAT SWITCH**

The heat for the rearview mirrors shall be controlled through a virtual button on the Vista display and control screen.

## **CAB FENDER**

Full width wheel well liners shall be installed on the extruded cab to limit road splash and enable easier cleaning. Each two-piece liner shall consist of an inner liner 16.00 inches wide made of vacuum formed ABS composite and an outer fenderette 3.50 inches wide made of SAE 304 polished stainless steel.

## **MUD FLAPS FRONT**

The front wheel wells shall have mud flaps installed on them.

## **CAB EXTERIOR FRONT & SIDE EMBLEMS**

The cab shall include three (3) Spartan emblems. There shall be one (1) installed on the front air intake grille and two (2) for the exterior sides of the cab shipped loose with the chassis for installation by the body manufacturer. The cab shall also include one (1) Advanced Protection System shield emblem on each front door.

## **IGNITION**

A master battery system with a keyless start ignition system shall be provided. Each system shall be controlled by a one-quarter turn Cole Hersee switch, both of which shall be mounted to the left of the steering wheel on the dash. A chrome push type starter button shall be provided adjacent to the master battery and ignition switches.

Each switch shall illuminate a green LED indicator light on the dash when the respective switch is placed in the "ON" position.

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The starter button shall only operate when both the master battery and ignition switches are in the "ON" position.

## **BATTERY**

The single start electrical system shall include six (6) Harris BCI 31 925 CCA batteries with a 210 minute reserve capacity and 4/0 welding type dual path starter cables per SAE J541.

## **BATTERY TRAY**

The batteries shall be installed within two (2) steel battery trays located on the left side and right side of the chassis, securely bolted to the frame rails. The battery trays shall be coated with the same material as the frame.

The battery trays shall include drain holes in the bottom for sufficient drainage of water. A durable, non-conducting, interlocking mat made by Dri-Dek shall be installed in the bottom of the trays to allow for air flow and help prevent moisture build up. The batteries shall be held in place by non-conducting phenolic resin hold down boards.

## **BATTERY BOX COVER**

Each battery box shall include a steel cover which protects the top of the batteries. Each cover shall include flush latches which shall keep the cover secure as well as a black powder coated handle for convenience when opening.

## **BATTERY CABLE**

The starting system shall include cables which shall be protected by 275 degree F. minimum high temperature flame retardant loom, sealed at the ends with heat shrink and sealant.

## **BATTERY JUMPER STUD**

The starting system shall include battery jumper studs. These studs shall be located in the forward most portion of the driver's side lower step, 8.00 inches apart. The studs shall allow the vehicle to be jump started, charged, or the cab to be raised in an emergency in the event of battery failure.

## **ALTERNATOR**

The charging system shall include a 320 amp Leece-Neville 12 volt alternator. The alternator shall include a self-exciting integral regulator.

## **STARTER MOTOR**

The single start electrical system shall include a Delco brand starter motor.

## **BATTERY CONDITIONER**

A Kussmaul Auto Charge 40 LPC battery conditioner shall be supplied. The battery conditioner shall provide a 40 amp output for the chassis batteries and a 15 amp output circuit for accessory

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loads. The battery conditioner shall be mounted in the cab in the LH rear facing outer seating position.

## **BATTERY CONDITIONER DISPLAY**

A Kussmaul battery conditioner display shall be supplied. The battery conditioner display shall be mounted in the cab, viewable through the cab mid side window behind the left front door.

## **AUXILIARY AIR COMPRESSOR**

A Kussmaul Pump 12V air compressor shall be supplied. The air compressor shall be installed behind the driver's seat. The air compressor shall be plumbed to the air brake system to maintain air pressure.

## **ELECTRICAL INLET LOCATION**

An electrical inlet shall be installed on the left hand side of cab over the wheel well.

## **ELECTRICAL INLET**

A Kussmaul 20 amp super auto-eject electrical receptacle shall be supplied. It shall automatically eject the plug when the starter button is depressed.

A single item or an addition of multiple items must not exceed the rating of the electric inlet that it's connected to.

### **Amp Draw Reference List:**

*Kussmaul 40 LPC Charger - 5 Amps*  
*Kussmaul 40/20 Charger - 8.5 Amps*  
*Kussmaul 80 LPC Charger - 13 Amps*  
*Kussmaul EV-40 - 6.2 Amps*  
*Blue Sea P12 7532 - 7.5 Amps*  
*Iota DLS-45/IQ4 - 11 Amps*  
*1000W Engine Heater - 8.33 Amps*  
*1500W Engine Heater - 12.5 Amps*  
*120V Air Compressor - 4.2 Amps*  
*120V Dometic HVAC - 15 Amps*

## **ELECTRICAL INLET CONNECTION**

The electrical inlet shall be connected to the battery conditioner.

## **ELECTRICAL INLET COLOR**

The electrical inlet connection shall include a yellow cover.

## **HEADLIGHTS**

The cab front shall include four (4) rectangular LED headlamps with separate high and low beams mounted in bright chrome bezels. Each lamp shall include a heating system that de-ices the headlight.

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## **HEADLIGHT LOCATION**

The headlights shall be located on the front fascia of the cab directly below the front warning lights.

## **FRONT TURN SIGNALS**

The front fascia shall include two (2) Whelen model M6 4.00 inch X 6.00 inch amber LED turn signals which shall be installed in a chrome radius mount housing above and outboard of the front warning and head lamps.

## **SIDE TURN/MARKER LIGHTS**

The sides of the cab shall include two (2) Tecniq S170 LED side marker lights which shall be provided just behind the front cab radius corners. The lights shall be amber with chrome bezels.

## **MARKER AND ICC LIGHTS**

In accordance with FMVSS, there shall be five (5) Tecniq S170 LED cab marker lamps designating identification, center and clearance provided. These lights shall be installed on the face of the cab within full view of other vehicles from ground level. The lights shall be amber with chrome bezels.

## **HEADLIGHT AND MARKER LIGHT ACTIVATION**

The headlights and marker lights shall be controlled via a virtual button on the Vista display. The headlights shall turn on in the low beam setting when the park brake is disengaged. The headlights shall turn off when the park brake is engaged. The marker lights shall turn on when the ignition switch is in the "On" position. There shall be a virtual dimmer control on the Vista display to adjust the brightness of the dash lights.

## **GROUND LIGHTS**

The ground lighting shall be activated when the parking brake is set, by the opening of the door on the respective cab side, and through a virtual button on the Vista display and control screen.

## **GROUND LIGHTS**

Each door shall include a Tecniq T44 LED ground light mounted to the underside of the cab step below each door. The lights shall include a polycarbonate lens, a housing which is vibration welded and LEDs which shall be shock mounted for extended life.

## **LOWER CAB STEP LIGHTS**

The middle step located at each door shall include a Tecniq T44 LED light which shall activate with the opening of the respective door. The lights shall include a polycarbonate lens, a housing which is vibration welded and LEDs which shall be shock mounted for extended life.



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## **INTERMEDIATE STEP LIGHTS**

The intermediate step well area at each door shall include a TecNiq D06 LED light within a chrome housing. The Egress step lights shall provide visibility to the step well area for the first step exiting the vehicle. The Egress step lights shall activate with Entry step lighting.

## **LIGHTBAR PROVISION**

There shall be two (2) light bars installed on the cab roof. The light bars shall be provided and installed by the chassis manufacturer. The light bar installation shall include mounting that shall place each light bar just above the junction box and wiring to a control switch on the cab dash.

## **CAB FRONT LIGHTBAR MODEL**

The cab shall be provided with two (2) Whelen model F4NMINI light bars. Each light bar shall be 21.50 inches in length and feature eight (8) customizable pods.

See the light bar layout for specific details.

## **LIGHTBAR SWITCH**

The light bar shall be controlled through a virtual button on the Vista display and control screen. There shall be an additional button located on the Vista display and control screen to control the clear lights.

## **SIDE SCENE LIGHTS**

The cab shall include two (2) Whelen M9 LED scene lights, one (1) each side which shall be surface mounted. The Whelen lights shall provide directional lighting from twenty four (24) Super-LEDs and a clear gradient lens. The scene light shall have specialized TIR optics for ideal scene illumination.

## **SIDE SCENE LIGHT LOCATION**

The scene lighting located on the left and right sides of the cab shall be mounted rearward of the cab "B" pillar in the 5.00 inch raised roof portion of the cab between the front and rear crew doors.

## **SIDE SCENE ACTIVATION**

The scene lights shall be activated by two (2) lighted momentary rocker switches located in the switch panel, one (1) for each light, by two (2) virtual buttons on the Vista display and control screen(s), one (1) for each light, and by opening the respective side cab doors.

## **REAR SCENE LIGHTS**

The vehicle shall include wiring for multiplex activated rear scene lighting for body builder installed scene lights and body builder installed multiplex output.

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## **REAR SCENE LIGHT ACTIVATION**

The rear scene lights shall be activated via a virtual button on the Vista display and control screen, a lighted momentary rocker switch on the dash labeled "REAR SCENE LTS", and when the transmission is placed in reverse.

## **INTERIOR OVERHEAD LIGHTS**

The cab shall include a red/clear Whelen LED dome lamp located over each door. The dome lamps shall be rectangular in shape and shall measure approximately 7.00 inches in length X 3.00 inches in width with a black colored bezel. The clear function of each lamp shall be activated by opening the respective door. While the door is closed the individual red or clear function of each lamp can be activated dependently by switches on each lamp.

An additional incandescent three (3) light module with dual map lights shall be located over the engine tunnel which can be activated by individual switches on the lamp.

## **ENGINE COMPARTMENT LIGHT**

There shall be a LED NFPA compliant light mounted under the engine tunnel for area work lighting on the engine. The light shall include a polycarbonate lens, a housing which is vibration welded and a bulb which shall be shock mounted for extended life. The light shall activate automatically when the cab is tilted.

## **DO NOT MOVE APPARATUS LIGHT**

The front headliner of the cab shall include a flashing red Whelen Ion LED light clearly labeled "Do Not Move Apparatus". In addition to the flashing red light, an audible alarm shall be included which shall sound while the light is activated.

The flashing red light shall be located centered left to right for greatest visibility.

The light and alarm shall be interlocked for activation when either a cab door is not firmly closed or an apparatus compartment door is not closed, and the parking brake is released.

## **MASTER WARNING SWITCH**

A master switch shall be included, as a virtual button on the Vista display and control screen which shall be labeled "E Master" for identification. The button shall feature control over all devices wired through it. Any warning device switches left in the "ON" position when the master switch is activated shall automatically power up.

## **HEADLIGHT FLASHER**

An alternating high beam headlight flashing system shall be installed into the high beam headlight circuit which shall allow the high beams to flash alternately from left to right.

Deliberate operator selection of high beams will override the flashing function until low beams are again selected. Per NFPA, these clear flashing lights will also be disabled "On Scene" when the park brake is applied.

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## **HEADLIGHT FLASHER SWITCH**

The flashing headlights shall be activated through a virtual button on the Vista display and control screen.

## **INBOARD FRONT WARNING LIGHTS**

The cab front fascia shall include two (2) Whelen M6 Super LED front warning lights in the left and right inboard positions. The lights shall feature multiple flash patterns including steady burn. The lights shall be mounted to the front fascia of the cab within a chrome bezel. The lights shall be programmed to emit the "PinWheel Variable" non-flashing pattern.

## **INBOARD FRONT WARNING LIGHTS COLOR**

The warning lights mounted on the cab front fascia in the inboard positions shall be red with a clear lens.

## **OUTBOARD FRONT WARNING LIGHTS**

The cab front fascia shall include two (2) Whelen M6 Super LED front warning lights in the left and right outboard positions. The lights shall feature multiple flash patterns including steady burn. The lights shall be mounted to the front fascia of the cab within a chrome bezel. The lights shall be programmed to emit the "PinWheel Variable" non-flashing pattern.

## **OUTBOARD FRONT WARNING LIGHTS COLOR**

The warning lights mounted on the cab front fascia in the outboard position shall be red with a clear lens.

## **FRONT WARNING SWITCH**

The front warning lights shall be controlled through a virtual control on the Vista display and control screen. This switch shall be clearly labeled for identification.

## **INTERSECTION WARNING LIGHTS**

The chassis shall include two (2) Whelen M6 series Super LED intersection warning lights, one (1) each side. The lights shall feature multiple flash patterns including steady burn. The lights shall be set to flash "DoubleFlash 150" in/out flash pattern.

## **INTERSECTION WARNING LIGHTS COLOR**

The intersection lights shall be red with a clear lens.

## **INTERSECTION WARNING LIGHTS LOCATION**

The intersection lights shall be mounted centered front to rear on the flat portion of the side of the bumper tail.

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## **SIDE WARNING LIGHTS**

The cab sides shall include two (2) Whelen M6 Super LED warning lights, one (1) on each side. The lights shall feature multiple flash patterns including steady burn for solid colors and multiple flash patterns for split colors. The lights shall be mounted to the sides of the cab within a chrome bezel. The light shall be programmed to emit the "DoubleFlash 150" in/out flash pattern.

## **SIDE WARNING LIGHTS COLOR**

The warning lights located on the side of the cab shall be red with clear lens.

## **SIDE WARNING LIGHTS LOCATION**

The warning lights on the side of the cab shall be mounted over the front wheel well directly over the center of the front axle.

## **SIDE AND INTERSECTION WARNING SWITCH**

The side warning lights shall be controlled through a virtual button on the Vista display and control screen. This button shall be clearly labeled for identification.

## **TANK LEVEL LIGHTS**

There shall be two (2) FRC MaxVision surface mount water level light strips.

The light strips shall feature four (4) colors of LED lights to indicate the fluid level of a tank. The colors from top to bottom shall be green, blue, amber, and red.

## **TANK LEVEL LIGHTS ACTIVATION**

The tank level lights shall be pre-wired and coiled at rear of the cab for connection to the apparatus by the body builder.

## **TANK LEVEL LIGHTS LOCATION**

There shall be water level lights mounted on each side of the cab, centered between the rear cab doors and the rear corners of the cab.

## **REAR WARNING LIGHTS**

The cab shall be prewired and contain a cutout for a Whelen TACTL5 Traffic Advisor control head to be installed by the body builder. The prewire shall be coiled under the center dash panel.

Wiring provisions shall be provided routed to the rear of the frame for OEM installation of up to eight (8) individual traffic advisor warning lights rated at no more than one (1) amp each.

The power to the control head shall be ignition switched and activation dependent upon the state of the controllers switched position upon ignition.

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## **SIREN CONTROL HEAD**

A Whelen 295HFS2 electronic siren control head with remote amplifier shall be provided and flush mounted in the switch panel with a location specific to the customer's needs. The siren shall feature 200-watt output, hands free mode and shall be in "standby" mode awaiting instruction. The siren shall offer radio broadcast, public address, wail, yelp, or piercer tones and hands free operation which shall allow the operator to turn the siren on and off from the horn ring if a horn/siren selector switch option is also selected.

## **STEERING WHEEL HORN BUTTON SELECTOR SWITCH**

A virtual button on the Vista display and control screen shall be provided to allow control of either the electric horn or the air horn from the steering wheel horn button. The electric horn shall sound by default when the selector switch is in either position to meet FMCSA requirements.

## **AUDIBLE WARNING LH FOOT SWITCH**

A foot switch wired to actuate the mechanical siren(s) shall be supplied for installation in the front section of the cab for driver actuation.

## **MECHANICAL SIREN FOOT SWITCH LH**

The mechanical siren foot switch shall be a Linemaster model 491-S.

## **MECHANICAL SIREN FOOT SWITCH LH LOCATION**

The mechanical siren foot switch shall be located on the left hand side accessible to the driver between the steering column and the door.

## **MECHANICAL SIREN FOOT SWITCH LH POSITION**

The mechanical siren foot switch shall be positioned outboard of any other foot switch, if applicable.

## **AUDIBLE WARNING LH FOOT SWITCH BRACKET**

A 30.00 degree angled foot switch bracket, wide enough to accommodate (2) foot switches, shall be installed outboard of the steering column for specified driver accessible foot switch activations.

## **AIR HORN AUXILIARY ACTIVATION**

The air horn activation shall be accomplished by a momentary rocker switch on the switch panel.

## **MECHANICAL SIREN BRAKE/AUXILIARY ACTIVATION**

The mechanical siren shall be actuated by a momentary rocker switch in the switch panel on the dash. A red momentary siren brake rocker switch shall be provided in the switch panel on the dash. A virtual button for the siren brake shall be provided on the Vista display.

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## **MECHANICAL SIREN INTERLOCK**

The siren shall only be active when master warning switch is on to prevent accidental engagement.

## **BACK-UP ALARM**

An ECCO model 575 backup alarm shall be installed at the rear of the chassis with an output level of 107 dB. The alarm shall automatically activate when the transmission is placed in reverse.

## **INSTRUMENTATION**

An ergonomically designed instrument panel shall be provided. Each gauge shall be backlit with LED lamps. Stepper motor movements shall drive all gauges. The instrumentation system shall be multiplexed and shall receive ABS, engine, and transmission information over the J1939 data bus to reduce redundant sensors and wiring.

A twenty eight (28) icon lightbar message center with integral LCD odometer/trip odometer shall be included. The odometer shall display up to 999,999.9 miles. The trip odometer shall display 9,999.9 miles. The LCD message center screen shall be capable of custom configuration by the users for displaying certain vehicle status and diagnostic functions.

The instrument panel shall contain the following gauges:

One (1) three-movement gauge displaying vehicle speed, fuel level, and Diesel Exhaust Fluid (DEF) level. The primary scale on the speedometer shall read from 0 to 100 MPH, and the secondary scale on the speedometer shall read from 0 to 160 KM/H. The scale on the fuel and DEF level gauges shall read from empty to full as a fraction of full tank capacity. Red indicator lights in the gauge and an audible alarm shall indicate low fuel or low DEF at 1/8<sup>th</sup> tank level.

One (1) three-movement gauge displaying engine RPM, and primary and secondary air system pressures shall be included. The scale on the tachometer shall read from 0 to 3000 RPM. The scale on the air pressure gauges shall read from 0 to 150 pounds per square inch (PSI) with a red line zone indicating critical levels of air pressure. Red indicator lights in the gauge and an audible alarm shall indicate low air pressure.

One (1) four-movement gauge displaying engine oil pressure, coolant temperature, voltmeter, and transmission temperature shall be included. The scale on the engine oil pressure gauge shall read from 0 to 100 pounds PSI with a red line zone indicating critical levels of oil pressure. A red indicator light in the gauge and audible alarm shall indicate low engine oil pressure. The scale on the coolant temperature gauge shall read from 100 to 250 degrees Fahrenheit (°F) with a red line zone indicating critical coolant temperatures. A red indicator light in the gauge and audible alarm shall indicate high coolant temperature. The scale on the voltmeter shall read from 9 to 18 volts with a red line zone indicating critical levels of battery voltage. A red indicator light in the gauge and an audible alarm shall indicate high or low system voltage. The low voltage alarm shall indicate when the system voltage has dropped below 11.8 volts for more than 120 seconds in accordance with the requirements of NFPA 1901. The scale on the transmission temperature gauge shall read from 100 to 300 degrees °F with a red line zone indicating critical temperatures. A red indicator light in the gauge and an audible alarm shall indicate a high transmission temperature.

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The light bar portion of the message center shall include twenty-eight (28) LED backlit indicators. The lightbar shall be split with fourteen (14) indicators on each side of the LCD message screen. The lightbar shall contain the following indicators and produce the following audible alarms when supplied in conjunction with applicable configurations:

## **RED INDICATORS**

Stop Engine - indicates critical engine fault  
Air Filter Restricted - indicates excessive engine air intake restriction  
Park Brake - indicates parking brake is set  
Seat Belt - indicates a seat is occupied and corresponding seat belt remains unfastened  
Low Coolant - indicates critically low engine coolant  
Cab Tilt Lock - indicates the cab tilt system locks are not engaged.

## **AMBER INDICATORS**

Malfunction Indicator Lamp (MIL) - indicates an engine emission control system fault  
Check Engine - indicates engine fault  
Check Transmission - indicates transmission fault  
Anti-Lock Brake System (ABS) - indicates anti-lock brake system fault  
High exhaust system temperature – indicates elevated exhaust temperatures  
Water in Fuel - indicates presence of water in fuel filter  
Wait to Start - indicates active engine air preheat cycle  
Windshield Washer Fluid – indicates washer fluid is low  
DPF restriction - indicates a restriction of the diesel particulate filter  
Regen Inhibit-indicates regeneration of the DPF has been inhibited by the operator  
Range Inhibit - indicates a transmission operation is prevented and requested shift request may not occur.  
SRS - indicates a problem in the supplemental restraint system  
Check Message - indicates a vehicle status or diagnostic message on the LCD display requiring attention.

## **GREEN INDICATORS**

Left and Right turn signal indicators  
ATC - indicates low wheel traction for automatic traction control equipped vehicles, also indicates mud/snow mode is active for ATC system  
High Idle - indicates engine high idle is active.  
Cruise Control - indicates cruise control is enabled  
OK to Pump - indicates the pump is engaged and conditions have been met for pump operations  
Pump Engaged - indicates the pump transmission is currently in pump gear  
Auxiliary Brake - indicates secondary braking device is active

## **BLUE INDICATORS**

High Beam indicator

## **AUDIBLE ALARMS**

Air Filter Restriction  
Cab Tilt Lock  
Check Engine  
Check Transmission  
Open Door/Compartment  
High Coolant Temperature  
High or Low System Voltage

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High Transmission Temperature  
Low Air Pressure  
Low Coolant Level  
Low DEF Level  
Low Engine Oil Pressure  
Low Fuel  
Seatbelt Indicator  
Stop Engine  
Water in Fuel  
Extended Left/Right Turn Signal On  
ABS System Fault

## **BACKLIGHTING COLOR**

The instrumentation gauges and the switch panel legends shall be backlit using white LED backlighting.

## **HOUR METER**

Within the instrument panel, a Honeywell brand hour meter shall be installed which shall measure the amount of hours the PTO has been operated. The hour meter shall be prewired to the transmission location for final installation by the OEM and labeled "AERIAL HOURS".

## **CAMERA RIGHT HAND**

One (1) Audiovox Voyager heavy duty rearview teardrop shaped chrome plated housing camera shall be mounted on the officer side of the cab below the windshield ahead of the front door at approximately the same level as the cab door handles. The camera display shall activate when the right side turn signal is activated.

## **CAMERA REAR**

One (1) Audiovox Voyager heavy duty box shaped HD camera shall be shipped loose for OEM installation in the body to afford the driver a clear view to the rear of the vehicle.

The camera system shall include a one-way communication device that shall be an integral part of the rear camera for the use of voice commands directly to the driver. The rear camera display shall activate when the vehicle's transmission is placed in reverse.

## **CAMERA DISPLAY**

The camera system shall be wired to a single Weldon Vista display located on the driver's side dash. The camera system display can be activated through the Vista display panel.

## **CAMERA SPEAKER**

The rear camera shall be wired to speaker(s) in the cab and shall audible to the driver and officer. There shall be a virtual button provided on the Vista display and control panel to deactivate the speaker(s).



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## **COMMUNICATION ANTENNA**

An antenna shall be installed on the cab. The antenna shall be a custom configured Sharkee model GPSB. The antenna shall be mounted on the left hand front corner of the cab roof so not to interfere with light bars or other roof mounted equipment installed by chassis builder. The antenna shall be chassis builder supplied.

The custom configuration shall include:

- GPSB MULTI-BAND GPS 2G/3G/4G/WLAN ANT
- C23F-5F, FME (ftd) FME (ftd) 5m CS23 Cable
- ASF-155-S4-821, Flexi 155MHz/s4/821MHz Ant Element
- C29T-5SJ, TNC(m)-SMA(F) 5m CS29 Cable Assy
- C32SP-5SP, 5m CS32 Cable Assy SMA9m)-Sma(m)
- C23F-1MP, FME(f) MPL(m) 1m CS23 Cable

## **COMMUNICATION ANTENNA CABLE ROUTING**

The antenna cable shall be routed from the antenna base mounted on the roof to the area inside the center rocker switch console.

## **CAB EXTERIOR PROTECTION**

The cab face shall have a removable plastic film installed over the painted surfaces to protect the paint finish during transport to the body manufacturer.

## **FIRE EXTINGUISHER**

A 2.50 pound D.O.T approved fire extinguisher with BC rating shall be shipped loose with the cab.

## **ROAD SAFETY KIT**

The cab and chassis shall include one (1) emergency road safety triangle kit.

## **DOOR KEYS**

The cab and chassis shall include a total of four (4) door keys for the manual door locks.

## **DIAGNOSTIC SOFTWARE OCCUPANT PROTECTION**

Diagnostic software for the Spartan Advanced Protection System shall be available for free download from the Spartan Chassis website to Spartan authorized OEMs, dealers and service centers, as well as the vehicle owner.

The software has been validated to be compatible with the following RP1210 interface adapters:

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- Dearborn Group DPA4 Plus
- Noregon Systems JPRO® DLA+
- Cummins INLINE5
- Cummins INLINE6
- NexIQ™ USB-Link™

The software and adapter utilize the SAE J1939-13 heavy duty nine (9) pin connector which is located below the driver's side dash to the left of the steering column.

## **WARRANTY**

Summary of Warranty Terms:

THE FOLLOWING IS SUMMARY OF WARRANTY TERMS FOR INFORMATION ONLY. THE ACTUAL LIMITED WARRANTY DOCUMENT, WHICH IS ATTACHED TO THIS OPTION, CONTAINS THE COMPLETE STATEMENT OF THE SPARTAN FIRE CHASSIS LIMITED WARRANTY. SPARTAN'S RESPONSIBILITY IS TO BE ACCORDING TO THE TERMS OF THE COMPLETE LIMITED WARRANTY DOCUMENT.

The chassis manufacturer shall provide a limited parts and labor warranty to the original purchaser of the custom built cab and chassis for a period of twenty-four (24) months, or the first 36,000 miles, whichever occurs first. The warranty period shall commence on the date the vehicle is delivered to the first end user.

## **CHASSIS OPERATION MANUAL**

There shall be two (2) digital copies of the chassis operation manual provided with the chassis. The digital data shall include a parts list specific to the chassis model.

## **ENGINE AND TRANSMISSION OPERATION MANUALS**

The following manuals specific to the engine and transmission models ordered will be included with the chassis in the ship loose items:

- (1) Hard copy of the Engine Operation and Maintenance manual with digital copy
- (1) Digital copy of the Transmission Operator's manual
- (1) Digital copy of the Engine Owner's manual

## **CAB/CHASSIS AS BUILT WIRING DIAGRAMS**

The cab and chassis shall include two (2) digital copies of wiring schematics and option wiring diagrams.

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## **SALES TERMS**

The sale of the Spartan Chassis shall be governed by the terms contained on the Sales Terms – Acceptance of Purchase Order document, a copy of which is attached to this option.

## **DRIVELINE LAYOUT CONFIRMATION**

During the design phase of the chassis the Spartan Chassis driveline engineer shall submit the driveline layout to an OEM engineer to review the chassis design for any potential problems integrating the OEM body to the chassis. The OEM engineer shall provide approval to the driveline engineer prior to driveline bills of materials being released.

## **MUD FLAPS**

In addition to the chassis supplied front mud flaps, two (2) mud flaps shall be provided rearward of the rear axles on the apparatus.

## **EXTEND AIR TANK DRAINS**

The chassis air tank drains shall be extended to the outside of the body and terminate with key rings. The manual pull air tank drains are to be routed to a manifold.

The chassis supplied and installed heat exchanger shall be attached to the pump by the OEM manufacturer.

## **KNEELING FEATURE**

The OEM shall connect the kneeling system to the stabilizer plant sensors. The air bags will be depleted when the aerial master is activated and any one of the stabilizers are planted.

The air bags will refill once the last stabilizer is raised or the aerial master switch is turned off. In the event the aerial master is not turned off, the aerial master is interlocked to the park brake and will be turned off once the park brake is depressed refilling the air bags.

## **RELOCATE CAB TILT**

The cab tilt pendant shall be relocated as deemed best fit by the OEM.

## **WATER TANK**

The apparatus shall be equipped with a United Plastic Fabricating (UPF) 480 U.S. gallon water tank. Certification of the tank capacity shall be recorded on the manufacturer's record of construction and shall be provided to the purchaser upon delivery of the apparatus. The water tank shall be constructed of 1/2" thick PT2E polypropylene sheet stock, a non-corrosive stress relieved thermoplastic material, black in color, and UV-stabilized for maximum protection. The tank shall be of a specific configuration and shall be designed to be completely independent of the body and compartments. All joints and seams shall be nitrogen welded and tested for maximum strength and integrity. The top of the tank shall be fitted with removable lifting eyes designed with a 3:1 safety factor to facilitate easy removal.

## **TANK BAFFLES**

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The swash partitions shall be manufactured of natural color 3/8" PT2E polypropylene, with the transverse partitions extending from approximately 4" off the floor to just under the cover and the longitudinal partitions extending to the floor of the tank through the cover to allow for positive welding and maximum integrity. All partitions shall be equipped with vent and air holes to permit movement of air and water between compartments. The partitions shall be designed to provide maximum water flow, interlock with one another, and be welded to each other and the walls of the tank.

## **TANK SUMP**

One (1) sump shall be provided in the bottom of the water tank, constructed of 1/2" polypropylene, and located in the driver's side front quarter of the tank. Tanks requiring a front suction shall incorporate a 4" schedule 40 polypropylene pipe with a dip tube from the front of the tank to the sump location. The sump shall be used as a combination clean-out and drain. An anti-swirl plate shall be located approximately 2" above the sump.

## **TANK FILL CONNECTION**

All tank fill couplings shall be backed with flow deflectors to break up the stream of water entering the tank, and shall be capable of withstanding sustained fill rates of up to 1,000 GPM.

## **TANK LID**

The tank lid shall be constructed of 1/2" thick PT2E polypropylene and incorporate a three-piece locking design allowing for individual removal and inspection if necessary. The tank lid shall be recessed 3/8" from the top of the tank and welded to the sides and the longitudinal partitions for maximum integrity. The lid shall have hold downs consisting of 2" polypropylene dowels spaced a maximum of 30" apart. These dowels shall extend through the covers, ensuring the covers remain rigid under fast filling conditions. A minimum of two lifting dowels shall be drilled and tapped 1/2" x 13" to accommodate the lifting eyes.

## **WATER TANK MOUNTING**

The water tank carrier shall be designed specifically for this apparatus. The carrier structure shall be supported by and welded directly to the top plate of the torque-box.

## **WATER TANK DRAIN**

A 1-1/2" drain valve shall be provided in the pump compartment to drain the water tank. The valve shall include a locking lever to prevent accidental draining of the water tank.

## **WATER TANK FILL TOWER**

The tank shall have a combination vent and manual fill tower, marked "Water Fill", located at the driver's side front corner of the tank. The fill tower shall be constructed of blue 1/2" PT2E polypropylene and be a minimum dimension of 8" x 8" at the outer perimeter. The tower shall have a 1/4" thick removable polypropylene screen and a PT2E polypropylene hinged-type cover.

## **WATER TANK LEVEL GAUGE**

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One (1) Fire Research, model WLA300-A00, TankVision Pro 300 water tank level gauge shall be provided on the pump operator's control panel.

The gauge shall have nine (9) easy to see super bright RGB LEDs to show the tank volume. The display shall use a two-dimensional, two-element lens to refract the light from the LEDs to provide full 180° visibility for the level indication. The gauge shall start to flash when the tank volume is at 1/4 tank or less and use down scrolling LEDs to alert the pump operator when the tank is almost empty.

## **FRC MAXVISION WATER TANK LEVEL DISPLAYS**

An FRC MaxVision water tank level strip light shall be installed on the driver's side and officer's side of the chassis cab by the chassis manufacturer. The OEM shall connect the datalink needed for all strips to mimic each other.

## **4" WATER TANK OVERFLOW**

The tank shall be equipped with a minimum of a 4" schedule 40 polypropylene overflow/air vent pipe installed in the fill tower extending through the tank and dumping behind the rear axle.

The water tank overflow is to be extended below the fuel tank and rear axle so that the overflow does not dump or spray on top of either.

## **FOAM CELL**

One (1) United Plastic Fabricating (UPF) 20 U.S. gallon foam cell shall be incorporated into the water tank. One (1) pressure/vacuum vent shall be installed and one (1) drain hose shall be connected to the foam cell.

The drain shall have a quarter-turn valve installed as close to the foam tank as possible and it shall drain below the frame rail of the chassis.

The foam cell shall be designed for use with Class "A" foam.

The foam cell shall have a manual fill tower constructed of 1/2" PT3 polypropylene and shall be a minimum dimension of 8" x 8" outer perimeter. The foam fill tower shall be green in color, indicating the type of foam to be utilized and located on the officer's side front corner of the water tank. The capacity of the cell shall be engraved on the top of the fill tower lid. The tower shall have a 1/4" thick removable polypropylene screen and a stainless steel hinged-type cover. Inside the fill tower, approximately 1.5" down from the top, there shall be an anti-foam fill tube that extends down to the bottom of the cell. A pressure vacuum vent shall be provided in the lid of the fill tower.

## **FOAM CELL LEVEL GAUGE**

One (1) Fire Research, model WLA360-A00, TankVision Pro 300 foam tank level gauge shall be provided on the pump operator's control panel.

The gauge shall have nine (9) super bright RGB LEDs to show the tank volume. The display shall use a two-dimensional, two-element lens to refract the light from the LEDs to provide full 180° visibility for the level indication. The gauge shall use a pressure transducer installed near

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the bottom of the foam tank to determine the correct volume in the tank. The gauge shall be self-calibrating by filling the tank at a steady flow rate. Self-diagnostics capabilities shall be standard on the gauge. The gauge shall start to flash when the tank volume is at 1/4 tank or less and use down scrolling LEDs to alert the pump operator when the tank is almost empty.

The gauge shall have a label that indicates it is for the foam cell that contains Class "A" foam.

## **HOSE BED**

The hose bed shall be located ahead of the turntable support structure on the officer's side of the water tank and have a minimum of 30 cubic feet of combined storage space in accordance with NFPA 1901, current edition. The hose bed shall extend backward, past the side of the turntable support, and exit at the rear of the apparatus through one (1) access opening. The access opening shall be free of obstructions that may interfere with the deployment and loading of hose. One (1) painted aluminum door shall cover the hose bed access opening. The door shall be a horizontally hinged lift-up design with a positive latch gas strut hold open device. A 1" stainless steel body trim piece shall be at the rear-bottom of the hose bed, to protect the chevron striping when deploying hose.

The interior walls of the hose bed shall have an abraded aluminum finish.

The floor of the hose bed shall be constructed of Dura-Dek fiber reinforced plastic material to prevent the accumulation of water and to allow ventilation to aid in drying hose. The flooring shall be fabricated of "T" beam pultrusions in parallel connected with cross slats that are first mechanically bonded and then epoxied, forming a large sheet. The top portion of each "T" cross section shall measure 1-1/4" wide and 3/16" thick with beaded ends. The vertical portion shall be 3/8" thick, beading out at the bottom to a thickness of 1/2" and tall enough to result in an overall height of 1". The "T" sections shall be spaced 3/4" apart to allow for drainage and ventilation.

Each "T" beam shall be constructed utilizing a core of 250,000 continuous glass fiber strands that are high in resistance to tension, compression and bending. An outer sheath consisting of a continuous strand mat to prevent linear splitting and slipping shall surround the core. The sheath shall also serve to draw the protective resin to the bar surface. Both reinforcements shall be pulled through an isophthalic polyester resin, treated with antimony trioxide for fire resistance, to form a solid length.

The flooring shall then be protected with a polyurethane coating to screen out ultraviolet rays. The bright white coating shall be baked on.

The hose bed area shall be adequately lit to meet requirements.

The hose bed shall contain the following hose load:

1000' of 5" double jacket hose

## **HOSE BED LOADING LIGHTS**

Two (2) Grote, model 61E41, LED hose bed loading lights shall be provided to illuminate of the hose bed area in accordance with NFPA 1901, current edition. The lights shall be installed on the bulkhead at the front of the hose bed. The hose bed lighting circuit shall be activated when

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the parking brake is engaged. The hose bed loading lights shall be controlled by a switch located above the taillight bezel on the driver's side.

## **ALUMINUM BODY CONSTRUCTION**

The apparatus body shall be fabricated from 1/8" 5052-H32, smooth aluminum sheet. The total outside width of the apparatus body shall not exceed 100 inches. The width measurement of the sidewalls shall be made from the outside wall of the two opposite sides of the body.

The complete apparatus body shall be fabricated utilizing the break and bend techniques in order to form a strong, yet flexible, uni-body structure. The body shall be constructed with holding fixtures to ensure proper dimensioning. Each apparatus body is specific in design in order to meet the unique requirements of the purchasing fire department.

The main body compartments on each side, as well as the rear center compartment if applicable, shall contain a sweep out floor design. Each compartment shall be made to the most practical dimensions in order to provide maximum storage capacity for the fire department's equipment. The door opening threshold shall be positioned lower than the compartment floor permitting easy cleaning of the compartments.

Continuous, solid welded seams shall be located at the upper front and upper rear corners of the apparatus body. The flooring of all lower, main body compartmentation shall also have solid weld seams. All door jams, on both the top and the bottom, shall be solid welded as well. Each main door jam consists of a double jam design; this is comparable to a double struck frame design, which provides superior strength and durability. All double door jams are to be welded together utilizing the plug weld technique. All remaining compartment walls shall be stitch welded.

The compartment floors, specifically L1 and R1, shall have a minimum of two (2) 2" x 2" square tubes welded to the entire width of the compartment floor. The two (2) rear side compartments as well as the rear center compartment, if applicable, shall be welded to the rear deck support structure. This rear deck support structure is specially designed for the galvanized apparatus body substructure. Each lower, rear compartment shall be adequately stitch welded to the cross tubes providing strength and durability to the entire apparatus body.

The body design shall include a "false wall" design in the lower portion of each lower, rear compartment. This "false wall" is required in order to allow for easy accessibility to the rear electrical components found in the rear taillight cluster area.

On the upper area of the apparatus body, directly above the side compartment door openings, a header is to be fabricated from smooth, aluminum sheet. This area shall be free of any body seams and shall be painted the same color as the apparatus body. The height of the header may vary depending on the following factors: apparatus design, lettering requirements, scene lights and warning light requirements as well as various other options. A "J" channel shall be incorporated into the body design in order to provide a rain gutter to further assist in preventing excessive moisture from getting into the compartments.

## **SIDE COMPARTMENT DOORS**

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ROM roll-up doors shall be installed on each side body compartment, eight (8) total. Each door shall be a shutter type with slats that roll onto a spool at the top of the compartment. Each slat shall be equipped with nylon end shoes to assure operation without the need for constant lubrication. The door slats and tracks shall be wet painted by the door manufacturer to match the apparatus body.

Each ROM roll-up door shall be supplied with a full-width lift bar and finger pull handle integrated into the bottom rail for easy one hand operation.

Shop Note: Order the roll-up doors with anodized bottom sills.

## **DOOR HANDLES**

The door handles on the side body compartments of the apparatus shall be non-locking style.

Door protectors shall be provided in the upper section of the body compartments with roll-up doors. Each door protector shall mitigate the damage to the roll-up.

## **PULL DOWN STRAP**

There shall be a nylon pull down strap installed on each roll-up door. The straps shall be installed as followed: There shall be a nylon strap with loops sewn into each end. The strap shall be long enough to be installed at the midpoint of the compartment and the bottom of the door, and shall be long enough to completely open the door but not so long that it will hang out of the door when it is in the closed position. There shall be a footman loop installed on the bottom of the door just inside the jam. The footman loop shall be threaded through the loop in the strap and secured to the door with nut zerts. The other end of the strap shall be installed vertically at the mid point of the compartment opening just inside the door track. The footman loop shall be threaded through the nylon strap and secured to the compartment opening with nut Zerts.

## **REAR COMPARTMENT DOOR**

One (1) ROM roll-up door shall be installed on the T1 compartment face. The door shall be a shutter type with 34-millimeter slats that roll onto a spool at the top of the compartment. Each slat shall be equipped with nylon end shoes to assure operation without the need for constant lubrication. The door slats, tracks, and bottom sill shall be wet painted by the door manufacturer to match the apparatus body.

The ROM roll-up door shall be supplied with a full-width lift bar and finger pull handle integrated into the bottom rail for easy one hand operation.

The rear compartment shall be illuminated by the Rom lights supplied with the door.

The compartment shall be furnished with integrated LED compartment light(s). An automatic door switch shall activate the compartment light.

## **BODY COMPARTMENT LIGHTING**



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A total of sixteen (16) On-Scene Access Series LED compartment lights shall be installed in the body compartments. Each light shall be enclosed within a tough waterproof Lexan tube enclosure and offer 400 lumens per 18" of light and an adjustable beam angle. The lights shall have a five (5) year replacement warranty.

Shop Note: Compartment lights are to be as long as possible.

## **COMPARTMENT COATING**

The interior of the body compartments shall be coated with gray Line-X unless otherwise specified. The coating shall be durable enough to withstand the everyday wear and tear of equipment removal and shifting.

All warning labels will be installed in an Innovative bezel. No label will be adhered directly to the body.

## **COMPARTMENT AIR RELEASE**

Each compartment shall be vented to help remove trapped air when closing the compartment door. The vent shall be a rubber gasket in the area of the outboard corners of the compartment. Wiring may also be run through these areas.

## **COMPARTMENT DRAIN HOLES**

Each body compartment shall be equipped with drain holes to allow standing water to exit underneath the apparatus.

## **FUEL FILL**

A fuel fill pocket shall be located in the rear wheel well area on the driver's side. The fuel fill shall utilize a stainless steel OEM door that is painted primary body color. The hinge and frame shall all be constructed out of stainless steel material.

## **WHEEL WELL "SMART STORAGE"**

The wheel wells shall be designed to accept "Smart Storage" modules for maximum compartment efficiency.

## **DRIVER'S (LEFT) SIDE BODY COMPARTMENTS**

### **COMPARTMENT L1**

A full height compartment shall be located ahead of the rear wheels on the driver's side of the apparatus body. This compartment shall be designated as L1 within these specifications and any ensuing paperwork or drawings after contract execution.

The dimensions of the compartment shall be:

- Height: 65"
- Width: 23"

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- Depth: 14" Upper and 23" Lower
- Intermediate Divide Height: 30"

## **COMPARTMENT L2**

A standard height compartment shall be located above the rear wheels on the driver's side of the apparatus body. This compartment shall be designated as L2 within these specifications and any ensuing paperwork or drawings after contract execution.

The dimensions of the compartment shall be:

- Height: 36"
- Width: 78"
- Depth: 14" Upper and 14" Lower
- Intermediate Divide Height: 0"

## **COMPARTMENT L3**

A standard height compartment shall be located above the rear wheels on the driver's side of the apparatus body. This compartment shall be designated as L3 within these specifications and any ensuing paperwork or drawings after contract execution.

The dimensions of the compartment shall be:

- Height: 23"
- Width: 51"
- Depth: 14" Upper and 14" Lower
- Intermediate Divide Height: 0"

## **COMPARTMENT L4**

A full height compartment shall be located behind the rear wheels on the driver's side of the apparatus body. This compartment shall be designated as L4 within these specifications and any ensuing paperwork or drawings after contract execution.

The dimensions of the compartment shall be:

- Height: 54"
- Width: 32"
- Depth: 14" Upper and 23" Lower
- Intermediate Divide Height: 30"

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## L1 Components

### ADJUSTABLE SHELF

One (1) aluminum adjustable shallow-depth shelf shall be installed in the compartment. The shelf shall be constructed of 3/16" aluminum sheet with a minimum of 2" lips. The shelf shall have an abraded finish and shall be designed in such a manner as to allow liquids to readily drain.

### FLOOR MOUNTED ROLL OUT TRAY

One (1) roll out tray shall be installed on the floor of the compartment. The tray shall be provided with an On-Scene Cargo Slide roller type assembly. The roller assembly shall have a rated capacity of 1,000 lb. distributed load and shall have 100% extension capabilities. A mechanical lock assembly shall be provided to lock the tray in the extended or retracted position. The tray shall be constructed of 3/16" aluminum sheet with 3" lips and shall have an abraded finish. The roller assembly is constructed of anodized aluminum and stainless steel fasteners.

### COMPARTMENT STRUTS

Aluminum vertical strut channels shall be welded in the compartment. Two (2) struts shall be provided for any full depth portion and one (1) strut shall be provided for any shallow depth portion.

The compartment layout shall be detailed at the pre-construction meeting.

## L2 Components

### FLOOR MOUNTED ROLL OUT TRAY

One (1) roll out equipment tray shall be installed on the floor of the compartment. The tray shall be equipped with an Austin Hardware drawer slide. The roller assembly shall have a rated capacity of 300 lbs. distributed load and shall have 100% extension capability. The tray shall be constructed of 3/16" aluminum sheet with 3" lips. The tray shall have an abraded finish and shall be equipped with a locking slide in order to hold the tray in either a fully extended or closed position. The tray shall be equipped with the Austin Hardware front drawer release system which allows for one handed operation of the system.

### COMPARTMENT STRUTS

Aluminum vertical strut channels shall be welded in the compartment. Two (2) struts shall be provided for any full depth portion and one (1) strut shall be provided for any shallow depth portion.

The compartment layout shall be detailed at the pre-construction meeting.

## L3 Components

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## **FLOOR MOUNTED ROLL OUT TRAY**

One (1) roll out equipment tray shall be installed on the floor of the compartment. The tray shall be equipped with an Austin Hardware drawer slide. The roller assembly shall have a rated capacity of 300 lbs. distributed load and shall have 100% extension capability. The tray shall be constructed of 3/16" aluminum sheet with 3" lips. The tray shall have an abraded finish and shall be equipped with a locking slide in order to hold the tray in either a fully extended or closed position. The tray shall be equipped with the Austin Hardware front drawer release system which allows for one handed operation of the system.

## **COMPARTMENT STRUTS**

Aluminum vertical strut channels shall be welded in the compartment. Two (2) struts shall be provided for any full depth portion and one (1) strut shall be provided for any shallow depth portion.

The compartment layout shall be detailed at the pre-construction meeting.

## **L4 Components**

### **ADJUSTABLE SHELF**

One (1) aluminum adjustable shallow-depth shelf shall be installed in the compartment. The shelf shall be constructed of 3/16" aluminum sheet with a minimum of 2" lips. The shelf shall have an abraded finish and shall be designed in such a manner as to allow liquids to readily drain.

## **FLOOR MOUNTED ROLL OUT TRAY**

One (1) roll out tray shall be installed on the floor of the compartment. The tray shall be provided with an On-Scene Cargo Slide roller type assembly. The roller assembly shall have a rated capacity of 1,000 lb. distributed load and shall have 100% extension capabilities. A mechanical lock assembly shall be provided to lock the tray in the extended or retracted position. The tray shall be constructed of 3/16" aluminum sheet with 3" lips and shall have an abraded finish. The roller assembly is constructed of anodized aluminum and stainless steel fasteners.

## **COMPARTMENT STRUTS**

Aluminum vertical strut channels shall be welded in the compartment. Two (2) struts shall be provided for any full depth portion and one (1) strut shall be provided for any shallow depth portion.

The compartment layout shall be detailed at the pre-construction meeting.

## **DRIVER'S SIDE SMART STORAGE - WL1**

A three (3) air bottle Smart Storage compartment shall be installed in the forward portion of the rear wheel well area, on the driver's side of the apparatus. The compartment shall be a triangle design. The compartment door shall be constructed of 3/16" aluminum material. The door shall have a rubber gasket to create a 100% seal against an aluminum flange to protect the interior of the compartment. The door shall be painted primary body color.

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## **DRIVER'S SIDE SMART STORAGE - WL2**

A Smart Storage open storage compartment shall be installed in the rear wheel well area between the tandem axles on the driver's side of the apparatus. The compartment door shall be constructed of 3/16" aluminum material. The door shall have a rubber gasket to create a 100% seal against an aluminum flange to protect the interior of the compartment. The door shall be painted primary body color.

## **DRIVER'S SIDE SMART STORAGE - WL3**

A three (3) air bottle Smart Storage compartment shall be installed in the rearward portion of the rear wheel well area, on the driver's side of the apparatus. The compartment shall be a triangle design. The compartment door shall be constructed of 3/16" aluminum material. The door shall have a rubber gasket to create a 100% seal against an aluminum flange to protect the interior of the compartment. The door shall be painted primary body color.

## **OFFICER'S (RIGHT) SIDE BODY COMPARTMENTS**

### **COMPARTMENT R1**

A full height compartment shall be located ahead of the rear wheels on the officer's side of the apparatus body. This compartment shall be designated as R1 within these specifications and any ensuing paperwork or drawings after contract execution.

The dimensions of the compartment shall be:

- Height: 65"
- Width: 23"
- Depth: 14" Upper and 23" Lower
- Intermediate Divide Height: 30"

### **COMPARTMENT R2**

A standard height compartment shall be located above the rear wheels on the officer's side of the apparatus body. This compartment shall be designated as R2 within these specifications and any ensuing paperwork or drawings after contract execution.

The dimensions of the compartment shall be:

- Height: 36"
- Width: 78"
- Depth: 14" Upper and 14" Lower
- Intermediate Divide Height: 0"

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## **COMPARTMENT R3**

A standard height compartment shall be located above the rear wheels on the officer's side of the apparatus body. This compartment shall be designated as R3 within these specifications and any ensuing paperwork or drawings after contract execution.

The dimensions of the compartment shall be:

- Height: 23"
- Width: 51"
- Depth: 14" Upper and 14" Lower
- Intermediate Divide Height: 0"

## **COMPARTMENT R4**

A full height compartment shall be located behind the rear wheels on the officer's side of the apparatus body. This compartment shall be designated as R4 within these specifications and any ensuing paperwork or drawings after contract execution.

The dimensions of the compartment shall be:

- Height: 54"
- Width: 54"
- Depth: 14" Upper and 23" Lower
- Intermediate Divide Height: 30"

## **R1 Components**

### **ADJUSTABLE SHELF**

One (1) aluminum adjustable shallow-depth shelf shall be installed in the compartment. The shelf shall be constructed of 3/16" aluminum sheet with a minimum of 2" lips. The shelf shall have an abraded finish and shall be designed in such a manner as to allow liquids to readily drain.

### **FLOOR MOUNTED ROLL OUT TRAY**

One (1) roll out tray shall be installed on the floor of the compartment. The tray shall be provided with an On-Scene Cargo Slide roller type assembly. The roller assembly shall have a rated capacity of 1,000 lb. distributed load and shall have 100% extension capabilities. A mechanical lock assembly shall be provided to lock the tray in the extended or retracted position. The tray shall be constructed of 3/16" aluminum sheet with 3" lips and shall have an abraded finish. The roller assembly is constructed of anodized aluminum and stainless steel fasteners.

### **COMPARTMENT STRUTS**

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Aluminum vertical strut channels shall be welded in the compartment. Two (2) struts shall be provided for any full depth portion and one (1) strut shall be provided for any shallow depth portion.

The compartment layout shall be detailed at the pre-construction meeting.

## **R2 Components**

### **FLOOR MOUNTED ROLL OUT TRAY**

One (1) roll out equipment tray shall be installed on the floor of the compartment. The tray shall be equipped with an Austin Hardware drawer slide. The roller assembly shall have a rated capacity of 300 lbs. distributed load and shall have 100% extension capability. The tray shall be constructed of 3/16" aluminum sheet with 3" lips. The tray shall have an abraded finish and shall be equipped with a locking slide in order to hold the tray in either a fully extended or closed position. The tray shall be equipped with the Austin Hardware front drawer release system which allows for one handed operation of the system.

### **COMPARTMENT STRUTS**

Aluminum vertical strut channels shall be welded in the compartment. Two (2) struts shall be provided for any full depth portion and one (1) strut shall be provided for any shallow depth portion.

The compartment layout shall be detailed at the pre-construction meeting.

## **R3 Components**

### **FLOOR MOUNTED ROLL OUT TRAY**

One (1) roll out equipment tray shall be installed on the floor of the compartment. The tray shall be equipped with an Austin Hardware drawer slide. The roller assembly shall have a rated capacity of 300 lbs. distributed load and shall have 100% extension capability. The tray shall be constructed of 3/16" aluminum sheet with 3" lips. The tray shall have an abraded finish and shall be equipped with a locking slide in order to hold the tray in either a fully extended or closed position. The tray shall be equipped with the Austin Hardware front drawer release system which allows for one handed operation of the system.

### **COMPARTMENT STRUTS**

Aluminum vertical strut channels shall be welded in the compartment. Two (2) struts shall be provided for any full depth portion and one (1) strut shall be provided for any shallow depth portion.

The compartment layout shall be detailed at the pre-construction meeting.

## **R4 Components**

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## **ADJUSTABLE SHELF**

One (1) aluminum adjustable shallow-depth shelf shall be installed in the compartment. The shelf shall be constructed of 3/16" aluminum sheet with a minimum of 2" lips. The shelf shall have an abraded finish and shall be designed in such a manner as to allow liquids to readily drain.

## **FLOOR MOUNTED ROLL OUT TRAY**

One (1) roll out tray shall be installed on the floor of the compartment. The tray shall be provided with an On-Scene Cargo Slide roller type assembly. The roller assembly shall have a rated capacity of 1,000 lb. distributed load and shall have 100% extension capabilities. A mechanical lock assembly shall be provided to lock the tray in the extended or retracted position. The tray shall be constructed of 3/16" aluminum sheet with 3" lips and shall have an abraded finish. The roller assembly is constructed of anodized aluminum and stainless steel fasteners.

## **COMPARTMENT STRUTS**

Aluminum vertical strut channels shall be welded in the compartment. Two (2) struts shall be provided for any full depth portion and one (1) strut shall be provided for any shallow depth portion.

The compartment layout shall be detailed at the pre-construction meeting.

## **OFFICER'S SIDE SMART STORAGE - WR1**

A Smart Storage compartment shall be installed in the forward portion of the rear wheel well area, on the officer's side of the apparatus. The compartment shall be designed to store one (1) 2.5 gallon water can and one (1) 20 lbs fire extinguisher. The compartment door shall be constructed of 3/16" aluminum material. The door shall have a rubber gasket to create a 100% seal against an aluminum flange to protect the interior of the compartment. The door shall be painted primary body color.

## **OFFICER'S SIDE SMART STORAGE - WR2**

A Smart Storage open storage compartment shall be installed in the rear wheel well area between the tandem axles on the officer's side of the apparatus. The compartment door shall be constructed of 3/16" aluminum material. The door shall have a rubber gasket to create a 100% seal against an aluminum flange to protect the interior of the compartment. The door shall be painted primary body color.

## **OFFICER'S SIDE SMART STORAGE - WR3**

A three (3) air bottle Smart Storage compartment shall be installed in the rearward portion of the rear wheel well area, on the officer's side of the apparatus. The compartment shall be a triangle design. The compartment door shall be constructed of 3/16" aluminum material. The door shall have a rubber gasket to create a 100% seal against an aluminum flange to protect the interior of the compartment. The door shall be painted primary body color.

## **REAR BODY COMPARTMENT**



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A compartment shall be located at the rear of the apparatus that extends into the apparatus torque box.

## **HOT-DIP GALVANIZED STEEL BODY MOUNT SUB FRAME**

The main body mount sub frame shall be constructed from formed steel channel bolted and welded to the torque box. The sub frame shall be located at the front and rear of the body and in front of, above, and rear of the wheel well opening.

The compartment area behind the rear axle shall be supported by a drop frame fabricated of steel tube and angles. All drop frame structures shall be welded directly to the torque box to allow the body to be a completely separate structure from the chassis.

## **BODY RUB RAILS**

Rub rails shall be installed beneath the compartment doors to protect the apparatus body from damage should the body be brushed or rubbed against another object. The rub rails shall be 2-1/2" x 1" 3/16" aluminum channel. The rub rails shall be highly polished and then bright dip anodized.

The rub rails shall be installed on the body utilizing non-corrosive nylon spacers and secured with stainless steel bolts. The outside edge of the rub rails shall be even with the fenderettes and bolt-on steps to prevent snagging.

## **TWO REAR TOW EYES**

Two (2) chrome plated tow eyes shall be installed at the rear of the apparatus above the rear step area. The tow eyes shall be bolted to a heavy-duty assembly that is welded to the torque box. The tow eyes shall have a 2-1/2" ID hole.

## **REAR WHEEL WELLS**

Wheel wells shall have semicircular black polymer composite inner liners that are bolted to the wheel well panel and supported inboard by brackets that are connected to the body framework. Each wheel well shall be a continuous piece with no breaks or ledges where road grime or debris may accumulate. This liner shall be removable for access to suspension assembly for repairs. There shall be no exception to the bolted wheel well inner liner requirement.

## **STAINLESS STEEL FENDERETTES**

Four (4) stainless steel fenderettes shall be installed at the outboard edge of the rear wheel well area, two (2) on each side. Rubber welting shall be provided between the body and the crown to seal the seam and restrict moisture from entering. A dielectric barrier shall be provided between the fender crown fasteners (screws) and the fender sheet metal to resist deterioration. The fenderettes shall be constructed of stainless steel that has been polished to a high-quality finish.

## **EXHAUST HEAT DEFLECTOR SHIELD**

A 5" heat deflector shield shall be installed over the exhaust to aid in dissipating the heat to prevent exhaust heat from adversely affecting contents stored in the body.

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## **FUEL TANK GAUGE ACCESS PANEL**

Access shall be provided in the torque box for service of the fuel tank gauge without removing the fuel tank.

## **LICENSE PLATE BRACKET**

A license plate bracket shall be mounted on the rear of the apparatus. A clear LED light shall be incorporated into the bracket.

## **TRIMRITE STAINLESS STEEL FASTENERS**

TrimRite stainless steel fasteners shall be provided for all exposed and unpainted fasteners throughout the body in locations such as overlays, pump panels, and other numerous hardware mounting locations. TrimRite stainless is a hardenable martensitic stainless steel that provides a high level of corrosion resistance, hardness up to Rockwell C 51, good cold formability and ease of heat treatment, all of which combine to provide an alloy which has been used for many applications. TrimRite stainless is tested to salt spray standard ASTM B117, which is a 200-hour salt spray test. The OEM shall use TrimRite stainless with an added blue patch which provides improved vibration resistance for the fasteners.

## **ADDITIONAL HARDWARE**

A bag of stainless steel nuts, bolts, and washers shall be supplied with the apparatus for mounting of equipment.

## **WALKWAYS AND OVERLAYS**

All exterior surfaces designated by the manufacturer as stepping, standing, or walking areas shall be overlaid with 3003 H22 bright tread plate to provide a slip resistant surface, even when the surface is wet. All interior surfaces designated by the manufacturer as stepping, standing, or walking areas shall be slip resistant when the surface is dry. The degree of slip resistance shall be in accordance with NFPA 1901, current edition.

Horizontal walkways shall have .080" aluminum tread plate overlays installed and vertical surfaces shall have .125" aluminum tread plate overlays. Overlays shall be installed that are totally insulated from the apparatus with nylon shoulder washers that extend into holes in the body. Stainless steel cap nuts shall be employed where bolt ends may damage equipment or cause injury. After the apparatus is painted and the overlays are reinstalled, they shall be additionally sealed at the edges with a caulking compound. The exterior top tread plate overlay shall be mounted flush with the outer edges of the apparatus body.

Any designated horizontal standing or walking surface higher than 48" from the ground and not guarded by a railing, or structure at least 12" high shall have a "safety yellow line" marking the outside perimeter of the designated standing or walking surface area. Yellow reflective SCENEdots shall be used to create the line along the outside edges of standing and walking surfaces. Steps and ladders shall not be required to have the yellow line.

## **STEPPING SURFACES**

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All steps shall have a surface area of at least 35 square inches and shall be able to withstand a load of at least 500 pounds. Steps shall be provided at any area that personnel may need to climb and shall be adequately lit.

## TURNTABLE ACCESS LADDER

"Smart" aluminum fold down access ladder shall be provided and installed at the right rear of the apparatus for access to the turntable, rearward of the side body compartments. The ladder rungs shall be constructed of a slip resistant stepping material.

The upper section shall be permanently secured to the body with a mechanical style hinge and fasteners that allow the ladder to extend down and out to the ground from the apparatus body. When deployed, the fold-down steps shall create a safe and comfortable climbing angle.

Two (2) gas cylinders shall be installed to assist in the deployment of the lower fold-down section. Access ladder rung illumination shall be provided during low light conditions.

If the step is not properly stowed and the transmission is placed into drive or reverse mode with the parking brake released, it shall activate the hazard light in the cab to alert the crew.

A grab handle shall be installed on top of the body at the rear of the apparatus.

A 6" Red / 6" White diamond grade reflective chevron shall be installed on each outboard side of the ladder. "THIS IS NOT A STEP" red reflective message shall be installed on the bottom of the last step in two directions so when the step is folded up you can read it from standing on top of the turn table or by standing on the ground.

## **FRONT TREAD PLATE OVERLAYS**

A tread plate overlay shall be located on the front vertical areas of each side of the apparatus body. The overlays shall be located on the front of the body compartments.

## **FRONT BODY STEPS AND LIGHTING**

Four (4) Innovative Controls folding steps (3004234-27-1-1-1-1-0) shall be located on the front of the driver's side body compartments. The folding steps shall have two large open slots to prevent the buildup of ice or mud and to provide a hand-hold when necessary. The steps shall have a surface area of at least 35 square inches and shall be able to withstand a load of 500 pounds.

Each step shall be a backlit polydomed Spartan Logo, a LED step light module and a bottom down-light module.

## **FRONT BODY STEPS AND LIGHTING**

Three (4) Innovative Controls folding steps (3004234-27-1-1-1-1-0) shall be located on the front of the officer's side body compartments. The folding steps shall have two large open slots to prevent the buildup of ice or mud and to provide a hand-hold when necessary. The steps shall have a surface area of at least 35 square inches and shall be able to withstand a load of 500 pounds.

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Each step shall be a backlit polydomed Spartan Logo, a LED step light module and a bottom down-light module.

## **BACKLIT HANDRAILS**

All handrails, unless otherwise stated, shall be constructed of knurled aluminum with white colored LED backlighting and (2) recessed "Reflexite" reflective strips, red in color. All railing shields and brackets shall be chrome plated and shall be bolted to the body with stainless steel bolts. The lower bracket on all vertical handrails shall have a drain hole drilled in it at the lowest point.

The following handrails shall be provided on the apparatus:

A handrail shall be installed forward on the top of the body, on the driver's side.

A handrail shall be installed on the top officer's side front of the body.

## **AUXILIARY STEP/LIGHT SHIELD ABOVE SIDE PUMP PANELS**

There shall be a step/light shield provided on each side of the apparatus above the pump panels, for a total of two (2) steps. Each step shall be a minimum of 8" deep and the width of the pump panel and be formed from aluminum anti-slip tread plate. Each step shall have hand hold cut-outs fabricated into the outer edge of the step, and shall house the pump panel light under it for its respective side.

## **GROUND LADDER STORAGE**

The ground ladders shall be stored within the torque box and shall be removable from the rear of the apparatus. The ladders shall be fully enclosed so road dirt and debris cannot foul or damage the ladders. The ladders shall be stored in individual full-length aluminum slides so they can be removed individually. The slides shall be lined with nylon to aid in moving the ladders.

The following ground ladders shall be supplied with the apparatus:

One (1) Duo Safety, model 585-A, 10' aluminum folding ladder shall be provided.

One (1) Wing Enterprises, model 15187-882 Aluminum "Defender" Little Giant Type 1A ladder shall be provided.

Two (2) Duo Safety model 875-A, 16' aluminum roof ladders with folding roof hooks shall be provided.

One (1) Duo Safety, model 1200-A, 28' aluminum two-section extension ladder shall be provided.

One (1) Duo Safety, model 1225-A, 35' aluminum three-section extension ladder shall be provided.

## **PIKE POLE STORAGE**

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Six (6) aluminum tubes for the storage of pike poles shall be installed inside the upper portion of the torque box.

The following pike poles shall be supplied with this location on the apparatus:

Two (2) Nupla, model YPD-6, 6' fiberglass pike poles with a standard hook and butt-style handle shall be provided.

Two (2) Nupla, model YPD-8, 8' fiberglass pike poles with a standard hook and butt-style handle shall be provided.

Two (2) Nupla, model YPD-12, 12' fiberglass pike poles with a standard hook and butt-style handle shall be provided.

## **PIKE POLE STORAGE**

Two (2) aluminum trays for the storage of pike poles shall be installed inside the upper portion of the torque box.

The following pike poles shall be supplied with this location on the apparatus:

One (1) Nupla, model YPDH-6, 6' fiberglass pike poles with a standard hook and a wood/steel "D" handle shall be provided.

One (1) Nupla, model YPDH-8, 8' fiberglass pike poles with a standard hook and "D" handle shall be provided.

## **WHEEL CHOCK STORAGE**

The wheel chocks shall be stored in locations that are easily accessible under the front of the body on the driver's side of the apparatus.

## **WHEEL CHOCKS**

One (1) pair of Zico, model SAC-44, wheel chocks shall be provided with the apparatus. The wheel chocks shall be mounted in Zico model, SQCH-44-H, mounting brackets.

## **WHEEL CHOCK STORAGE**

The wheel chocks shall be stored in locations that are easily accessible under the front of the body on the officer's side of the apparatus.

## **WHEEL CHOCKS**

One (1) pair of Zico, model SAC-44, wheel chocks shall be provided with the apparatus. The wheel chocks shall be mounted in Zico model, SQCH-44-H, mounting brackets.

## **INDEPENDENT ALUMINUM PUMP MODULE**

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The pump module shall be fabricated from 1/8" 5052-H32, smooth aluminum sheet. The module shall be fabricated as an individual unit, independent from the body. The module shall be fabricated utilizing the break and bend technique in order to form a strong yet flexible structure. The pump module shall be fabricated using precision holding fixtures to ensure proper dimensions and all attachment points shall be heavily reinforced.

## **PUMP COMPARTMENT LIGHTS**

Two (2) LED OnScene Solutions "Access" Series 8" tube lights shall be installed inside the pump compartment module to illuminate the piping and plumbing components.

The lights shall be activated by a weather resistant toggle switch installed inside the pump compartment.

## **DRIVER'S SIDE RUNNING BOARD**

A modular bolt-on running board, constructed of anti-slip tread plate, shall be installed on the driver's side of the pump module. The outside edge of the running board shall be flush with the rub rail installed on the body to maintain a uniform appearance. The running board shall be installed with sufficient support to form a sturdy, non-deflecting step area for personnel.

## **OFFICER'S SIDE RUNNING BOARD**

A modular bolt-on running board, constructed of anti-slip tread plate, shall be installed on the officer's side of the pump module. The outside edge of the running board shall be flush with the rub rail installed on the body to maintain a uniform appearance. The running board shall be installed with sufficient support to form a sturdy, non-deflecting step area for personnel.

## **PULL OUT PLATFORM**

One (1) On-Scene pull out platform shall be provided that can support a maximum of 600 pounds on the driver's side of the pump module. The top surface of the platform shall be constructed of aluminum serrated bar grating for ease of maintenance and to provide a slip resistant surface for the operator. The platform shall lock in both the retracted and the extended position. The pull out platform shall be wired to the door-ajar circuit. The trim pieces shall be fabricated out of aluminum tread plate.

## **DUNNAGE COMPARTMENT**

A dunnage compartment shall be located above the pump module. The dunnage compartment floor shall be constructed of tread plate.

## **FRONT PUMP ACCESS PANEL**

A tread plate access panel shall be provided on the front of the pump compartment. The panel shall be of the single pan design and shall be positively latched in the closed position utilizing compression latches. An aluminum sill protector shall be installed on the bottom of the door opening to protect the paint from chipping and scratching. This area shall be accessible when the cab is tilted.

## **OFFICER'S SIDE PUMP ACCESS PANEL**

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A painted aluminum access panel shall be above the officer's side pump panel to allow access to the pump compartment. The vertically hinged panel shall be of the single pan design and shall be positively latched in the closed position utilizing compression latches. A gas strut shall be provided on the door. An aluminum sill protector shall be installed on the bottom of the door opening to protect the paint from chipping and scratching. The door shall be wired into the door-ajar warning light circuit.

## **CONTROL PANEL**

The driver's side of the pump enclosure shall be divided into two sections. The lower section shall be where all valve controls, the primer control, the discharge relief valve controls (pilot valve), and other mechanical controls are located. This surface shall be referred to as the "control panel".

All valve controls shall be the self-locking type, activated by either direct control or with a direct linkage utilizing friction locking bell cranks and universal ball swivels. The primary valve handles shall have color coded tags installed in a recessed area to clearly denote the purpose of each control.

## **INSTRUMENT PANEL**

The surface up above the control panel shall contain all instruments, gauges, test fittings, and optional controls. This surface shall be referred to as the "instrument panel". The instrument panel shall be independent and hinged and latched so that it may be opened. All instruments, gauges, and other equipment shall be installed with sufficient slack in any cabling, tubing, or plumbing to allow the panel to swivel to the fully open position.

The instrument and gauge panel shall be vertically hinged "swing out" to provide access for service.

## **OFFICER'S SIDE PUMP PANEL**

A single panel shall be installed on the officer's side of the pump enclosure. This shall be the area where any officer's side discharges, inlets, steamers, and other pump-associated equipment are located. This panel shall be easily removable and held in place with quick release push latches. It shall be fully removable for pump and plumbing access without the need to use hand tools. Any electrical equipment that may be installed shall be equipped with connectors so they may be easily separated from the opening created when the below described front access panel is removed.

## **PANEL SURFACES**

The control panel, instrument panel, and officer's side pump panel shall be fabricated from a minimum of 16 gauge stainless steel with #4 brushed finish.

## **GARNISH RING BEZEL ASSEMBLIES**

Innovative Controls intake and/or discharge garnish rings shall be installed to the apparatus with mounting bolts. These bezel assemblies shall be used to identify intake and/or discharge ports with color and verbiage. The garnish rings shall be designed and manufactured to withstand the specified apparatus service environment and shall be backed by a warranty equal to that of the

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exterior paint and finish. The specified assemblies shall feature a chrome-plated panel-mount bezel with durable UV resistant polycarbonate inserts. These UV resistant polycarbonate graphic inserts shall be subsurface screen printed to eliminate the possibility of wear and protect the inks from fading. All insert labels shall be backed with 3M permanent adhesive, which meets UL969 and NFPA standards.

## **VERBIAGE TAG BEZEL ASSEMBLIES**

Innovative Controls verbiage tag bezels shall be installed. The bezel assemblies will be used to identify apparatus components. These tags shall be designed and manufactured to withstand the specified apparatus service environment and shall be backed by a warranty equal to that of the exterior paint and finish. The verbiage tag bezel assemblies shall include a chrome-plated panel-mount bezel with durable easy-to-read UV resistant polycarbonate inserts featuring the specified verbiage and color coding. These UV resistant polycarbonate verbiage and color inserts shall be subsurface screen printed to eliminate the possibility of wear and protect the inks from fading. Both the insert labels and bezel shall be backed with 3M permanent adhesive, which meets UL969 and NFPA standards.

## **SAFETY MESSAGE BEZEL ASSEMBLIES**

Innovative Controls safety message bezels shall be installed. The bezel assemblies will be used to identify, instruct, or warn the operators. These tags shall be designed and manufactured to withstand the specified apparatus service environment and shall be backed by a warranty equal to that of the exterior paint and finish. The safety message bezel assemblies shall include a chrome-plated panel-mount bezel with durable easy-to-read UV resistant polycarbonate inserts featuring ANSI safety standard graphics or custom graphics. These UV resistant polycarbonate graphic inserts shall be subsurface screen printed to eliminate the possibility of wear and protect the inks from fading. Both the graphic insert labels and bezel shall be backed with 3M permanent adhesive, which meets UL969 and NFPA standards.

## **PUMP PANEL LIGHTING**

The pump operator's control panel and the officer's side pump panel shall each be illuminated by ONE (1) maximum length available On-Scene LED Access lighting.

## **PUMP PANEL LIGHT ACTIVATION**

One (1) pump panel light at the operator's panel shall be illuminated at the time the pump is ready to pump and it is "OK TO PUMP". The Pump shift has been completed and the chassis automatic transmission is engaged.

The remaining lights shall be controlled by a switch located one (1) each side of the pump compartment.

## **MIDSHIP MOUNT FIRE PUMP**

The pump shall be a Waterous CSUC20 2000 U.S. GPM fire pump. The pump shall be a single stage centrifugal class "A" rated fire pump, designed specifically for the fire service.

The pump body shall be cast as two (2) horizontally split pieces. The body shall be made of high tensile, close-grained gray iron with a minimum tensile strength of 40,000 PSI.



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## **FLAME PLATED IMPELLER HUBS**

The pump impellers shall be bronze, specifically designed for the fire service and accurately balanced for vibration free running. The stripping edges shall be located on opposite sides of the impellers to reduce shaft deflection.

The impeller shaft shall be stainless steel, accurately ground to size and supported at each end by oil or grease lubricated anti-friction ball bearings for rigid, precise support. The bearings used on the impeller shaft shall be automotive type bearings, easily cross-referenced and readily available at normal parts or bearing stores.

The impeller hubs shall be flame plated with tungsten carbide to hardness approximately twice that of tool steel to assure maximum pump life and efficiency. During the flame plating process, the base metal shall not be allowed to exceed a temperature of 300 degrees Fahrenheit to prevent altering the metallurgical properties of the impeller material.

## **IMPELLER WEAR RINGS**

The pump shall be equipped with replaceable bronze wear rings for increased pump life and minimum maintenance cost. The wear rings shall be designed to fit into a groove in the face of the impeller hubs forming a labyrinth that, as the clearance increases with age, directs water from the discharge side in several directions eventually exiting outward, away from the eye of the impeller hub.

## **LUBRICATION SYSTEM**

An internal lubrication system shall deliver lubricant directly to the drive chain. This unique design shall eliminate the need for an external lubrication pump and auxiliary cooling. Oil shall be supplied with the lubrication system.

## **PUMP TRANSMISSION**

The pump shall have a Waterous model C20 series transmission. The housing of the transmission shall be constructed of high strength, three-piece, horizontally split aluminum. The drive line shafts shall be made from alloy steel forgings, hardened and ground to a size 2.350 inch 46 tooth involute spline. The drive and driven sprockets shall be made of steel and shall be hardened and have ground bores. The drive chain shall be a Morse HV high strength involute form chain. Bearings shall be deep-groove, anti-friction ball bearings and shall give support and proper alignment with the impeller shaft assembly. Bearings shall be oil splash lubricated, completely separated from the water being pumped, and protected by a V-ring and oil seal. An internal lubrication system shall deliver lubricant directly to the drive chain. This unique design eliminates the need for an external lubrication pump and auxiliary cooling. The pump and transmission shall be easily separable. A two-piece shaft shall be splined allowing for individual repair of either the pump or transmission, to keep down time to a minimum. All drive line components shall have a torque rating equal to or greater than the final net engine torque.

## **MECHANICAL SEALS**

# METRO FIRE APPARATUS

The pump shall be equipped with self-adjusting, maintenance free mechanical shaft seals that shall not require manual adjustment. These seals shall be designed in a manner such that they shall remain functional enough to permit continued use of the pump in the unlikely event of a seal failure.

## **ZINC ANODES**

Four (4) Waterous Magnesium anodes shall be provided with the fire pump. The anodes shall aid in preventing galvanic corrosion within the water pump and be easily replaceable. The anodes shall be installed as follows:

- Two (2) on the intake side of the pump
- Two (2) in the discharge manifold of the fire pump.

The pump shall be rated at 2000 gallons per minute.

## **FIRE PUMP MOUNTING**

The fire pump shall be mounted within a separate body module that is not directly connected to the apparatus body.

The pump shall be frame mounted; therefore minimizing the likelihood of the pump casing cracking should the apparatus be involved in a collision.

The pump module shall be mounted to the frame in a minimum of four (4) locations and shall be reinforced appropriately in order to carry the expected load for the life of the apparatus.

## **PUMP SHIFT**

The pump shift shall be supplied and installed by the chassis manufacturer.

The pump system shift indicator lights in the chassis cab shall be supplied and installed by the chassis manufacturer.

The pump system shift indicator lights on the operator's panel shall be incorporated with the pump pressure governor.

## **PRESSURE GOVERNOR**

A Fire Research InControl series TGA400 pressure governor and monitoring display kit shall be installed. The kit shall include a control module, intake pressure sensor, discharge pressure sensor, and cables. The control module case shall be waterproof and have dimensions not to exceed 5 1/2" high by 10 1/2" wide by 2" deep. The control knob shall be 2" in diameter with no mechanical stops, have a serrated grip, and a red idle push button in the center. It shall not extend more than 1 3/4" from the front of the control module. Inputs for monitored information shall be a J1939 data bus or independent sensors. Outputs for engine control shall be on the J1939 data bus or engine specific wiring.

The following continuous displays shall be provided:

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- Pump discharge; shown with four daylight bright LED digits more than 1/2" high
- Pump Intake; shown with four daylight bright LED digits more than 1/2" high
- Pressure/RPM setting; shown on a dot matrix message display
- Pressure and RPM operating mode LEDs
- Throttle ready LED
- Engine RPM; shown with four daylight bright LED digits more than 1/2" high
- Check engine and stop engine warning LEDs
- Oil pressure; shown on a dual color (green/red) LED bar graph display
- Engine coolant temperature; shown on a dual color (green/red) LED bar graph display
- Transmission Temperature: shown on a dual color (green/red) LED bar graph display
- Battery voltage; shown on a dual color (green/red) LED bar graph display

The dot-matrix message display shall show diagnostic and warning messages as they occur. It shall show monitored apparatus information, stored data, and program options when selected by the operator. All LED intensity shall be automatically adjusted for day and night time operation.

The program shall store the accumulated operating hours for the pump and engine to be displayed with the push of a button. The kit shall monitor inputs and support audible and visual warning alarms for the following conditions:

- High battery voltage
- Low battery voltage (engine off)
- Low battery voltage (engine running)
- High transmission temperature
- Low engine oil pressure
- High engine coolant temperature
- Out of water (visual alarm only)
- No engine response (visual alarm only)

The program features shall be accessed via push buttons and a control knob located on the front of the control panel. There shall be a USB port located at the rear of the control module to upload future firmware enhancements.

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Inputs to the control panel from the pump discharge and intake pressure sensors shall be electrical. The discharge pressure display shall show pressures from 0 to 600 PSI. The intake pressure display shall show pressures from -30 in. Hg to 600 PSI.

The governor shall operate in two control modes: pressure and RPM. No discharge pressure or engine RPM variation shall occur when switching between modes. A throttle ready LED shall light when the interlock signal is recognized. The governor shall start in pressure mode and set the engine RPM to idle. In pressure mode, the governor shall automatically regulate the discharge pressure at the level set by the operator. In RPM mode, the governor shall maintain the engine RPM at the level set by the operator except in the event of a discharge pressure increase. The governor shall limit a discharge pressure increase in RPM mode to a maximum of 30 PSI. Other safety features shall include recognition of no water conditions with an automatic programmed response and a push button to return the engine to idle.

An interlock system shall be provided to prevent advancement of the engine speed at the pump operator's panel unless the apparatus has "Throttle Ready" indication.

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

## **INTAKE RELIEF VALVE**

A Task Force Tips, model #A1850, pressure relief valve shall be installed on the suction side of the pump. The valve shall be factory preset and shall have an easy to read adjustment range from 90 to 300 PSI with easy to read 90, 125, 150, 200, 250, 300 PSI settings and an "OFF" position. Pressure adjustment can be made utilizing a 1/4" hex key, 9/16" socket or 14mm socket. For corrosion resistance the cast aluminum valve shall be hard coat anodized with a powder coat interior and exterior finish. The valve shall have a 2-1/2" male Victaulic discharge outlet. The valve shall be in accordance with NFPA 1901, current edition requirements for pump inlet relief valves. The unit shall be covered by a five-year warranty.

## **TRIDENT PRIMING PUMP**

The priming pump shall be a Trident Emergency Products three-barrel, compressed air powered, high efficiency, multi-stage, venturi based AirPrime System. All wetted metallic parts of the priming system are to be of brass and stainless steel construction. A pressure protection valve shall be installed with the priming pump. A single panel mounted control shall activate the priming pump and open the priming valve to the pump.

## **MASTER DRAIN VALVE**

A Trident manifold drain valve assembly shall be supplied. This drain shall provide the capability to drain the entire pump by turning a single control. The valve assembly shall consist of a stainless steel plate and shaft in a bronze body with multiple ports. The drain valve control shall be mounted on the driver's side pump panel and labeled "Master Drain".

## **WATEROUS OVERHEAT PROTECTION MANAGER WITH INDICATOR LIGHTS AND BUZZER**

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A Waterous Overheat Protection Manager (OPM) shall be installed on the pump. The relief valve shall automatically relieve water from the pump when the temperature of the pump water exceeds 140°F. In addition, a warning light on the pump panel shall be triggered by a thermal switch when the water in the pump reaches 180°F. The warning light and a buzzer act as additional protection devices if the temperature inside the pump keeps rising although the valve is open. The valve shall automatically reset after activation.

## **PAINT PUMP GRAY/PAINT INTAKES PRIMARY BODY COLOR**

The pump body shall be painted with AkzoNobel High Solids polyurethane paint. The paint color shall be a neutral gray. The pump enclosure shall be painted the same color as the apparatus body.

The main intake(s) and auxiliary intake valves shall be painted with a AkzoNobel High Solids polyurethane paint. The paint color shall be the same as the apparatus body.

## **PUMP MANUALS**

Two (2) Pump Operation and Maintenance manuals shall be provided in digital format with the apparatus.

## **PUMP AND ENGINE COOLING SYSTEM**

A pump and engine cooling system shall be provided on the apparatus. The cooling system shall keep the engine cool when running for long periods of time and the pump cool during long periods of pumping when water is not being discharged. The cooling system shall also be setup in a way that the cooling system lines can be easily drained through the master pump drain.

The cooling system lines shall consist of high-temperature hose. The engine cooling 3/8" lines shall be installed with one (1) line going from the discharge side of the water pump through a Class 1, 3/8 38BV" in-line quarter turn ball valve assembly with rectangle handle and continuing on to the chassis heat exchanger. The return line from the heat exchanger shall then run into the suction side of the pump. The pump cooling lines shall be installed with one (1) line going from the discharge side of the water pump through a Class 1, 3/4" 34BV in-line quarter-turn ball valve assembly with rectangle handle up to the water tank. At the water tank, the pump cooling line shall be plumbed into a 3/4" check valve on the "Tank Fill" valve. The check valve shall prevent tank water from back flowing into the pump when the cooling system is not in use. A return line from the water tank shall be plumbed into the water pump.

The engine cooling system valve shall be controlled on the operator's panel, and shall be clearly labeled, "Engine Cooler".

The pump cooling system valve shall be controlled on operators' panel, and shall be clearly labeled, "Pump Cooler".

Shop Note: Will not accept the 1/4 turn round handles.

## **FOAM SYSTEM**

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

Paddlewheel type flow meter shall be installed in the discharges specified to be foam capable.

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

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

A 12-volt electric motor driven positive displacement foam concentrate pump, rated up to 2.6 GPM, with operating pressures up to 400 PSI, shall be installed in a suitable compartment near the apparatus pump house. A pump motor electronic driver (mounted to the base of the pump) shall receive signals from the computer control display, and power the 1/2 horsepower electric motor. The electric motor is directly coupled to the concentrate pump in a variable speed duty cycle to ensure that the correct proportion of concentrate preset by the pump operator is injected into the water stream.

System capacity shall be as follows:

- 0.2% Foam Concentrate / 1300 Maximum GPM
- 0.5% Foam Concentrate / 520 Maximum GPM

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- 1.0% Foam Concentrate / 260 Maximum GPM
- 3.0% Foam Concentrate / 85 Maximum GPM

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

Components of the complete proportioning system as described above shall include:

- Operator control and display
- Paddlewheel flow meter
- Pump and electric motor/motor driven
- Wiring harnesses
- Low-level tank switch
- Foam injection check valve

An installation and operation manual shall be provided for the unit, along with a one (1) year limited warranty. A system-schematic-placard and a system-rating-placard shall be supplied and installed in accordance with NFPA 1901, current edition.

## **FLUSH SYSTEM**

A single foam flush system shall be installed to provide a clean water flush of the foam concentrate pump preventing foam concentrates from mixing and possible jelling. Clean water from the booster tank shall be plumbed to a 1/4 turn T-handle valve/controller located on the pump panel. The valve shall be capable of operating pressures to 500 PSI.

Shop Note: The foam flush needs to be controlled by a 1/4 turn T-handle on the panel. The 1/4 turn round handle will not be accepted.

## **FOAM REFILL SYSTEM**

The apparatus shall be equipped with a FoamPro single foam, electronic, automatic concentrate refill system. It shall be separate from the proportioning system to allow for simultaneous operations. The system shall be capable of handling Class A or Class B foam concentrate. The apparatus shall be plumbed from the externally accessed intake/ flush port to the foam cell. The external intake/flush connection shall be quick connect, cam-lock type and incorporated a check valve to prevent backflow. The refill line shall be positioned in the lower portion of the foam cell to minimize agitation. The refill operation shall be based on direct measurement of the concentrate level in the cell and the refill pump intake performance. The system must be capable of automatically stopping when the foam cell is full and warn the operator when the concentrate source is empty or any other conditions preventing flow occurs. The system shall be equipped and electronic control suitable for installation on the pump panel. Incorporated within the control shall be a microprocessor that receives input from the system while also monitoring foam concentrate pump output. An all bronze three-way valve shall be included to allow that operator to flush the system after use.

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A 12-volt electric motor driven positive concentrate pump, with a minimum of 10 U.S. GPM @ 20 PSI rating, with concentrate viscosity exceeding 5500 CPS, shall be installed per manufacturer recommendations. A pump motor electronic driver shall receive signals from the computer control display and power the electric motor directly coupled to the concentrate pump. The system shall receive readings when the concentrate tank is full and stop operation to prevent overflow. The system shall terminate operations when flow is not detected on the intake side for twelve (12) seconds.

## **FOAM PROPORTIONING SYSTEM TESTING**

The foam proportioning system shall be tested and certified after final installation in accordance with NFPA 1901, current edition.

## **PLUMBING MANIFOLD**

The plumbing manifold shall consist of the inlet side manifold and the discharge side manifold. Galvanized Victaulic couplings shall be used wherever possible for ease of maintenance and superior corrosion protection.

The inlet side of the plumbing manifold shall utilize schedule 10, 304-grade stainless steel tubing and preformed elbows for inlets that are larger than 3". Side auxiliary inlets that are 3" or smaller shall utilize schedule 10, 304-grade stainless steel threaded tubing and preformed elbows. The inlet manifold shall thread into the pump auxiliary inlet ports and each inlet valve shall thread onto the inlet manifold.

The discharge side of the plumbing manifold shall utilize schedule 10, 304-grade stainless steel tubing and preformed elbows to ensure the quality of the manifold where welds are required. The discharge manifold shall connect to the pump discharge ports using 1/2" stainless steel flanges that shall be machined to seat an O-ring to ensure a leak proof seal. Each discharge shall derive from a port on the manifold assembly connected to a discharge valve with 1/2" 304-grade stainless steel flanges. Discharges that terminate in a location other than the pump module (i.e. rear discharges) that do not require welding shall utilize a combination of high-pressure flex hose and schedule 10, 304-grade stainless steel tubing to allow flexibility between the body and the pump module.

A 3/4" quarter turn drain valve shall be included. A chrome plated rectangular handle shall be provided on the drain valve to facilitate use with a gloved hand. The drain valve shall be located just above the running board and below the pump panel to reduce clutter in the pump panel area. The drain valve shall be connected to the valve with a flexible hose that is routed in such a manner as to assure complete drainage to below the apparatus. A matching color coded bezel shall be included.

## **INNOVATIVE CONTROLS DISCHARGE GAUGES - 2-1/2" - 0-400 PSI**

The discharge gauges on the apparatus shall be 2-1/2" diameter Innovative Controls pressure gauges. The gauges shall have a one-piece die-cast brass case that integrates the valve stem connection, movement support, and bourdon tube support into a single unit that eliminates distortion and leakage. Clear scratch resistant molded lenses shall be used to ensure distortion-free viewing and they shall be sealed to the gauge by being trapped together with a profile gasket by a crimped stainless steel bezel. The gauges shall be filled with a synthetic mixture to



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dampen shock and vibration, lubricate the internal mechanisms, prevent lens condensation and ensure proper operation from  $-40^{\circ}\text{F}$  to  $+160^{\circ}\text{F}$ .

The gauges shall exceed ASME B40.100 Grade B requirements with an accuracy of  $\pm 1.5\%$  full scale and include a size appropriate phosphorous bronze bourdon tube with a reinforced lap joint and large tube base to increase the tube life and gauge accuracy.

Highly-polished stainless steel bezels shall be provided to prevent corrosion and protect lenses and gauge cases. The gauges shall be installed into decorative chrome-plated mounting bezels that incorporate valve identifying verbiage and/or color labels.

The gauges shall display a range from 0 to 400 PSI and shall have an orange tip on the pointer.

## **MASTER PRESSURE CENTER ASSEMBLY**

The master gauges shall be installed on the pump panel no more than 6 inches apart in an integrated master pressure assembly that includes the two (2) master gauges and the test port manifold.

The master intake and master discharge gauges shall be 4" diameter Innovative Controls pressure gauges. Each gauge shall have a one-piece die-cast brass case that integrates the valve stem connection, movement support, and bourdon tube support into a single unit that eliminates distortion and leakage. A clear scratch resistant molded lens shall be used to ensure distortion-free viewing and it shall be sealed to the gauge by being trapped together with a profile gasket by a crimped stainless steel bezel. The gauge shall be filled with a synthetic mixture to dampen shock and vibration, lubricate the internal mechanisms, prevent lens condensation and ensure proper operation from  $-40^{\circ}\text{F}$  to  $+160^{\circ}\text{F}$ .

Each gauge shall exceed ASME B40.100 Grade B requirements with an accuracy of  $\pm 1\%$  full scale and include a size appropriate phosphorous bronze bourdon tube with a reinforced lap joint and large tube base to increase the tube life and gauge accuracy. A highly-polished stainless steel bezel shall be provided to prevent corrosion and protect the lens and gauge case.

The two (2) master gauges shall be installed into a decorative chrome-plated zinc mounting bezel that also incorporates a test port manifold and a graphic overlay that identifies the master intake and discharge gauges, the vacuum test port, and the pressure test port. The test port manifold is solid cast brass with chrome-plated plugs.

The gauge on the left shall be the master pump intake gauge and display a range from -30 to 400 PSI with black graphics on a white background. The gauge on the right shall be the master pump discharge gauge and display a range from 0 to 400 PSI with burgundy graphics on a white background.

## **HARDWARE BRAND**

The non-Storz discharge and intake fittings provided on this apparatus shall be South Park Corp. Brand. The adapter/cap/plug fittings shall be manufactured from high-quality brass that shall be polished to remove manufacturing irregularities with a chrome finish applied to the polished surface.

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The Storz discharge and intake fittings provided on this apparatus shall be Task Force Tips Brand. For corrosion resistance, the adapter shall be constructed of hard coat anodized aluminum alloy and include a polymer bearing ring for prevention of galvanic corrosion.

The auxiliary intake(s) shall terminate with NH swivels, and the discharges shall terminate with male NH threads.

## **DISCHARGE, PRE-CONNECT, AND INTAKE DRAINS**

An Innovative Controls 3/4" quarter turn drain valve shall be included on each discharge, gated intake, and steamer valve (if applicable). A side stem, long stroke chrome plated lift handle shall be provided on the drain valve to facilitate use with a gloved hand. The drain valve shall have a verbiage tag that angles upward so that it can easily be seen and read by the operator before opening. The drain valve shall be located just above the running board and below the pump panel to reduce clutter in the pump panel area. The drain valve shall be connected to the valve with a flexible hose that is routed in such a manner as to assure complete drainage to below the apparatus. A matching color coded bezel shall be included.

## **AUTOMATIC DRAINS**

A Class 1 automatic drain shall be installed on the deluge valve (if applicable). The drains shall also be located in low laying areas (i.e., front discharge) The Drains will open whenever the pressure in the line drops below 6 PSI.

## **PLUMBING LABELS**

Innovative Controls brand labels shall be used to identify any pump valve controller, gauge, or drain on the apparatus. The labels shall be color coded in accordance with NFPA 1901, current edition compliance. The colors and verbiage of the labels shall be the OEM standard label package. The label package shall comply with the following:

- Each Pump-to-Tank Fill shall be labeled "Tank Fill" and shall have a light blue label color.
- Each Tank-to-Pump shall be labeled "Tank to Pump" and shall have a navy blue label color.
- Each intake label shall be burgundy in color and shall have verbiage to identify it.
- Each discharge label shall have a unique color and shall have verbiage to identify it.

For easy identification of each component, the verbiage of each label shall be size 22 pt, font "Helvetica Neue Condensed Bold"

The tank plumbing valves and controllers shall have the OEM Standard label package unless stated otherwise. The Pump-to-Tank Fill shall be labeled "TANK FILL" and shall have a light blue label color. The Tank-To-Pump shall be labeled "TANK TO PUMP"

## **2" TANK FILL**

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A 2" tank fill shall be plumbed from the pump to the tank. Installation shall be completed with 2" Class 1 rubber hose and stainless steel hose couplings.

An Akron Brass, model 8820, 2" Swing-Out valve shall be provided. The valve shall have an all brass body with flow optimizing stainless steel ball and dual polymer seats. The valve shall be capable of dual directional flow while incorporating a self-locking ball feature using an automatic friction lock design and specially designed flow optimizing stainless steel ball. The valve shall not require lubrication of seats or any other internal waterway parts and must be capable of swinging out of the waterway for maintenance by the removal of six bolts. The valve shall carry a ten (10) year warranty by the valve manufacturer.

## **3" TANK-TO-PUMP**

A 3" tank-to-pump shall be plumbed with a Class 1 flexible hose from the tank to the suction side of the pump. An Akron Brass, model 8830, 3" Swing-Out valve shall be provided. The valve shall have an all brass body with flow optimizing stainless steel ball and dual polymer seats. The valve shall be capable of dual directional flow while incorporating a self-locking ball feature using an automatic friction lock design and specially designed flow optimizing stainless steel ball. The valve shall not require lubrication of seats or any other internal waterway parts and must be capable of swinging out of the waterway for maintenance by the removal of six bolts. The valve shall also include a necessary B3-SH pump flange adapter, which shall be specifically used for the tank-to-pump line to properly adjust the plumbing based on the pitch of the pump. The valve shall carry a ten (10) year warranty by the valve manufacturer.

A check valve shall be between the pump suction and the booster tank valve. The check valve shall eliminate back flow into the water tank when the pump is connected to a pressurized source.

The valve shall be actuated by an Akron Brass, model R1 manual actuator. The manual actuator shall be controlled by an Innovative Controls push/pull T-handle.

## **6" DRIVER SIDE MAIN INTAKE**

A 6" main intake shall be located on the driver's side of the pump module. The suction fittings shall include a removable die-cast screen to provide cathodic protection for the pump thus reducing corrosion. A short steamer barrel shall be installed to accommodate an intake valve without exceeding the legal overall body width. The intake shall terminate male NH threads.

One (1) 6" NH thread long handle chrome plated vented steamer cap shall be provided.

## **2-1/2" DRIVER'S SIDE AUXILIARY INTAKE**

A 2-1/2" gated auxiliary intake with 2-1/2" plumbing shall be provided on the driver's side of the pump module. The auxiliary intake shall be fully recessed behind the panel in order to keep the valve protected from the elements.

An Akron Brass, model 8825, 2-1/2" Swing-Out valve shall be provided. The valve shall have an all brass body with flow optimizing stainless steel ball and dual polymer seats. The valve shall be capable of dual directional flow while incorporating a specially designed flow optimizing stainless steel ball. The valve shall not require lubrication of seats or any other internal waterway parts and must be capable of swinging out of the waterway for maintenance by the

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removal of six bolts. The valve shall be manufactured and assembled in the United States. The valve shall carry a ten (10) year warranty by the valve manufacturer.

The valve shall be actuated by an Akron Brass, model TSC manual actuator installed directly on the valve. The handle shall allow the valve to be controlled directly at the valve.

One (1) 2-1/2" NH thread rocker lug chrome plated vented plug, complete with cable or chain, shall be provided.

## **6" OFFICER SIDE MAIN INTAKE**

A 6" main intake shall be located on the officer's side of the pump module. The suction fittings shall include a removable die-cast screen to provide cathodic protection for the pump thus reducing corrosion. A short steamer barrel shall be installed to accommodate an intake valve without exceeding the legal overall body width. The intake shall terminate male NH threads.

One (1) 6" NH thread long handle chrome plated vented steamer cap shall be provided.

## **2-1/2" OFFICER'S SIDE AUXILIARY INTAKE**

A 2-1/2" gated auxiliary intake with 2-1/2" plumbing shall be provided on the officer's side of the pump module. The auxiliary intake shall be fully recessed behind the panel in order to keep the valve protected from the elements.

An Akron Brass, model 8825, 2-1/2" Swing-Out valve shall be provided. The valve shall have an all brass body with flow optimizing stainless steel ball and dual polymer seats. The valve shall be capable of dual directional flow while incorporating a specially designed flow optimizing stainless steel ball. The valve shall not require lubrication of seats or any other internal waterway parts and must be capable of swinging out of the waterway for maintenance by the removal of six bolts. The valve shall be manufactured and assembled in the United States. The valve shall carry a ten (10) year warranty by the valve manufacturer.

The valve shall be actuated by an Akron Brass, model TSC manual actuator installed directly on the valve. The handle shall allow the valve to be controlled directly at the valve.

One (1) 2-1/2" NH thread rocker lug chrome plated vented plug, complete with cable or chain, shall be provided.

See label order form (required)

## **2-1/2" DRIVER'S SIDE DISCHARGE**

A 2-1/2" discharge with 2-1/2" plumbing shall be located on the driver's side of the pump compartment. The discharge shall terminate with male NH thread.

An Akron Brass model 8625 2-1/2" Swing-Out valve shall be provided. The valve shall have an all brass body with flow optimizing stainless steel ball and dual polymer seats. The valve shall be capable of dual directional flow while incorporating a specially designed flow optimizing stainless steel ball. The valve shall not require lubrication of seats or any other internal waterway parts and must be capable of swinging out of the waterway for maintenance by the removal of six bolts. The valve shall be manufactured and assembled in the United States. The

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valve shall carry a ten (10) year warranty by the valve manufacturer.

The valve shall be actuated by an Akron Brass rack and sector actuator installed on the valve. The manual actuator shall be controlled by an Innovative Controls push/pull T- handle.

The discharge shall have a 2-1/2" brass case gauge with bezel and a display range from 0 to 400 PSI. The gauge shall have a black dial graphic and an orange tip on the pointer.

One (1) 2-1/2" female NH thread swivel rocker lug x 2-1/2" male NH thread 30-degree chrome plated elbow adapter shall be provided.

One (1) 2-1/2" NH thread rocker lug chrome plated vented cap, complete with cable or chain, shall be provided.

## **2-1/2" OFFICER'S SIDE DISCHARGE**

A 2-1/2" discharge with 2-1/2" plumbing shall be located on the officer's side of the pump compartment. The discharge shall terminate with male NH thread.

An Akron Brass, model 8825, 2-1/2" Swing-Out valve shall be provided. The valve shall have an all brass body with flow optimizing stainless steel ball and dual polymer seats. The valve shall be capable of dual directional flow while incorporating a specially designed flow optimizing stainless steel ball. The valve shall not require lubrication of seats or any other internal waterway parts and must be capable of swinging out of the waterway for maintenance by the removal of six bolts. The valve shall be manufactured and assembled in the United States. The valve shall carry a ten (10) year warranty by the valve manufacturer.

The valve shall be actuated by an Akron Brass, model R1, manual actuator installed on the valve. The manual actuator shall be controlled by an Innovative Controls push/pull T- handle at the pump operator's panel.

The discharge shall have a 2-1/2" brass case gauge with bezel and a display range from 0 to 400 PSI. The gauge shall have a black dial graphic and an orange tip on the pointer.

One (1) 2-1/2" female NH thread swivel rocker lug x 2-1/2" male NH thread 30-degree chrome plated elbow adapter shall be provided.

One (1) 2-1/2" NH thread rocker lug chrome plated vented cap, complete with cable or chain, shall be provided.

## **4" OFFICER'S SIDE DISCHARGE**

A 4" large diameter discharge, with 4" plumbing, shall be located on the officer's side of the pump compartment. The discharge shall terminate with male NH thread.

One (1) Akron Brass, model 8840, 4" Swing-Out valve shall be provided. The valve shall have an all cast brass valve body with a 4" full flow waterway ideal for flows up to 2000 GPM and a maximum body length of 4". The valve shall utilize a bronze flat ball design with a single urethane seat and be structurally rated to 500 PSI with a 250 PSI operating pressure. The valve shall not require the lubrication of seats or any other internal waterway parts, and shall be capable of swinging out of the waterway for maintenance by the removal of six bolts. The valve

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shall carry a ten (10) year warranty by the valve manufacturer.

The valve shall be actuated by an Akron Brass gear actuator installed on the valve. The gear actuator shall operate at a 50:1 gear ratio, which actuates from fully open to fully closed in twelve (12) rotations.

The gear actuator shall be controlled by an Akron Brass 6" handwheel valve controller. The handwheel worm gear shall be connected to the remote mounted valve via a rod assembly. The handwheel shall turn a gear sector mounted on the valve for smoother and easier operations under pressure. A position indicator shall show the position of the ball valve in accordance with NFPA 1901, current edition. Opening and closing speed shall comply with the current NFPA standard to minimize effects of water hammer.

The discharge shall have a 2-1/2" brass case gauge with bezel and a display range from 0 to 400 PSI. The gauge shall have a black dial graphic and an orange tip on the pointer.

One (1) 5" Storz x 4" female NH thread swivel rocker lug 30-degree elbow adapter shall be provided. The elbow shall be constructed of hard coat anodized aluminum alloy and have a silver powder coat finish inside and out.

One (1) 5" Storz blind cap, complete with lanyard, shall be provided.

## **2-1/2" FRONT BUMPER DISCHARGE**

A 2-1/2" discharge shall be located above the gravel shield on the officer's side of the front bumper. The discharge shall be plumbed with 2-1/2" chassis installed stainless steel plumbing and OEM installed stainless steel plumbing and high-pressure flex hose with stainless steel couplings. The discharge shall terminate with male NH thread.

The discharge shall have Class1 automatic drains installed in the low routed areas below the manual drain. The automatic drains shall open whenever the pressure in the line drops below 6 PSI.

The discharge shall be foam capable.

An Akron Brass, model 8825, 2-1/2" Swing-Out™ valve shall be provided. The valve shall have an all brass body with flow optimizing stainless steel ball and dual polymer seats. The valve shall be capable of dual directional flow while incorporating a specially designed flow optimizing stainless steel ball. The valve shall not require lubrication of seats or any other internal waterway parts, and must be capable of swinging out of the waterway for maintenance by the removal of six bolts. The valve shall be manufactured and assembled in the United States. The valve shall carry a ten (10) year warranty by the valve manufacturer.

The valve shall be actuated by an Akron Brass, model R1, manual actuator installed on the valve. The manual actuator shall be controlled by an Innovative Controls push/pull T-handle.

The discharge shall have a 2-1/2" brass case gauge with bezel and a display range from 0 to 400 PSI. The gauge shall have a black dial graphic and an orange tip on the pointer.

The discharge shall be designated as a pre-connect so no cap and chain shall be required.

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## **CROSSLAY CONFIGURATION**

Two (2) 1-1/2" and one (1) 2-1/2" crosslay pre-connects shall be located above the front stabilizers. The housing shall be adequately lit to meet requirements. High-pressure flex hose with stainless steel couplings shall be used in the plumbing.

A 90-degree swivel elbow shall be utilized to keep the hose from kinking when pulled from either side of the apparatus. The swivel for each crosslay shall be located outboard for ease of making connections while changing hose.

The pre-connect hose beds shall be sized to accommodate the following hose load:

The interior of the pre-connect hose bed shall have a maintenance free abraded finish.

## **FLOORING**

The floor of the pre-connect area shall be covered with Dura-Dek fiber reinforced material. The Dura-Dek shall have "T" beams in parallel connected with cross slats that are first mechanically bonded and then epoxied. The "T" sections shall be spaced 3/4" apart to allow for drainage and ventilation.

## **CROSSLAY TRIM**

Brushed stainless steel trim shall be installed at the openings on the bottom and on each side of the crosslay hose bed area. The trim shall reduce the chaffing of the hose jacket on the edges of the bay area.

## **DIVIDERS**

Two (2) dividers shall be in the crosslay area. Each divider shall be fabricated of 3/16" aluminum and shall be mounted in a channel on each end for adjustability. The dividers shall have a maintenance free abraded finish. Each divider shall have a vertical hand hold cutout provided at each end.

## **CROSSLAY COVER**

A bi-fold aluminum non-slip tread plate cover shall be installed on the crosslay hose bed. The cover shall not interfere with hose loading when in the open position. When in the open position the cover shall remain open due to automatically engaging mechanisms that require no type of latch operation to engage or release. The cover shall be provided with two full length stainless steel piano style hinges that shall attach the cover to the body and allow it to bi-fold. The cover shall be light yet rigid. Opening the cover may be performed by one person on one side of the apparatus. The cover shall be rigid enough to support weight without deformation.

The crosslay end covers shall be dealer supplied and installed.

Shop Note: SOE Required

## **1-1/2" PRE-CONNECT**

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A 1-1/2" pre-connect with 2" plumbing shall be provided. The pre-connect shall terminate out a swivel male NST threads.

The 1-1/2" crosslay pre-connect shall have a capacity of 250' of 1-3/4" double jacket fire hose stored in a single stack.

The discharge shall be foam capable.

An Akron Brass, model 8820, 2" Swing-Out valve shall be provided. The valve shall have an all brass body with flow optimizing stainless steel ball and dual polymer seats. The valve shall be capable of dual directional flow while incorporating a specially designed flow optimizing stainless steel ball. The valve shall not require lubrication of seats or any other internal waterway parts and must be capable of swinging out of the waterway for maintenance by the removal of six bolts. The valve shall be manufactured and assembled in the United States. The valve shall carry a ten (10) year warranty by the valve manufacturer.

The valve shall be actuated by an Akron Brass, model R1, manual actuator installed on the valve. The manual actuator shall be controlled by an Innovative Controls push/pull T- handle.

The discharge shall have a 2-1/2" brass case gauge with bezel and a display range from 0 to 400 PSI. The gauge shall have a black dial graphic and an orange tip on the pointer.

The discharge shall be designated as a pre-connect so no cap and chain shall be required.

## **1-1/2" PRE-CONNECT**

A 1-1/2" pre-connect with 2" plumbing shall be provided. The pre-connect shall terminate out a swivel male NST threads.

The 1-1/2" crosslay pre-connect shall have a capacity of 250' of 1-3/4" double jacket fire hose stored in a single stack.

The discharge shall be foam capable.

An Akron Brass, model 8820, 2" Swing-Out valve shall be provided. The valve shall have an all brass body with flow optimizing stainless steel ball and dual polymer seats. The valve shall be capable of dual directional flow while incorporating a specially designed flow optimizing stainless steel ball. The valve shall not require lubrication of seats or any other internal waterway parts and must be capable of swinging out of the waterway for maintenance by the removal of six bolts. The valve shall be manufactured and assembled in the United States. The valve shall carry a ten (10) year warranty by the valve manufacturer.

The valve shall be actuated by an Akron Brass, model R1, manual actuator installed on the valve. The manual actuator shall be controlled by an Innovative Controls push/pull T- handle.

The discharge shall have a 2-1/2" brass case gauge with bezel and a display range from 0 to 400 PSI. The gauge shall have a black dial graphic and an orange tip on the pointer.

The discharge shall be designated as a pre-connect so no cap and chain shall be required.



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## **2-1/2" PRE-CONNECT**

A 2-1/2" pre-connect with 2-1/2" plumbing shall be provided. The pre-connect shall terminate out a swivel NST.

The 2-1/2" crosslay pre-connect shall have a capacity of 250' of 2-1/2" double jacket fire hose stored in a single stack.

The discharge shall be foam capable.

An Akron Brass, model 8825, 2-1/2" Swing-Out™ valve shall be provided. The valve shall have an all brass body with flow optimizing stainless steel ball and dual polymer seats. The valve shall be capable of dual directional flow while incorporating a specially designed flow optimizing stainless steel ball. The valve shall not require lubrication of seats or any other internal waterway parts, and must be capable of swinging out of the waterway for maintenance by the removal of six bolts. The valve shall be manufactured and assembled in the United States. The valve shall carry a ten (10) year warranty by the valve manufacturer.

The valve shall be actuated by an Akron Brass, model R1, manual actuator installed on the valve. The manual actuator shall be controlled by an Innovative Controls push/pull T-handle.

The discharge shall have a 2-1/2" brass case gauge with bezel and a display range from 0 to 400 PSI. The gauge shall have a black dial graphic and an orange tip on the pointer.

The discharge shall be designated as a pre-connect so no cap and chain shall be required.

## **AERIAL WATERWAY DISCHARGE**

A discharge shall be plumbed to the aerial waterway with 4" plumbing. The plumbing shall be constructed from schedule 10 stainless steel components.

An Akron Brass, model 8940, 4" Swing-Out™ valve shall be provided. The valve shall have an all brass body with flow optimizing Fusion CF™ composite ball with Hydromax™ technology. The valve shall not require lubrication of seats or any other internal waterway parts, and must be capable of swinging out of the waterway for maintenance by the removal of four bolts. The valve shall carry a ten (10) year warranty by the valve manufacturer.

The valve shall be actuated by an Akron Brass electric actuator installed on the valve. The electric actuator shall have a 25:1 gear ratio, which actuates from fully open to fully close in eight (8) seconds, a clutchless motor, and utilize an electric controller with current limiting design.

The electric actuator shall be controlled by an Akron Brass, model 9335, Navigator™ Pro valve controller. The electric controls shall be of true position feedback design, requiring no clutches in the motor or current limiting. The unit shall be completely sealed with momentary open, close as well as an optional one (1) touch full open feature to operate the actuator. Three (3) additional buttons shall be available to be used for preset selection, preset activation, CAFS activation and menu navigation. The unit shall be capable of being connected to a Pressure Sensor and provide an LCD display showing pressure as well as valve position indication. Valve position indication shall be determined from true position feedback and indicate the exact position of the valve. The unit shall be capable of being used in conjunction with at least two (2)

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additional displays to control one (1) valve. The unit shall be able to be programmed to Bar, PSI or kPa for pressure. The unit shall have programmed pipe sizes and be capable of custom calibration to high and low flow ranges. The unit shall also be capable of turning on and off a solenoid used in a CAFS system. The only calibration required is to set the unit to the valve during initial set up. No other calibration shall be required. The display shall be a full color LCD display with a backlight. It shall have manual adjustment of the brightness as well as an auto-dimming option. Unit shall carry a five (5) year warranty.

All discharges shall have the OEM Standard label package unless stated otherwise. Each discharge label shall be a unique color. Specific verbiage and colors on each discharge label tag shall be determined at the pre-construction meeting.

## **ELECTRICAL SYSTEM**

Wiring harnesses shall be the automotive type, engineered specifically for the builder's apparatus, and shall meet the following criteria. Under no circumstances shall diodes, resistors, or fusible links be located within the wiring harness. All such components shall be located in an easy to access wiring junction box or the main circuit breaker area. All wire shall meet white book, baseline advanced design transit coach specification and Society of Automotive Engineers recommended practices. It shall be stranded copper wire core with cross-linked polyethylene insulation complying with SAE specification J1128. Each wire shall be hot stamp function coded every three inches starting one inch from the end and continuing throughout the entire harness. In addition to function coding, each wire shall be numbered, colored, and gauge coded.

Wire harnesses shall be protected by 275 degree Fahrenheit minimum high temperature flame retardant loom. All nodes and sealed Deutsch connectors shall be waterproof.

Harnesses shall be modular in design; main harness system subdivided into several smaller sub-harnesses. The harness subsections shall be connected using Deutsch branded, heavy duty, environmentally sealed, connectors with silicone seals and a rear insertion/removal contact system. For isolation of electrical "zones" the harness subsections shall consist of a main harness, a pump harness with a separate pump gauge panel harness, a left body harness with a separate left compartment harness, a right body harness with a separate right compartment harness, and a rear body harness with two separate rear compartment harnesses.

The main harness and three body harnesses shall interconnect at a central, easy to reach location and their connectors shall not be obstructed by other harnesses or fuel/air lines. In addition, the main and body harness connectors shall be color-coded for ease of identification with their respective colors noted on the accompanying electrical diagrams.

Where connectors are not provided by the electrical component manufacturer, all 12-volt lights and other electrical components (excluding rocker and toggle switches) shall connect to the harnesses using Deutsch brand connectors; butt connectors are considered unacceptable.

All Deutsch connectors shall meet the following criteria:

- All connectors shall be rated for three feet submersion in water.
- Temperature range from -67°F to 257°F continuous at rated current.

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- All contacts shall be soldered unless a crimping tool or machine is used that gives an even and precise pressure for the terminal being used.
- All contacts shall be pull-tested to ensure their integrity.

## **WEATHERPROOF DOOR SWITCHES**

Because of the harsh environment and susceptibility to moisture on the fire ground, the fire apparatus compartment doors shall utilize weatherproof switches. No Exceptions.

The switches shall be used for activation of the compartment lights and to provide a signal to the door open circuit in the cab.

## **V-MUX ELECTRICAL MANAGEMENT SYSTEM**

The apparatus shall be equipped with a V-MUX Multiplex System. There are several key benefits to multiplexing, one is to reduce the number of connections in a vehicle's electrical system, because of this it is important to limit the amount of modules that control certain functions of the vehicle.

### **Outputs:**

The outputs shall perform all the following items without added modules to perform any of the tasks:

- **Load Shedding:** The System shall have the capability to Load Shed with 8 levels any output. This means you can specify which outputs (barring NFPA restrictions) you would like Load Shed. Level 1 12.9v, Level 2 12.5V, Level 3 - 12.1V, Level 4 - 11.7V, Level 5 11.3V, Level 6 10.9V, Level 7 10.5, Level 8 10.1. Unlike conventional load shedding devices you can assign a level to any or all outputs. No add-on modules shall be acceptable; the module with the outputs must perform this function.
- **Load Sequencing:** The System shall be able to sequence from 0 8 levels any output. With 0 being no delay and 1 being a 1-second delay, 2 being a 2-second delay and so on. Sequencing reduces the amount of voltage spikes and drops on your vehicle and can help limit damage to your charging system. No add-on modules shall be acceptable; the module with the outputs must perform this function.
- **Output Device:** The System shall have solid-state output devices. Each solid-state output shall be a MOS-FET (Metal Oxide Semiconductor - Field Effect Transistors); MOS-FETs are solid-state devices with no moving parts to wear out. A typical relay, when loaded to spec, has a life of 100,000 cycles. The life of a FET is more than 100 times that of a relay. No add-on modules shall be acceptable; the module with the outputs must perform this function.
- **Flashing Outputs:** The System shall be able to flash any output in either A or B phase, and logic is used to shut down needed outputs in park or any one of several combined interlocks. The flash rate can be selected at either 80, or 160 FPM. This means any light

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can be specified with a multiplex truck with no need to add flashers. Flashing outputs can also be used to warn of problems. No add-on modules shall be acceptable; the module with the outputs must perform this function.

- PWM: The modules shall have the ability to PWM at some outputs so that a Headlight PWM module is not needed. No add-on modules shall be acceptable; the module with the outputs must perform this function.
- Diagnostics: An output shall be able to detect either a short or open circuit.

## Inputs:

The inputs shall have the ability to be switched by a ground or battery signal.

The inputs shall be filtered for noise suppression via hardware and software so that RF or dirty power will not trick an input into changing its status.

## System Network:

The Multiplex system shall contain a Peer-to-Peer network. A Master-Slave Type network is not suitable for the Fire/Rescue industry. A Peer-to-Peer network means that all the modules are equal on the network; a Master is not needed to tell other nodes when to talk.

## System Reliability:

The Multiplex system shall be able to perform in extreme temperature conditions, from -40° to +85° C (-40° to +185° F.) The system shall be sealed against the environment, moisture, humidity, salt or fluids such as diesel fuel, motor oil or brake fluid. The enclosures shall be rugged to withstand being mounted in various locations or compartments around the vehicle. The modules shall be protected from over voltage and reverse polarity.

## **12-VOLT SYSTEMS TEST**

After completion of the unit, the 12-volt electrical system shall undergo a battery of tests as listed in NFPA 1901. These tests shall include, but not be limited to:

- Reserve capacity test
- Alternator performance test at idle
- Alternator performance test at full load
- Low voltage alarm test

Certification of the results shall be supplied with the apparatus at the time of delivery.

## **TAILLIGHTS**

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A Whelen M6 series LED taillight assembly shall be installed on each side of the rear of the apparatus. Each assembly shall include the following:

- One (1) red LED stop/tail combination light (Red with Clear lens)
- One (1) amber LED turn light with arrow (Amber with Clear lens)
- One (1) clear LED backup light (White with Clear lens)

The lights shall be mounted in individual chrome plated housings.

## **REAR WORK LIGHT SWITCH**

A switch shall be installed above the taillight bezel on the left side of the rear of the apparatus. The switch shall be wired to the backup lights to provide additional work lighting. The rear work light circuit shall be deactivated when the park brake is disengaged. In addition to the lights being activated by the above switch, the lights shall also come on when the transmission is placed in reverse.

## **MIDSHIP TURN SIGNALS**

Two (2) Tecniq model S170 amber LED midship auxiliary/turn signal lights shall be installed in the rub rail, one (1) on each side of the body.

The mid turn signals are to be set to steady burn and will only flash when activated.

## **PERIMETER GROUND LIGHTING**

Tecniq, model T44-WD0B-1, 4" round LED lights shall be installed beneath the apparatus in areas where personnel may be expected to climb on and off the apparatus. The lights shall illuminate the ground within 30" of the apparatus to provide visibility of any obstructions or hazards. These areas shall include, but not be limited to, side running boards and the rear step area.

The lights shall be activated with the chassis ground light activation.

## **CLEARANCE LIGHTS**

Five (5) lights shall be located in the tailboard portion with three (3) of those lights centered and two (2) in the outboard corners. The two additional (2) lights shall be located as high and wide as possible on the rear of the apparatus.

On the sides of the apparatus there shall be four (4) lights, two (2) located on each side of the apparatus in the rub rails. One (1) forward under L4/R4 and one (1) rearward under L5/R5.

## **CHASSIS SUPPLIED BACK UP CAMERA SYSTEM**

A backup camera system shall be installed in the cab with the chassis. The camera shall be installed on the rear center upper portion of the apparatus.

## **DOOR OPEN AUDIBLE ALARM**

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An audible alarm shall be provided and connected to the door open circuitry.

## **UPPER ZONE A**

The upper zone A warning lights shall be supplied and installed by the chassis manufacturer.

## **UPPER ZONE C**

Two (2) Whelen L31 series Super-LED beacons shall be installed in Upper Zone C. The high profile 12v beacons shall incorporate thirty-two (32) Super-LEDs installed in sets of eight (8) on four (4) PC boards. The four (4) PC boards will be installed on a LED ballast. The beacons shall have an optic hard coated polycarbonate lens and a metalized reflector with clear optic collimators. The hard coated lens shall provide extended life/luster protection against UV and chemical stresses. The four (4) conformal coated PC boards shall provide additional protection against environmental elements. The beacons shall include 28 Scan-Lock patterns including four (4) simulated rotating patterns and synchronized features. The beacons shall also contain cruise mode and low power mode. The beacon dome lenses shall be sealed to a black powder coated die- cast aluminum base with an "O" ring gasket assembly. The solid state beacon light shall be vibration resistant.

The driver's and officer's side beacon shall both have red LED's and clear lens.

## **UPPER ZONE B/D SIDE WARNING LIGHTS**

Four (4) Whelen ION Series Super-LED lights with black housing shall be installed, two (2) each in Upper Zone B and Upper Zone D. The wide angle warning lights shall incorporate six Super-LEDs, a clear optic hard coated polycarbonate lens, and utilize a TIR reflector for maximum output. The lights shall be compliant with NFPA KKK1822F requirements. The hard coated lens shall provide extended life/luster protection against UV and chemical stresses. The conformal coated PC board and liquid injection molded lens/gasket assembly shall provide additional protection against environmental elements. The solid state warning lights shall be vibration resistant.

Shop Note: Specify ActionScan flash pattern when ordering.

The driver's and officer's side warning lights shall have red LED's and clear lenses.

## **LOWER ZONE WARNING LIGHT PACKAGE**

There shall be two (2) Whelen M6 Series Linear Super-LED® lights with chrome flange and clear lenses installed in the lower zone of the apparatus to meet NFPA compliance. The warning lights shall incorporate Linear Super-LED® and Smart LED® technology.

The M6 configuration shall consist of eighteen (18) clear Super-LED's and a clear optic polycarbonate lens. The warning lights, with the aid of two screws, shall have the ability to be installed as a surface mount warning lights. The M6 shall utilize optic collimators and a metalized reflector for maximum illumination. The warning lights shall include an internal flasher with 164 Scan-Lock™ flash patterns including a variety of CA Title 13 compliant patterns, left/right, top/bottom, in/out, and steady burn. The lights shall also provide synchronize and low power features. The M6 shall meet KKK 1822F, NFPA 1901, SAE and EC65 specifications.

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The lens/reflector assembly shall be sealed and resistant to water, moisture, dust, and other environmental conditions. The hard coated lens shall provide extended life/luster protection against UV and chemical stresses. The light engine shall be installed at the rear of the unit and be vacuum tested to ensure proper sealing. The PC board shall be conformal coated for additional protection.

There shall be four (4) Whelen WIONSMCR lights installed two (2) each side of the apparatus in the lower warning zone, (1) located ahead of the rear wheel well and one (1) located behind the rear wheel well each side. Two (2) Whelen M6 series lights shall be installed on the rear of the apparatus, one (1) each side.

Shop Note: Specify DoubleFlash 150 In/Out flash pattern when ordering the M6 lights. Specify ActionScan when ordering the ION lights.

The lower zone warning lights shall have red LEDs with clear lenses.

## **TRAFFIC ADVISOR**

One (1) Whelen Traffic Advisor shall be installed on the apparatus. The traffic directional light shall consist of eight (8) Whelen, WIONSMA Super LED installed individually. The traffic advisor shall be controlled with a TACTL5 controller.

The traffic directional light shall be surface mounted on the rear of the body.

Shop Note: Make sure the lights are not installed over a body seam.

## **AIR HORN ACTIVATION**

One (1) air horn button shall be provided on the driver's side pump panel. The button shall be red in color and include a label reading "AIR HORN".

## **WHELEN 12V SURFACE-MOUNT SCENE LIGHTS**

Two (2) Whelen M9 Series, model M9LZC, scene lights shall be installed on the apparatus. Each steady burn scene light shall incorporate Linear Super-LED and Smart LED technology. Each light configuration shall consist of 24 clear gradient Super-LED's and a clear optic polycarbonate lens. Each scene light shall have specialized TIR optics for ideal scene illumination. Each light shall have a rugged powder coat heat sink and a waterproof wire entry grommet. Each light shall meet KKK 1822F and AMD024 specifications.

Each lens/reflector assembly shall be sealed and resistant to water, moisture, dust, and other environmental conditions. The hard coated lens shall provide extended life/luster protection against UV and chemical stresses. Each light engine shall be installed at the rear of the unit and be vacuum tested to ensure proper sealing. Each light's PC board shall be conformally coated for additional protection. Each light shall have 6,500 usable lumens.

The two (2) lights shall be installed on the rear face of the body, one (1) on each side.

The rear scene light(s) shall be controlled by a switch located on the V-Mux display in the chassis cab and one (1) switch located at the pump panel. The switch at the pump panel shall

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have an indicator that shall illuminate when the switch is in the "ON" position. The activation on the V-Mux display and the pump panel switch shall be labeled "REAR SCENE."

In addition to the switch located on the V-Mux, the rear scene light(s) shall be activated by the rear work light switch and when the apparatus is placed in reverse.

## **WHELEN 12V SEMI-RECESSED SCENE LIGHTS**

Two (2) Whelen, model PCH2, Pioneer Plus Super-LED lights in semi-recessed mounts installed on the apparatus.

Each light shall be a Whelen Dual Panel Pioneer Plus, model PCH2, Super-LED combination floodlight, and spotlight. The rectangular extruded light fixture with die cast end caps shall measure 14" wide by 4-1/4" high by 3" deep and have a white powder coat finish. Each light shall consist of 36 white Super-LEDs, with a collimator/metalized reflector assembly, and a clear non-optic polycarbonate lens. The Pioneer flood/spot light shall have 17,750 usable lumens and that shall draw 13 amps at 12 volts. Each light shall have a Whelen five-year factory warranty.

Each light shall be complete with one (1) Whelen, model PBH203, semi-recessed mount with a chrome flange. The lights shall be set at a 15° downward angle.

The two (2) lights shall be installed above the body, ahead of the turntable in an aluminum box painted to match the body, one (1) on each side.

The box shall be angled down to the rear.

The top of each box shall have treadplate installed.

The driver's side and officer's side scene light(s) shall be controlled by a switch located on the V-Mux display in the chassis cab. One (1) rocker switch shall be located on the pump panel for each side of scene lights, for a total of two (2). The switch at the pump panel shall have an indicator that shall illuminate when the switch is in the "ON" position.

The activation for the driver's side scene lights on the V-Mux display and the pump panel switch shall be labeled "LEFT SCENE" and the officer's side shall be labeled "RIGHT SCENE."

## **GENERATOR**

A Harrison hydraulic driven generator shall be installed on the apparatus. The continuous duty rating of the generator shall be 10,000 watts, 42/83 amps, 120/240VAC volts. Current frequency shall be stable at 60 hertz.

The system shall be designed and assembled by a company with no less than 10 years experience in the manufacture of hydraulic driven generators. The system shall be tested prior to shipping and shall be accompanied with a test report. The generator shall be tested at various loads from no load to full load to ensure reliable power delivery at various loads.

The motor/generator shall be placed in a frame, which affords protection to the components and provides a unitized mounting module containing the motor/generator, reservoir, oil cooler, filtration, and an on/off manifold containing a cross port check valve allowing the unit to be started and shut down remotely. The generator shall be a commercial type with a heavy duty



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bearing and of brushless design to ensure low maintenance. No brushes or slip rings shall be allowed. The reservoir shall include an oil level sight gauge, oil temperature gauge, fill cap, oil filter, and a venturi boost unit to provide positive pressure to the pump suction port. The generator and motor shall be close coupled and aligned using a Morse taper with a through bolt to secure the motor to the generator. No two (2) bearing generators shall be used.

The system must be capable of producing the rated full power when driven from the vehicle PTO from idle to maximum engine speed.

The hydraulic motor and pump shall be of axial piston design to provide low internal leakage and a high degree of frequency stability. No gear pumps or motors shall be used. The pump shall match the system with the proper orifice, pressure compensator, and load sense settings to provide stable output regardless of engine rpm or electrical load demands.

The system shall be capable of normal operations using a commonly available ISO 46 fluid. All fluid service points shall be in close proximity to the reservoir for ease of scheduled maintenance.

The system shall be warranted for a period of not less than two (2) years or 2000 hours, whichever should come first.

## **GENERATOR DISPLAY**

A FROG D shall be provided with the generator. The FROG D shall automatically sense a generator signal and begin displaying information. The digital meter display shall constantly monitor and display voltage, frequency (accurate to within 1 decimal point), and current draw on two separate lines. The display shall be capable of displaying total accumulated run time hours when the MODE button is pressed. This information shall be stored in a non-erasable memory.

One (1) remote start for the hydraulic generator shall be located in the chassis cab and one (1) remote start shall be located on the pump panel.

## **GENERATOR PTO CONNECTION**

The hydraulic pump for the generator system shall be connected to the chassis transmission through a "Hot Shift", electrically engaged power-takeoff system. The control to engage and disengage the power-takeoff system shall be installed in the chassis cab.

The Harrison generator shall be located above the pump module.

## **8 CIRCUIT NON-GFI LOAD CENTER**

A 120/240-volt load center shall be incorporated into the 120/240-volt wiring system. The load center shall include adequate circuit breakers to protect the loads specified on the apparatus. The entire 120/240-volt electrical system shall be installed in accordance with NFPA 1901, current edition. This shall include all testing, labeling, wiring methodology, and dimensional requirements. Certification of compliance shall accompany the apparatus at the time of delivery. All 120/240-volt A.C. wiring shall be done in accordance with NFPA 1901, current edition as well as nationally accepted electrical codes.

## **BRANCH CIRCUIT OVERCURRENT PROTECTION**

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Over current protection devices shall be provided for circuits in accordance with NFPA 1901, current edition. The load center shall be equipped with a non-GFI two pole main breaker when the six or more individual branch circuits are present. Over current protection devices shall be marked with labels to identify the function of the circuit they protect.

The generator load center shall be located on the forward bulkhead of the L1 compartment.

## **ELECTRIC CORD REEL**

A Hannay 120 volt electric rewind cord reel shall be installed on the apparatus. A push button labeled "REEL REWIND" shall be installed for 12-volt rewinding of the cord reel.

Rollers shall be supplied to prevent damage to the electrical cable if pulled in any direction.

The cord reel shall be equipped with 200' of yellow STW Seoprene 10/3 wire installed with a cable stop to prevent damage to cable fittings.

## **JUNCTION BOX**

An Akron Brass Extenda-Lite, model EJBX, backlighted electrical junction box equipped with four (4) electrical receptacles, two (2) per side, shall be provided. Each receptacle shall be equipped with a spring loaded snap cover. The cord reel shall be hardwired to the cast aluminum junction box to supply power to the receptacles. An extension cord shall be connected to the junction box through a heavy-duty water resistant strain relief and flexible extender. Each side of the junction box shall be fitted with polypropylene faceplates, which are backlighted so that plug orientation to the receptacles is quick and easy to align.

The junction box shall be equipped with an Akron Brass, model CS, cord stop.

The junction box shall have a gray powder-coat finish.

One (1) NEMA 5-20R, 120 volt, duplex, 3-wire, straight blade (household type) receptacle shall be installed on the junction box.

One (1) NEMA 5-20R, 120 volt, duplex, 3-wire, straight blade (household type) receptacle shall be installed on the junction box.

One (1) NEMA L5-20R, 120 volt, single, 3-wire, twistlock receptacle shall be installed on the junction box.

One (1) NEMA L5-20R, 120 volt, single, 3-wire, twistlock receptacle shall be installed on the junction box.

The cord reel shall be located in the R4 compartment.

## **105' AERIAL LADDER CONSTRUCTION STANDARDS**

The aerial ladder shall be of the rear mount design with the turntable mounted over the rear axles of the apparatus, and the ladder extending toward the front of the apparatus when in the bedded position. The aerial ladder shall be comprised of four sections and shall extend to a nominal height of 105' at 72 degrees, measured in a vertical plane from the top rung of the fly

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section (not including the egress) to the ground. To maintain a maximum level of safety, units exceeding a 76-degree angle of inclination, in accordance with NFPA 1931/1932, current edition, shall not be acceptable.

## **OPERATIONAL ENVELOPE/REACH**

The aerial ladder shall have an operations range of -8 degrees elevation to +72 degrees elevation.

The minimum vertical reach of the aerial shall be 105' above the ground with the aerial at full extension and elevation. This measurement shall be taken to the end of the permanent structure and not include the removable egress. Requiring a removable egress to achieve 105' of vertical reach shall not be acceptable.

A minimum horizontal reach of 101'-5" shall be measured from the turntable centerline to the outermost rung on the outermost fly section, with the aerial at full extension and at 0 degrees elevation. Units measuring the horizontal reach to the end of a removable egress shall be required to hold the egress to the same load testing criteria as the permanent structure.

Reach and height shall be measured in accordance with NFPA 1901, current edition.

## **STRUCTURAL MATERIAL**

The primary load support members of the ladder shall be constructed of certified 100,000 PSI yield strength (minimum) steel tubing, with full traceability on all structural materials. Each section shall be trussed diagonally, vertically, and horizontally using welded steel tubing. All critical points shall be reinforced for extra rigidity and to provide a high strength to weight ratio.

All ladder rungs shall be constructed of A606 Type 4 certified steel tested per ASTM A370 standards. A606 Type 4 exhibits superior corrosion resistance over regular carbon steel as a result of the development of a protective oxide film on the surface. A606 Type 4 shall meet a minimum 6.0 Atmospheric Corrosion Factor. The ladder rungs shall be round and welded to each section utilizing "K" bracing for torsional rigidity.

All welding of structural components, including the aerial ladder sections, turntable, pedestal, and outriggers, will be in compliance with the American Welding Society standards. All welding personnel will be certified, as qualified under AWS welding codes. Materials used to manufacture the structural components are to be certified by the mill that manufactured the materials. Certifications or re-certifications of structural materials by vendors other than the mill they were manufactured at will not be acceptable. Any material testing that is performed after the mill test will be for verification only and not completed with the intent of changing the classification. Any welded structural component for the ladder will be traceable to their mill lots.

## **PRIMARY DIMENSIONS**

The inside dimensions of the ladder shall be as follows:

- Base Section - 40.250"
- First Fly Section - 33.500"

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- Second Fly Section - 27.750"
- Last Fly Section - 22.500"

The height of the handrails above the center line of the rungs shall be as follows:

- Base Section - 28.875"
- First Fly Section - 24.875"
- Second Fly Section - 21.375"
- Last Fly Section - 17.375"

## **NFPA SAFETY FACTOR AND RATED CAPACITIES**

The methodology, definitions, testing, and criteria used by the aerial manufacturer to determine the preceding and following Safety Factor and Rated Capacity of the aerial device shall be in strict compliance with the definitions of such, in accordance with NFPA 1901, current edition, and these specifications. Any apparatus claiming to exceed the testing requirements of NFPA 1901 shall provide certified documentation of the tests.

## **AERIAL DEVICE SAFETY FACTOR AND RATED CAPACITY**

The purchaser desires to purchase with these specifications, an aerial device with a minimum 2.0:1 safety factor as required and in accordance with NFPA 1901, current edition. Therefore, the aerial manufacturer shall hereby certify, by submitting a bid for these specifications; that the aerial device meets or exceeds the following requirements.

The design stress or primary stress within all structural load supporting members of the aerial device shall not exceed 50% of the minimum as welded yield strength of the material based on the combination of the dead load of the aerial plus the rated capacity of 750 lbs. at the tip of the aerial; while flowing 1500 GPM, at a 90 degree angle to ladder centerline; with the structural load supporting members of the aerial device at either; an ambient temperature of 75 degrees F or an elevated temperature of 350 degrees F- thereby exhibiting a minimum 2.0:1 safety factor in all feasible operational conditions.

These capabilities shall be valid and true when the apparatus is deployed in the unsupported configuration, while flowing 1500 GPM, based upon 360-degree rotation, from full retraction to full extension, and at any degree of elevation (-8 to +72). In order to provide a clear picture of apparatus capabilities, any manufacturer with any restrictions to any of these capabilities shall provide the lowest ratings of tip load and water flow.

## **AERIAL DEVICE SAFETY FACTOR SERVICE LIFE**

The purchaser desires to purchase an aerial device with a safety factor that remains NFPA compliant and constant throughout the life of the aerial device. The safety factor of every structural load bearing member in the aerial device shall remain above 2.0:1 for a "Safety Factor Service Life" of up to 20 years minimum. Any apparatus claiming to exceed the guidelines of NFPA 1901 shall provide certified documentation.

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## **AERIAL SPECIAL LABELS**

Legible, permanent signs shall be installed in positions readily visible to the operator to provide operational directions, warnings, and cautions. The signs shall describe the function of each control and provide operating instructions.

Warning and caution signs shall indicate hazards inherent in the operation of the aerial device. These hazards shall include, but shall not be limited to:

- Electrical hazards involved where the aerial device does not provide protection to the personnel from contact with, or near proximity to, an electrically charged conductor.
- Electrical hazards involved where the aerial device does not provide protection to ground personnel who might contact the vehicle when in contact with energized electrically charged conductors.
- Hazards from stabilizer motion.
- Hazards that can result from failure to follow the manufacturer's operating instructions.

## **AERIAL DEVICE SPECIFICATION PLACARD**

A permanent label shall disclose the following information relative to the aerial device:

- Make
- Model
- Insulated or non-insulated
- Serial number
- Date of manufacture
- Rated capacity (s)
- Rated vertical height
- Rated horizontal reach
- Maximum hydraulic system pressure
- Hydraulic oil type and capacity
- All other appropriate labels to ensure safe operation of the aerial device shall be permanently affixed in conspicuous locations.

## **THIRD PARTY NON-DESTRUCTIVE TESTING**

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Welds shall be tested using two (2) non-destructive methods by Underwriters Laboratories (UL) or Underwriters Laboratories of Canada (ULC). Due to their unmatched experience testing fire apparatus, UL or ULC shall be the only acceptable organizations to perform the testing of the apparatus. Steel and aluminum ladders, at a minimum, shall have all welds tested using two (2) separate NDT methods.

Aerial structures shall have 100 % of all structural welds tested using both magnetic particle method and visual testing method. Aerials that are fabricated of aluminum must have 100% of all structural welds tested using dye penetrant method and visual method.

All magnetic particle inspections shall be conducted in accordance with ASTM E709, Standard Guide for Magnetic Particle Testing. All dye penetrant inspections shall be conducted in accordance with ASTM E164, Standard Test Method for Liquid Penetrant Examinations.

Manufacturers who rely only on visual inspection (performed in-house or by any third party) as a primary method of testing shall not be considered and their bid shall be rejected.

## **STRUCTURAL SAFETY FACTOR**

The purchaser desires a device that has been tested by a third party for compliance with the 2 to 1 safety factor specified by NFPA 1901. Devices that have not been certified by an engineer that is independent of the manufacturer shall not be acceptable.

## **NFPA AERIAL STABILITY FACTOR AND TESTING**

A one and one-half to one (1.5:1) stability factor shall be provided. This capability shall be established in an unsupported configuration. Since the device is rated while flowing water, stability testing shall account for the distributed weight of water in a full waterway and water reactionary force as required by NFPA 1901.

Following are specific descriptions of what tests are to be performed, and conditions they shall be performed under. The aerial manufacturer shall strictly adhere to these tests and conditions as set forth in these specifications and NFPA 1901.

For both of the following tests, the only obstructions to a full 360-degree rotation with the aerial at 0 degrees elevation and full extension shall be presented by the apparatus itself, and NOT external obstructions at the manufacturer's test location(s). This means that the aerial device manufacturer shall ensure that the testing grounds present no obstruction (trees, buildings, etc.) to the full 360-degree rotation at 0 degrees elevation and full extension, which may cause the need to raise the aerial to clear the obstruction.

Additionally, the apparatus shall be tested for stability only after the entire apparatus is complete. Manufacturers using a third-party to manufacture the aerial device must provide certified documentation the unit was UL or ULC tested by the manufacturer of the aerial and the final OEM manufacturer. This requirement is specified in NFPA 1901 as the apparatus being in "service-ready condition". There shall be no exception to this requirement due to the fact that it would be unlikely that actual weight distribution could be accurately simulated for the stability testing.

## **TEST 1**

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After the above conditions have been satisfied, the aerial shall be subjected to the following test in the presence of the third party testing company that is in compliance with these specifications. Specifically, the aerial device shall be placed on level ground with the stabilizers deployed per manufacturer recommendations. The aerial device then shall have 1.5 times the rated capacity placed at the tip of the aerial, with the device at full extension and at 0 degrees elevation; which is the most stringent configuration. The device shall be rotated 360 degrees, raising and lowering the aerial as needed to clear the cab of the apparatus. The aerial shall prove to be stable during the entire test and no component of the aerial shall permanently deform.

## TEST 2

After the above conditions have been satisfied, the aerial shall be subjected to the following test in the presence of the third party testing company that is in compliance with these specifications. Specifically, the aerial device shall be placed on a 5-degree downward slope with the stabilizers deployed per manufacturer recommendations. The aerial device then shall have 1.33 times the rated capacity placed at the tip of the aerial, with the device at full extension and at 0 degrees elevation; which is the most stringent configuration. The device shall be rotated 360 degrees, raising and lowering the aerial as needed to clear the cab of the apparatus. The aerial shall prove to be stable during the entire test and no component of the aerial permanently deform.

## RUNG COVERS

Each rung shall be covered with secure, heavy duty, deeply serrated rubber sheathing. The rung cover shall be installed on a minimum of sixty percent (60%) of each ladder rung. Attachment of the sheathing to the rung shall be by mechanical means and an adhesive application. Under no circumstance shall the rung covers turn when a rung is at ambient temperature (75 degrees F) or at an elevated temperature (350 degrees F); there shall be no exception to this requirement for the safety of persons climbing the ladder sections.

The sheathing shall be easily replaceable if the rubber becomes worn, however, the rung covers shall be designed, constructed, and installed with lifetime service as the objective. To ensure ease of maintenance if damaged, manufacturers using embossed metal in place of the rubber rung covers are not acceptable.

To prevent corrosion of the rungs by introducing air to the inside, under no circumstances will rung covers attached with screws or rivets be acceptable.

## HEAVY DUTY LADDER TRAVEL SUPPORT

A heavy duty ladder rest with poly pads shall be provided for support of the ladder in the travel position. The location of the travel support shall be directly behind the chassis cab. The travel support shall be fabricated from heavy duty steel and painted to match the primary body color. If the body is a two-tone design, the travel support shall be painted to match the top body color. The travel support shall be designed to be easily removable to allow for ease of maintenance and repair if necessary.

The base section of the ladder shall contain stainless steel scuff plates where the ladder comes into contact with the ladder support.

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An indicator light shall be provided on the turntable to indicate when the ladder is aligned with the travel support and may be lowered into it. The ladder rest shall be attached to the front outrigger box assembly for added stability.

The ladder rest shall be illuminated for night time operation. The illumination light shall automatically activate with the aerial master switch.

## **CRADLE INTERLOCK SYSTEM**

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

## **NYLATRON WEAR PADS**

There shall be nylatron installed on the sides of the ladder support to protect the ladder from contacting metal to metal when bedding the aerial.

## **ELEVATION SYSTEM**

Two (2) double acting lift cylinders shall be utilized to provide smooth precise elevation from 8 degrees below horizontal to 72 degrees above horizontal. The lift cylinders shall have a 6" internal diameter (bore) and a 2.5" solid cylinder rod. The lift cylinders shall be equipped with integral holding valves located on the cylinder to prevent the unit from lowering should the charged lines be severed at any point within the hydraulic system.

The lowering of the ladder shall be controlled by a pressure limiting valve to limit the downward pull of the ladder when it is bedded. Both raising and lowering functions shall be influenced by flow compensation, which shall maintain ladder tip speed within the design speed regardless of load, angle, or extension. Ladder tip speed shall be decelerated above 65 degrees in order to reduce "tip-lash". Ladder lowering shall be controlled on the down motion to prevent the cylinders from completely retracting, thus allowing a cushion of oil for continuous ladder load readout.

The elevation cylinder upper and lower pivot pins shall be installed with a secondary tensioning system to secure the pins and prevent them from slipping out over time. The design shall not inhibit the pins from being removed for future servicing purposes.

## **EXTENSION/RETRACTION SYSTEM**

A fully hydraulic powered extension and retraction system shall be provided using two (2) sets of siamese hydraulic cylinders and cables. Each set shall be capable of operating the ladder in the event of a failure of the other. The extension cylinders shall each have a 3.5" internal diameter (bore) and a 1.5" diameter solid rod. Extension and retraction of the telescopic sections shall be internally limited within the cylinders, eliminating excess strain on the cables, sheaves, and ladder structure. Each of the cylinder, cable, and sheave assemblies shall be completely independent of the other, to provide a safety factor wherein a failure of one assembly will not affect the function and operation of the other. The extension cylinders shall be equipped with counterbalance holding valves to synchronize the cylinders for smoother operation and prevent the unit from retracting should the charged lines be severed at any point



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within the hydraulic system. The holding valves shall be mounted directly on the cylinders with no hoses between the valve and the cylinder.

The reeling of the cable shall be such to provide synchronized, simultaneous movement of all sections from full extension to full retraction. All pulleys and sheaves shall be enclosed as an added safety feature as well as to prevent personnel on the ladder from becoming entangled in them.

## **MAINTENANCE FREE SHEAVE BEARINGS**

The aerial sheave bearings shall be made with continuous wound PTFE and high-strength fibers encapsulated in a lubricated, high-temperature epoxy resin. This material shall be corrosion-resistant, have a high load capacity, and be self-lubricating.

It shall also be resistant to shocks, misalignment, and wear. The bearings shall not require lubrication. Aerial cable systems that require extensive maintenance, and constant lubrication, are not acceptable.

## **AERIAL CABLES**

To ensure a maximum level of safety the following standards shall be used on the extension and retraction cable system with no exception:

- Cables shall have a 5:1 safety factor based on ultimate strength under all safe operating conditions.
- The factor of safety shall remain above 2:1 during any extension or retraction system stall
- The minimum ratio of the diameter of cable to the diameter of sheave shall be 1:12

The cables used between the base and second section shall be 1/2" diameter. Due to the amount of stress applied to this first pair of cables, they shall be 6x26, Flex-X design for maximum durability, stability, and service life. This design provides greater surface area resulting in less sheave and drum wear. For these reasons, any other cable design on the first set of cables shall not be considered acceptable.

The cables between the second and third ladder sections shall be 3/8" diameter. The cables between the third and fly sections shall be 5/16" diameter. These cables shall be 7x19, galvanized aircraft cable for extended corrosion resistance and flexibility.

All cables shall be pre-stressed, proof-loaded, and certified by the cable manufacturer to minimize changes to the cable lengths and performance.

## **CERTIFIED CABLE SWAGED SHACKLES**

All swaged shackle ends shall have a certification test from the manufacturer of the assembly.

## **IGUS ENERGY CHAIN**

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The electrical cable, hydraulic hose and/or air hose shall be routed through the interior of the structural tubing of the ladder sections as well as utilizing Igus energy chain. The energy chain shall be routed through the inside section of the vertical side walls of the aerial ladder device. The cable and/or hose routing shall use one or both bottom cord rectangular tube(s) on the base section of the ladder and the bottom cord rectangular tube(s) on the last ladder fly section. The ladder sections between the base and last fly shall utilize the energy chain in order to route all electrical cables and hose lines.

The energy chain shall travel within a carrier shield, which is fabricated out of 16 gauge anodized aluminum material. Each model of energy chain used shall be adequately sized to fit the application.

Rollers, which are located in the lower portion of the ladder section(s), shall be constructed of a nylon plastic material that is specifically designed for these types of applications. Spacer pads, made from the same material as the rollers, shall be installed and evenly spaced in order to secure the Igus energy chain within the specifically designed carrier shield(s).

The electrical cables used to transfer power to the ladder tip shall be Igus Chain Flex cables. These cables are specially designed for the Igus energy chain system and custom fit for each aerial apparatus. If applicable, the hydraulic hose(s) and air hose(s) shall be Parker Hannifin with a rating of 2,500 PSI.

Igus Energy chain enables travel of up to 130 feet, is virtually wear-free and offers extremely quiet operation. Igus energy chain is very well suited to resist the harsh environmental conditions by being able to withstand extreme temperatures and is UV resistant.

## **WEAR PADS/BEARING SURFACES**

Nylon wear pads impregnated with molybdenum disulfide and high in molecular weight shall be used between the telescoping sections for maximum weight distribution, strength, and smoothness of operation. This impregnation shall provide a lubricating function.

Stainless steel adjustment screws shall be provided on the wear pads to permit proper side tension. Plates shall be installed on the sides of the slide pads where adjustment screws come into contact with them. No exceptions shall be allowed to this requirement to prohibit the adjustment screws from embedding themselves into the pads, which may cause the pad to crack and fail.

To prevent additional maintenance and pressure points from the limited surface area, roller systems in place of wear pads will not be considered acceptable.

## **ROTATION BEARING**

A 44-inch diameter external tooth, swing circle bearing shall be used for the rotation system. The bearing shall provide 360-degree continuous rotation. The bearing shall be designed specifically for the aerial device in lieu of the aerial device being designed to accommodate a particular bearing.

The turntable shall be bolted to the bearing using forty (40) 5/8" SAE grade 8 bolts. The bearing shall be bolted to the base support structure with sixty (60) 5/8" SAE grade 8 bolts. Welding on the bearing in any manner shall not be acceptable.

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The turntable base and the torque box bearing plate surfaces that contact the bearing shall be machined to prevent loading the bearing when the attaching bolts are brought to full torque. Machining of the surfaces shall be done after all welding to assure no further distortion of the material.

Shims shall not be acceptable as they reduce the surface contact area significantly thereby causing a concentration of forces at the shims.

## **BOLT TORQUING FROM TOP SIDE**

All rotation bearing bolts shall be torqued from the top side of the turntable without the bolt or nut being held under the turntable by a person. Units requiring removal of equipment to access the torque bolts shall be considered unacceptable.

This design shall prevent the bolt from "spinning" while torque is being applied to the fastener. Application of Loctite or a similar compound alone, without any other means provided to hold the fastener shall not be acceptable. Additionally, this design feature shall not incorporate drilling, bending, welding on, or in any way modifying the structural fastener, nut, or washers.

## **ROTATION GEAR REDUCTION BOX**

A hydraulically driven planetary gearbox with a drive speed reducer shall be used to provide infinite and minute rotation control throughout the entire rotational travel. The rotation gear reduction box shall be installed on the top side of the turntable so that it is easily accessible, yet it shall be installed so that it does not provide an obstruction or tripping hazard to persons on the turntable. Specifically, it shall be installed toward the front of the turntable, under the aerial ladder base section. Under no circumstance shall the gear box present any interference with the aerial device, even at low elevations.

Due to the additional maintenance required to keep two (2) rotation motors functioning properly without binding, units requiring more than one (1) rotation motor are not considered acceptable.

A spring applied, hydraulically released disc type swing brake shall be furnished to provide positive braking of the turntable assembly.

Provisions shall be made for manual operation of the rotation system should complete loss of hydraulic power occur. These provisions shall include a manual rotation drive tool supplied with the apparatus.

The hydraulic system shall be equipped with pressure relief valves, which shall limit the rotational torque to a nondestructive power. All moving parts of the rotation gear reduction box shall be enclosed or under the turntable decking eliminating safety hazards.

## **ROTATION INTERLOCK SYSTEM**

The aerial device shall be equipped with a rotation interlock system to prevent the ladder from being rotated to any side where the stabilizers are not sufficiently extended to provide for the full tip load rating.

The system shall monitor the stabilizers for extension. When a stabilizer is not sufficiently extended (short-jacked) to provide full tip load rating, the system shall prevent the aerial from

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being rotated more than 12 degrees past the front or rear center line into the short-jacked side of the apparatus.

A slowdown feature shall be built into the rotation interlock system. When the aerial is operating in a short-jacked mode, the rotational speed shall be automatically reduced, by approximately 50%, when the aerial is rotated to within approximately 10 degrees of the front or rear center line of the apparatus. The rotational speed shall remain reduced throughout an arc of approximately 20-degrees over the front or rear of the apparatus, regardless of the direction of the rotation movement.

The rotation function shall automatically stop when the aerial approaches the front or rear corner area of the short-jacked side of the apparatus.

The rotation interlock system shall allow for normal operation on the side of the apparatus where the stabilizers are sufficiently extended for full tip load rating.

An override system, activated by pull knobs within the main turntable control pedestal, shall be provided that allows the operator to rotate the aerial into the non-recommended (short-jacked) side of the apparatus, should the situation absolutely demand it.

To ensure the maximum amount of safety, units allowing aerial rotation to the short-jacked side of the apparatus or systems which only include a visual and audio warning without automatically stopping rotation shall not be acceptable.

## **AERIAL STOW OPERATION INTERLOCK SYSTEM**

A safety feature shall be included in the aerial operational system that limits the possibility of damage to the apparatus when stowing the aerial.

When a rear mounted aerial is positioned over the cab area of the apparatus, the interlock system shall not allow the downward movement of the aerial below a preset angle of elevation, unless the aerial is rotated into the bed-zone envelope. The bed-zone shall be approximately 2 degrees of rotation to the left and right side of the center of the aerial bed support. Once this bed-zone envelope is attained, downward movement of the aerial shall be allowed for proper positioning into the bed support.

An indicator light shall be located at the turntable control station to inform the aerial operator when the bed-zone envelope is attained.

## **COLLISION PROTECTION INTERLOCK**

The apparatus shall be equipped with a cab collision protection interlock. This interlock shall be enabled while rotating the aerial device at elevations as low as, or lower than the cab of the apparatus.

Should the operator accidentally rotate the aerial device toward the cab at an elevation low enough to cause a collision with the cab, the interlock shall automatically stop rotation of the aerial at a point that is within a few degrees of the cab.

A manual override shall be provided to override the interlock system.

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## **APPARATUS BODY DAMAGE CONTROL INTERLOCK SYSTEM**

A safety feature shall be included in the aerial operational system that minimizes the possibility of damage to the apparatus body at all angles for all standard (non-override) operational modes.

The system shall automatically stop the downward movement of the aerial at a preset angle of elevation unless the aerial has been rotated at least 80-degrees, left or right, from the center of the ladder support. Once this rotation point is reached, full range downward movement (to -8 degrees) shall be allowed.

The aerial manufacturer shall determine and set the angle of elevation where downward aerial movement is stopped. The highest point of an apparatus, in relation to the distance from the turntable, shall be used to determine the pre-set elevation angle stopping point.

The system shall also minimize the possibility of accidental damage to the apparatus body from aerial rotation whenever the aerial elevation is below the preset elevation angle stopping point.

Rotational speed shall be reduced by approximately 50% when the aerial is rotated within a minimum of 10 degrees of a body avoidance stopping point. Aerial rotation shall automatically stop before the aerial contacts the body of the apparatus.

The body damage interlock system shall have no effect on aerial operation when the aerial is raised above the preset downward movement stopping point.

The body damage interlock system shall not eliminate the possibility of damage to components such as telescopic lights that are in a raised position.

A manual override shall be provided that will override the interlock system.

## **POWER TAKE-OFF**

The apparatus shall be equipped with a power take-off (PTO) driven by the chassis transmission and actuated by an electric shift, located inside the cab. The PTO, which drives the hydraulic pump, shall meet all the requirements for the aerial unit operations.

## **"THRU-DRIVE" HYDRAULIC PUMP**

The hydraulic system shall be supplied by a pressure compensated, load sensing, variable gallonage type pump. The pump shall provide adequate fluid volume to allow all ladder functions to operate simultaneously, without noticeable loss of speed. The pump shall supply oil only when the ladder is in motion, thereby preventing overheating of the hydraulic oil.

The pump shall be a "thru-drive" design. This design shall be provided for applications that require a power source for additional hydraulically operated accessories or tools.

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

The Thru-Drive shall be set up so the generator shall be operable while the chassis transmission is in "Drive".

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## **HYDRAULIC SYSTEM**

The tubing and hoses used in the hydraulic system shall have a high-pressure rating, with the tubing having a minimum burst pressure of 9,600 to 17,400 PSI and the hoses being a minimum of 8,000 to 13,000.

The hydraulic oil tank shall have an approximate capacity of 50 gallons. A dipstick shall be provided to check the oil level. The oil fill shall be furnished with a cap that shall act as a ventilator to provide clean fresh air into the oil tank and a 40-micron filter to provide positive protection from contaminants. A magnetic drain plug shall be provided in a low point of the oil tank. An easily accessible 3-micron replaceable oil filter shall be installed on the hydraulic oil tank. The hydraulic oil tank shall be furnished with two pick-up tubes, one tube for normal operation and the other for emergency operation. The emergency pick-up tube shall extend further down into the oil tank to provide for reserve oil in case a hydraulic line is broken.

The hydraulic system shall be protected from possible hydraulic pump malfunctions by a relief valve, which shall route the excess oil into the oil tank when the pressure in the hydraulic system exceeds 3,500 PSI. The hydraulic control valves shall also be protected by being plumbed to a pressure relief valve to protect them from high pressure.

The hydraulic system shall be designed in such a way that all non-sealing moving components whose failure could result in motion of the aerial device shall have a minimum bursting strength of four times the maximum operating pressure to which the component is subjected. The hydraulic system shall have adequate cooling for continuous operation of not less than 2-1/2 hours.

## **HYDRAULIC PRESSURE GAUGE**

A 2-1/2" Innovative Controls brass case 5,000 PSI, pressure gauge shall be located at the ground level control station to monitor the hydraulic system pressure. The gauge shall be liquid filled to prevent gauge shock when the hydraulic system is energized. The liquid shall not be vulnerable to freezing in subzero temperatures.

The stabilizer hydraulic and diverter valves will be located behind the turntable access steps and will be accessible through a panel.

## **EMERGENCY PUMP**

The apparatus shall be equipped with one (1) emergency hydraulic pump electrically driven from the chassis battery system. The emergency pump shall be capable of providing adequate ladder functions to stow the aerial and stabilizers in the case of main hydraulic pump failure.

Two (2) control switches for this emergency pump shall be provided. One switch shall be installed at the turntable control console and the stabilizer control station. The switches shall be labeled EPU.

Each control shall be a spring loaded momentary switch. A red indicator light shall be mounted adjacent to each switch to indicate activation of the emergency pump.

## **HYDRAULIC SWIVEL**

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The aerial ladder shall be equipped with a swivel at the turntable. The swivel shall connect the hydraulic lines from the hydraulic pump and reservoir to the aerial control bank at the turntable, above the point of rotation.

The swivel shall connect all the electrical circuits through the rotation point. A minimum of thirty-two (32) collector rings shall be provided. All collector rings shall be enclosed and protected with desiccant plugs to protect against condensation and corrosion. Due to the possibility of paint contamination and dirt attraction, units requiring oil or silicone to protect the collector rings shall not be acceptable.

The swivel shall allow for 360 degrees of continuous rotation of the aerial device with no loss of speed or capacity in functions.

## **ANGLE INDICATOR**

A liquid filled angle indicator shall be mounted on the base section of the aerial ladder. The indicator shall give accurate elevation in degrees from -20 to +80 degrees in relation to level. The liquid shall be of proper viscosity and composition to remain in liquid form even when exposed to below zero temperatures. Reading of the indicator shall be accomplished by observing the position of a suspended ball in relation to the degrees of elevation as marked on the indicator housing. The indicator shall be backlit for visibility in low light conditions.

## **EXTENSION INDICATORS**

Numerals shall be affixed to the inside of the handrail of the base section opposite the turntable control console. The numerals shall be at appropriate intervals indicating total aerial extension in 5-foot increments. A band on the first fly section shall align with these marks at the appropriate extension distance. The extension indicator color shall provide a high contrast with the color of the ladder section to which it is applied. This shall make the length of aerial extension easily readable by the operator by merely glancing at the indicators. Numerals indicating the length of extension shall be placed adjacent to indicating bands.

## **MANUAL ROTATION DRIVE TOOL**

As required by NFPA 1901, one (1) manual rotation drive tool shall be provided as a means to rotate the turntable in the unlikely event of power loss. This drive tool shall be provided as standard equipment.

## **TORQUE BOX**

A "torsion box" subframe shall be installed on the chassis frame rails, integral with the stabilizers. The torque box shall be constructed of 3/8" steel plate with the exception of the turntable area which shall be 1/2" steel plate. The steel plates shall have a minimum yield strength of 36,000 psi and ultimate tensile strength of 58,000 – 80,000 psi. The torque box subframe assembly shall be capable of withstanding all torsional and horizontal loads when the apparatus is supported by the stabilizers. The torque box shall be bolted in place to the chassis frame rails using forty (40) 5/8" SAE grade 8 bolts with nuts.

The torque box shall have a section modulus of 516.9 In<sup>3</sup> and a resistance to bending moment of 18,611,273 inch pounds.

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The aerial torque box shall be painted with AkzoNobel High Solids polyurethane paint. The color shall be black.

To prevent unnecessary stress on the chassis, apparatus that use the chassis frame in place of a true torque box shall not be acceptable.

The torque Box will be adequately lit for night time operations.

## **FRONT AND REAR STABILIZERS**

Two (2) sets of stabilizers shall be installed for stability. Both sets shall be an extending box beam "H" style. Each set of stabilizers shall support full, certified aerial capabilities at a 16' spread, measured from the outermost edge of the stabilizers on each side of the apparatus. For additional stability, the stabilizers on each side of the apparatus shall have the capability of extending one (1) extra foot to a maximum spread of 18'. In order to get the true stabilizer spread, apparatus using measurements other than from each outside edge of the stabilizers shall not be considered acceptable.

The front stabilizers shall be located directly behind the chassis cab rear wall for maximum setup ability with minimal cab deflection. The stabilizers shall be an integral part of the torque box. A heavy-duty undersling assembly shall attach the front stabilizers to the front portion of the torque box. The undersling assembly shall be constructed of 6" x 10" x 1/2" square tubing, 1/4" and 3/8" steel gussets and 1/2" mounting plates. The overlap of the undersling and the torque box shall be a minimum of 24". The bottom side of the tubes shall contain a truss assembly that shall maximize the torsional strength of the undersling assembly.

The front stabilizers and torque box shall be attached to the truck frame in six (6) separate locations, three (3) on each side of the apparatus, utilizing 1/2" steel plate. The mounting plates shall be located directly under the front stabilizers utilizing eight (8) grade 8 .625" size bolts per side, under the front torque box area utilizing six (6) grade 8 .625" bolts per side and at the rear stabilizer area utilizing six (6) grade 8 .625" bolts per side.

The rear stabilizers shall be located directly behind the chassis rear wheels. The stabilizers shall be an integral part of the torque box.

The stabilizers shall be of the double box tube design with jack cylinders that have a 5" internal diameter (bore) and a 2.5" diameter solid cylinder rod. The jack cylinders shall be equipped with integral holding valves, which shall hold the cylinders either in the stowed or the working position, should a charged line be severed at any point within the hydraulic system.

The steel used to build the stabilizer system shall have a minimum yield strength of 36,000 psi and ultimate tensile strength of 58,000 – 80,000 psi.

Vertical jack cylinder rods shall be fully enclosed by a telescoping inner box to protect the cylinder rods, seal glands and pistons against damage from nicks, abrasion, and chrome damage. All vertical stabilizer cylinders shall be removable from the top of the box tube. The inner double box system shall be further designed to stabilize the column load imparted upon the cylinder rod, thereby also protecting against damage which may occur from lateral loading possibly caused by side slopes, shifting or sliding of the apparatus on icy or unstable surfaces, sudden sinking of one or more jack pads, or on scene collision while the aerial device is deployed. Vertical stabilizers that require cylinders to be removed from the bottom, or have the



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vertical stabilizer cylinders exposed, shall not be acceptable.

The stabilizers shall be connected to the hazard light circuit to warn the driver if they are not stowed when the parking brake is released.

Each extending style stabilizer shall have a painted stainless steel stabilizer cover. The cover shall be adjustable to allow for a proper fit.

The stabilizers shall contain safety lock valves and require no mechanical stabilizer pin locks, pin storage holders, or pin holes machined in the stabilizer extending beams.

## **STABILIZER STROKE**

The stroke of the stabilizers shall be a minimum of 25". The stabilizer pad shall be maintained at a stored height of approximately 12" to 15" (dependent on required ground clearance and angle of departure) resulting in a minimum ground penetration of 10" or greater.

## **STABILIZER FINISH**

The extending front/rear stabilizer beams, inner jack tubes, and stabilizer pads shall be wheel-obraided to remove any mill scale or contamination. The individual components shall then be hot dip galvanized. The galvanizing process shall require that the entire assembly is completely submerged. Following the galvanizing process, the surface shall be ground smooth to remove dross. This preparation shall provide maximum protection for these critical components. No exceptions shall be allowed to this requirement due to stabilizers exposure to salt spray and road debris.

The outer tubes shall be finished with a water-based, high quality, single component acrylic primer. The primer color shall be flat black.

## **STABILIZER EXTENSION SYSTEM**

Extension of the front and rear horizontal beams shall be activated by dual extension cylinders, which shall each have a 2" internal diameter (bore) and a 1.25" diameter cylinder rod. The extension cylinders shall be totally enclosed within the extension beams to prevent damage to the rod and hoses. The extension beams shall be 6.00" x 8.00" x .375" wall steel tubing with a .62" steel plate welded to the top and bottom of each beam.

## **WEAR PADS/BEARING SURFACES**

Nylon wear pads impregnated with molybdenum disulfide and high in molecular weight shall be used between the stabilizer housing assembly and the extension tube for maximum smoothness of operation.

Two (2) Nylatron wear pads shall be installed in each stabilizer extension system. There shall be one wear pad located on the top back portion of the extension tube assembly that shall glide on the inner wall of the top housing tube wall. There shall be an additional pad located on the inner wall of the bottom housing tube wall that shall separate the bottom side of the extension tube and the bottom wall of the housing tube. The pads shall be installed in such a manner as to reduce friction for ease of operation and to reduce the amount of metal to metal contact.

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Each stabilizer down jack housing tube shall contain four wear pads, one (1) on each side of the tubes.

## **STABILIZER ANGLE LEVEL GAUGES**

One (1) manual angle level gauge shall be located on the rear of the apparatus. The gauge shall have a sight bubble that will measure the side-to-side angle of the apparatus in 2 degree increments.

One (1) manual angle level gauge shall be located on the apparatus, near the rear. The gauge shall have a sight bubble that will measure the fore-to-aft angle of the apparatus in 2 degree increments.

## **ELECTRIC / HYDRAULIC STABILIZER CONTROLS**

The stabilizer controls shall be located at the rear of the apparatus. Two (2) stations shall be installed, one (1) on each side at the rear, arranged so that the operator has full visibility of the stabilizer being positioned. All stabilizer control functions shall be of the electric paddle joystick style. The make and model of the joysticks shall be P-Q controls, model M105. The controls shall be designed to allow stabilizers to be operated independently so that the vehicle may be set up in a restricted area or uneven terrain.

An electrically actuated diverter valve shall be provided in conjunction with the stabilizer controls as a safety device. The diverter valve shall allow the hydraulic fluid to flow either to the stabilizer circuit or the turntable and ladder circuit.

A stabilizer deployment warning alarm, activated by stabilizer mode, shall be provided at each stabilizer to warn personnel. The warning alarm shall deactivate only when all stabilizers are in the load supporting configuration, or when the diverter switch is no longer in the stabilizer mode.

The stabilizer controls shall each be accessible through a painted stainless steel door.

## **GROUND CONTROL STATION**

A control station shall be located at the rear of the apparatus in an easily accessible area. The control panel shall be illuminated for night time operation. The following items shall be furnished at the control console, clearly identified and located for ease of operation and viewing:

- Individual stabilizer down indicator lights
- Aerial PTO engaged indicator light
- High idle switch with indicator light
- Emergency hydraulic pump control with indicator light
- Stabilizer/Aerial diverter control with indicator light
- Side to side leveling bubble

A weatherproof compartment shall be furnished behind the control panel and shall contain the

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aerial circuit breakers, interlock components and control circuit distribution terminals. The control station shall be accessible through a painted stainless steel door.

The stabilizer controls and ground control station surfaces shall be fabricated from 3mm thick solid core aluminum composite panel with double-sided painted aluminum outer surfaces bonded to a solid polyethylene core. They shall include an Innovative Controls graphic overlay design and supply a second- surface printed UV and scratch-resistant polycarbonate graphic overlay backed with UL 969-compliant outdoor adhesive.

## **AUXILIARY STABILIZER PADS**

An auxiliary pad for additional load distribution on soft surfaces shall be supplied for each stabilizer. The pads shall be constructed of ultra-high molecular weight composite material that is a minimum of 1" thick with a minimum surface area of 576 square inches. The auxiliary pads shall be stored in locations that are readily accessible.

## **STABILIZER COVER WARNING LIGHTS**

One (1) Whelen M6 Series Super-LED flashing light shall be installed on each extending stabilizer cover panel, for a total of four (4). These lights shall be red in color with a clear lens and activated by the aerial master switch and emergency master switch.

## **STABILIZER ARM WARNING LIGHTS**

Eight (8) Whelen 5G Series Super-LED red flashing lights shall be mounted on the stabilizer beams. Each stabilizer beam shall include two (2) lights, one (1) facing forward and one (1) facing rearward. The lights shall be mounted inboard of vertical jack tubes. The warning lights shall be activated by the aerial master switch.

## **STABILIZER WORK LIGHTS**

Four (4) Truck-Lite round 6 Diode LED lights shall be provided, one (1) at each stabilizer location to illuminate the surrounding area. The lights shall be located under the stabilizer beams and activated by the aerial master switch.

## **TURNTABLE**

The turntable shall be designed in such a manner as to allow a generous working area, regardless of the position of the aerial, including when positioned at maximum elevation. The turntable shall also be designed to allow for the most efficient use of space on the apparatus body.

The turntable shall be a minimum of 95" side to side and 95" forward to aft.

It shall be covered with Tread-Grip Safe-Deck pattern decking to allow the walking surface to shed liquids with unparalleled ease and comply with NFPA intent, to provide secure footing for the operator in all weather conditions.

A downward lip shall "skirt" the turntable decking around the entire circumference to provide protection from hazards.

All hoses and electrical lines shall be routed under removable covers in order to prevent a

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tripping hazard. The covers shall also be designed to prevent damage from occurring to these components. Likewise, the center of the turntable shall have a removable step cover to prevent tripping hazards as well as provide for an easier transition to the first rung of the aerial ladder.

To prevent unnecessary added weight to the apparatus, the turntable shall not be built entirely from solid materials.

## **AERIAL PIVOT PINS**

The aerial device pivot pins shall be located on the turntable and shall attach the aerial device base section to the turntable. To maintain a suitable safety factor, the pivot pins shall be composed of certified structural steel, thereby ensuring structural integrity.

In the interest of safety, the pivot pins shall be located as low as possible and shall be at the aerial device base rails. This shall keep the pivot points away from the areas where persons regressing to and from the aerial base section, might place their hand(s).

Aerial pivot pins shall be installed with a means to keep the pins in place. The design shall not inhibit the pins from being removed by a qualified mechanic.

## **TURNTABLE HANDRAILS**

Three (3) handrails shall be of one piece construction and provide large sweep corners at the edge of the turntable. Each shall be 42" high and shall be constructed of knurled stainless steel. The handrails shall be installed around the rear 180-degree perimeter of the turntable for operator and personnel safety. Each individual handrail shall be secured to the turntable by the use of two (2) minimum 5/8" anchor bolts on the underside of the turntable. Additionally, chrome plated stanchions with rubber gaskets shall be provided on the top surface of the turntable where each railing meets the decking surface.

There will be two (2) openings in the handrails for access from the turntable access ladders.

## **TURNTABLE RESTRAINTS**

Two (2) FRC ManSaver Bars, without covers, shall be installed in the spaces between the handrails. They shall be permanently attached at one end.

## **TURNTABLE WORK LIGHTING**

The turntable shall be lit for night time operation with two (2) On Scene Access lights, which shall be automatically activated by the aerial master switch (day or night). The work lights shall be positioned so the light is directed toward the decking. The lights shall have cast aluminum housings to keep light from glaring upward into the operator's eyes.

An additional Truck-Lite LED light shall be recess mounted in the front access door of the control stand.

## **AERIAL HOUR METER**

An hour meter shall be installed at the turntable control station connected to the system engagement control for the aerial. The meter shall register the total hours of aerial use for

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scheduling periodic maintenance.

Hour meters that are not connected to the aerial system engagement are not considered acceptable in order to capture true aerial operational hours.

## **TURNTABLE CONTROL CONSOLE**

The turntable control console shall be located on the turntable, on the driver's side of the apparatus. The console shall be illuminated by an On-Scene Access LED light with mounting clips for night time operation and have a hinged weather cover. A pressurized gas filled cylinder shall be furnished on the cover to hold it in the open position. The gas filled cylinder shall assist in closing the cover automatically when it is positioned over the center. The console surface shall be angled toward the operator so controls may be viewed and operated ergonomically. Rubber bumpers shall be provided so that when the control console lid is closed, the lid and the control panel will be protected from each other (no metal to metal contact).

Three (3) handles for the ladder hydraulic functions (elevation, rotation, and extension) shall be installed at the control console. The controls shall be manual for safety and durability reasons - No Exceptions. The function of each control lever shall be cast into the plate under the appropriate lever. The controls shall be capable of being operated independently or simultaneously with a gloved hand. The speed of movement caused by moving any control shall be minimally affected when multiple controls are activated.

The control console surface shall be fabricated from aluminum and shall include a graphic overlay. The overlay shall be Innovative Controls design and supply a second surface-printed UV and scratch-resistant polycarbonate graphic overlay backed with UL 969-compliant outdoor adhesive.

A hinged door shall be provided on the front of the control console with a lift and turn latch. This door shall allow access to the inner components for inspection purposes. A recessed work light shall be provided in the access door. A hinged access door shall be provided on the outboard side of the control panel. The door shall be provided with a spring loaded, slotted head latch. The opening shall allow access to the electrical components for service purposes

All turntable controls shall override the controls at the tip.

The following items shall be furnished at the console, clearly identified and located for ease of operation and viewing:

- Elevation, extension and rotation controls
- Lighted push/pull button to deactivate hydraulic and electrical system
- Fast idle button
- Panel light mounted in cover
- Rung alignment light
- Ladder light switches

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- Ladder overload warning horn
- System pressure gauge
- Loadminder
- Emergency pump unit switch and light
- Monitor function controls
- Intercom with controls
- Operators load chart

## **SYSTEM LOCK CONTROL**

A push/pull systems engagement control shall be installed at the turntable control console. The control shall energize the hydraulic system for the ladder function and provide the flow of hydraulic fluid to the master valve bank. An automatic throttle switch shall be attached to the systems engagement control that advances the engine speed to a preset RPM when the engagement control is in the "RUN" position. In the "LOCK" position, the engine speed shall return to the normal idle RPM and the hydraulic system be de-energized.

## **NO RETRACTION OVERRIDE SAFETY SYSTEM**

## **AERIAL LOAD SENSING SYSTEM**

A Loadminder shall be installed at the operator's pedestal indicating the load(s) on the aerial device. The display shall be in the form of a LED illuminated bar graph. The instrument shall be readable in day and night conditions. The display shall be a "real time" display, thereby giving immediate readings to the operator. Additionally, a color-coded bar shall be above and below the actual LED bar graph, to surround the actual reading given to the operator; thereby making the display easier and faster to read. The color coded bars shall progress from green to yellow, and finally to red. When the LED bar graph illuminates, representing a load on the aerial ladder, the operator need only glance at the display to determine the load applied to the aerial device - in relation to 100% rated aerial device capacity.

The readout given by the display shall be continuous relative to the NFPA compliant aerial device rated capacity as stated in these specifications, and shall include (but not be limited to) the following items:

- Accumulated equipment on any and all ladder sections, or at the tip including manufacturer installed items or customer installed items
- Accumulated personnel on any and all ladder sections or at the tip
- Accumulated ice buildup on any and all ladder sections or at the tip
- The total load suspended from any load lifting / rappelling eye installed by the manufacturer

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- Any load reaction from dynamic loads placed on or realized by the aerial structure
- Any water weight or reactionary force realized by the aerial structure
- Any combination of the above items

The Loadminder as described shall be designed in such a manner that the operator will not have to refer to an angle indicator, extension tape, or load chart; or be required to guess at, or try to calculate the loads or forces applied to, or interacting with the aerial device at any given time, and in any situation. This shall be in compliance with NFPA 1901. Systems that require the use of a load chart, angle indicator or extension tape shall not be acceptable for safety reasons.

The Loadminder shall be connected to a 100 dB. alarm at the operator's control station that shall sound when the ladder load is above the rated capacity. This alarm system shall also be connected to two (2) strobe lights on the end of the base section, one on each side, to provide further notice to the operator of an unsafe condition.

## **AIR HORN ACTIVATION**

An air horn button shall be provided on the aerial turntable console. The button shall be red in color and include a label reading "AIR HORN".

## **AERIAL LADDER LOAD CHART**

A load chart shall be installed at the turntable control console of the aerial ladder. The load chart shall illustrate the full operating range of the ladder, with the waterway dry or flowing water.

## **AERIAL COMMUNICATION SYSTEM**

A Fire Research Always Clear Talking (ACT) Intercom, model ICA900-213, three-way system shall be provided between the aerial tip, the turntable control console, and the pump panel. The intercom kit shall include three control modules, one at the aerial tip that is hands free and one each at the turntable control console and pump panel that have a push-to-talk button, three speakers, and cables. The interconnection between control modules shall require two wires. The control modules shall have an LED volume display and push-button volume control. The hands free module shall constantly transmit to the other modules unless a push-to-talk button is pressed.

The intercom shall be designed for exterior use. The control module shall be no more than 2 7/8" high by 5 1/8" wide by 1 7/8". The speaker shall be no more than 5 1/8" high by 5 1/8" wide by 1 1/2" deep. The power requirements for each control module with a speaker shall not exceed 1/2-amp at 12 VDC.

## **TRACKING LIGHTS**

Two (2) Whelen PFH1P Pioneer Plus Super-LED lights on a pedestal mount shall be installed ahead of the cradle, on the base section of the aerial ladder, one (1) on each side.

Each light shall be a Whelen Single Panel Pioneer Plus PFH1P Super-LED floodlight. Each rectangular extruded light fixture with die cast end caps shall measure 10-13/16" wide by 9-3/4" high by 3" deep and have a white powder coat finish. Each light fixture shall have a single panel

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of (2) horizontal clusters of LED lamps with a molded vacuum metalized reflector that draws 6.5 amps at 12 Vdc. The lights shall be mounted with an aluminum adapter plate attached to the pole with a switch box (switch not included) and a locking swivel joint with a 3/4" diameter NPT threaded base to allow the lights to be manually tilted up/down and locked in position by the operator. There shall be a removable handle standard on each lighthead. Each light shall have the Whelen five-year factory warranty.

Each light shall be complete with one (1) Whelen pedestal mount.

The tracking lights shall be controlled by a toggle switch located on the turntable control console.

## **EGRESS**

A removable bolt on egress shall be installed on the tip of the fly section. Only certified structural fasteners shall be utilized to attach the egress to the tip of the fly section. Additionally, the fasteners shall be stainless steel. This design shall allow for easy replacement should the egress become damaged during rescue operations. This shall prevent the department from experiencing serious downtime, as is common with welded on egresses. For this reason, a design that allows the egress to be welded to the fly section shall not be acceptable.

When the ladder is at 0 degrees elevation, the rungs on the egress shall be on a plane of -11 degrees. This shall provide a smoother transition onto the ladder from the tip when it is at a high angle elevation.

The egress shall have handrails that match the fly section handrails for an unnoticeable transition between the two. The egress handrails shall have a radius design at the tip to eliminate corner joints, increase strength, and provide a pleasing appearance.

The rungs on the egress shall be held to the same design load criteria as the rungs of the aerial ladder sections. Specifically, each egress rung shall be able to support a design load of 500 lbs. minimum, distributed across the rung, as specified in NFPA 1901. This shall be in excess of that required by the aforementioned standard. No exceptions shall be allowed to this requirement.

## **AERIAL LADDER CREEPER CONTROLS**

A remote ladder creeper control shall be provided at the tip of the fly section. The control shall consist of three (3) spring loaded, triple pole double throw, return to center switches, one for each main ladder function. Each function switch shall be labeled on a black and white label that is located adjacent to the switches. Each switch shall be encircled by a rubber boot to protect the switch box from collecting moisture. The creeper control shall allow the crew member on the tip of the ladder to operate these three functions within the speed limitations as set forth in accordance with NFPA 1901, current edition.

A momentary switch shall be installed at the lower turntable control console to activate the creeper control system. When in the "normal" position, the system shall be de-energized. When the switch is held in the "on" position, power shall be available to the person at the tip and they shall be able to adjust the aerial with the creeper controls.



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## **SECTION FOLDING STEPS**

One (1) set of folding steps shall be installed at the tip of the ladder to provide solid footing for personnel while operating the elevated master stream device.

In order to meet NFPA requirements that state the operator's feet shall not protrude through the outermost fly section, a kick plate shall be provided with each step.

When folded for storage, the steps shall not present any obstruction to personnel on the apparatus. Proper installation of the steps shall require that rubber gaskets shall be installed under the mounting surface where the step is secured to the aerial ladder section with certified structural fasteners.

## **FLY SECTION LOAD LIFTING/RAPPELLING EYES**

The aerial ladder shall be equipped with two (2) load lifting/rappelling eyes at the tip of the fly section. The load lifting/rappelling eyes, as a pair, shall be rated not to exceed the tip load of the ladder structure.

## **AERIAL WIRING**

The AC wiring shall be Thermoplastic Elastomer (TPE) control cables and shall be highly flexible with very fine copper stranding. The cables shall have a center core strain relief for high tensile strength. The conductors shall be braided in bundles around the high tensile strength core. The outer jacket shall be gusset-filled, pressure-extruded, oil-resistant, bio-oil-resistant, PVC-free, halogen-free, and UV-resistant with low-temperature flexibility. The cables shall have a minimum bending radius of not greater than 5x the outer total diameter of the cable while moving.

## **120V RECEPTACLE**

One (1) NEMA L5-20R, 120-volt, single, 3-wire, twist lock receptacle shall be installed on the officer's side of the ladder tip. The receptacle shall have a 20-ampere rating and include a spring-loaded weather resistant cover if mounted in an exterior location. The receptacle shall be wired to the onboard generator.

## **WHELEN PIONEER PLUS TIP LIGHTS**

Two (2) Whelen PFP1 Pioneer Plus Super-LED lights on a pedestal mount shall be installed at the tip of the aerial.

Each rectangular extruded light fixture with die cast end caps shall measure 14" wide by 4-1/4" high by 2-7/8" deep and have a white powder coat finish. Each light fixture shall have a single panel of (2) horizontal clusters of LED lamps with a molded vacuum metalized reflector that draws .625 amps at 120 Vac. Each light shall be mounted with an aluminum adapter plate attached to the pole with an On-Off toggle switch, switch box and a locking swivel joint with a 3/4" diameter NPT threaded base to allow the lights to be manually tilted up/down and locked in position by the operator. There shall be a removable handle standard on each lighthouse. The lights shall have the Whelen HDP Heavy-Duty Professional five-year warranty.

Each light shall be complete with one (1) Whelen pedestal mount.

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The lights shall be located at the aerial tip, one (1) on the driver's side and one (1) on the officer's side.

The tip light(s) shall be controlled by a toggle switch located on the turntable control console.

## **WHELEN LED TIR3 LOCATOR LIGHTS**

Two (2) Whelen TIR3 LED locator lights shall be provided. The lights shall have blue LEDs and clear lens, and shall be activated by the aerial master switch.

The locator lights shall be located on the aerial tip, one (1) on each side.

## **WATERWAY SYSTEM**

A waterway system shall be provided consisting of the following components and features:

A 4-1/2" outside diameter pipe shall be connected to the water supply on one end and to a water swivel at the rotation point of the turntable. The swivel shall allow the ladder to rotate 360 degrees continuously while flowing water.

A 4" inside diameter pipe waterway shall be routed through the rotation point swivel up to the heel pin swivel. The heel pin swivel shall allow the water to flow to the waterway while elevating the aerial ladder from -8 degrees below to +72 degrees above horizontal.

The heel pivot pin shall not be 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.

## **WATERWAY PIPE DIAMETERS**

The integral telescopic waterway system shall consist of a 5" outside diameter steel pipe in the base section, a 4-1/2" diameter pipe on the second section, a 4" outside diameter pipe on the third section, and a 3-1/2" outside diameter pipe in the fly section.

## **CP-84 CHROME PLATED WATERWAY**

The CP-84 telescopic waterway shall be composed of high quality 84K PSI steel. The pipes shall be professionally prepared to accept a highly durable, hot dipped galvanizing coating. Preparation shall include de-greasing as needed, followed by wheel-o-braiding to remove any contaminants or scale.

Following preparation, each water pipe shall be hot-dipped galvanized. The pipes shall be completely submerged in the galvanizing bath to ensure 100% coverage and intimate bonding of the galvanic coating to the steel. Following the dipping process, all dross shall be ground and the perimeter of the pipe shall be ground to a smooth finish.

Each pipe shall then be prepared to be heavily chrome plated. Materials (nickel/copper/ chrome) used in the chrome plating process shall be of the highest purity to complete the chrome plating process. The chrome shall be polished to an extremely high luster.

The result of the preceding processes shall provide an aerial waterway that is of unequaled

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quality and durability. The heavy galvanizing and chrome plating shall ensure that no corrosion occurs on the waterway and that the outer surface remains smooth for long seal life. Additionally, the chrome plating shall aid in preventing nicks, scratches, and abrasions from occurring where they would otherwise easily occur with softer and more malleable aluminum tubes.

The waterway on the base section of the aerial device shall be galvanized with the process described above, followed by complete coverage utilizing AkzoNobel paint of job color.

## **POSITIONAL WATERWAY**

The waterway shall be a positional or detachable type in order to allow the uppermost fly section to be clear of obstructions when using the aerial device for rescue purposes. It shall be designed in such a manner as to allow the master stream device to be affixed to either the tip of the last fly or to the end of the next lower section. The device shall be designed in such a manner that when it is in the forward position the monitor master stream device shall be connected to the tip of the ladder and when it is toward the back, the device travels with the next lower ladder section. The connection for remote nozzle controls and electricity to the unit shall be permanent and not incorporate any spring loaded cable reels or electrical contact pads that can foul or become damaged allowing the monitor to become inoperable. In addition, the system shall require no external power supply such as a battery to operate the monitor.

A switch shall be located at the turntable control console for the positional waterway. The switch shall activate an electric actuator mechanism that will lock the monitor in the desired position. Two (2) separate indicator lights shall be located near the positioning switch to inform the aerial operator of the current position of the monitor. The individual lights shall be labeled "Rescue" and "Water Tower".

To ensure maximum safety for personnel, units that require a firefighter to climb to the end of the ladder and manually change the position of the waterway will not be considered acceptable.

## **WATERWAY RELIEF VALVE**

A 3/4" safety relief valve shall be installed in the base section waterway. The relief valve shall be preset at 240 psi. The valve shall protect the waterway from overpressure, which is normally caused by the capping of the monitor outlet. This valve in no way is to act as a relief for the total flow of the system.

## **WATERWAY DRAIN VALVE**

A 1-1/2" drain valve shall be installed in the lower section of the aerial plumbing under the apparatus. The valve, when opened, shall drain the aerial waterway and lower plumbing.

## **WATERWAY FLOW METER**

One (1) Akron Brass, model 9335, Navigator™ Pro valve controller shall be installed at the aerial ladder turntable control station.

The electric actuator shall be controlled by an Akron Brass, model 9335, Navigator™ Pro valve controller. The electric controls shall be of true position feedback design, requiring no clutches in the motor or current limiting. The unit shall be completely sealed with momentary open, close

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as well as an optional one (1) touch full open feature to operate the actuator. Three (3) additional buttons shall be available to be used for preset selection, preset activation, CAFS activation and menu navigation. The unit shall be capable of being connected to a Pressure Sensor and provide an LCD display showing pressure as well as valve position indication. Valve position indication shall be determined from true position feedback and indicate the exact position of the valve. The unit shall be capable of being used in conjunction with controller at the pump panel. The unit shall be able to be programmed to Bar, PSI or kPa for pressure. The unit shall have programmed pipe sizes and be capable of custom calibration to high and low flow ranges. The unit shall also be capable of turning on and off a solenoid used in a CAFS system. The only calibration required is to set the unit to the valve during initial set up. No other calibration shall be required. The display shall be a full color LCD display with a backlight. It shall have manual adjustment of the brightness as well as an auto-dimming option. Unit shall carry a five (5) year warranty.

Shop Note: This is to be connected into the 9335 controller at the pump panel.

## **AERIAL WATERWAY INLET**

A 4" inlet, with 4" plumbing, shall be installed on the officer's side pump panel of the apparatus to be used for supplying the aerial waterway.

A 4" NPT X 4" NH thread waterway adapter shall be provided.

One (1) 5" Storz x 4" female NH thread swivel rocker lug 30-degree elbow adapter shall be provided. The elbow shall be constructed of hard coat anodized aluminum alloy and have a silver powder coat finish inside and out.

One (1) 5" Storz blind cap, complete with lanyard, shall be provided.

## **TASK FORCE TIPS MONSOON RC ELECTRIC MONITOR**

One (1) Task Force Tips Monsoon RC remote controlled electric monitor shall be installed at the end of the aerial waterway. The monitor shall operate with 12-volt direct current and controlled by a monitor mounted switch panel with functions that control rotation, elevation, and nozzle patterns. The monitor shall be compatible with optional wired and wireless control panels.

The electrical controls for the monitor shall be waterproof and utilize current limiting and position encoders to protect the drive train at the ends of travel. The monitor will be pre-wired to a control/connection box with 4 feet of wire such that the control/connection box is mountable to the ladder at a nearby location. Control box on the monitor will contain a membrane switch panel for control of the unit from the top of the ladder. Remote control/connection box will contain one TFT communications module which will allow the connection of a remote TFT toggle switch box (supplied separately if additional controls at the ladder tip are desired) simultaneously with allowing input from discreet signals that provide a positive 12-volt signal for actuation of each movement axis or can be easily reconfigured in the field to accept ground signals. The priority of operation will be set from the factory such that the discrete inputs always have control priority. An electrical connection for a TFT remote control nozzle shall be provided. The monitor shall be equipped with small override knobs for use in the event of power failure or electrical malfunction. The knobs control stainless steel worm gears for rotation and elevation adjustment.

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The monitor shall have the following capabilities:

- Control box mounted to top center of monitor for maximum clearance
- Override control shafts shall be short in length to provide maximum clearance
- Small override knobs installed
- Maximum operating pressure of 200 PSI

For resistance to corrosion, the monitor shall be constructed from hard coat anodized aluminum with a silver powder coat interior and exterior finish. A threaded port for an optional pressure gauge shall be provided.

The monitor shall be designed with a unique waterway that minimizes the path of travel, reduces friction loss and turbulence, and produces a far-reaching water stream. The monitor shall be configured with a 4" ANSI 150 flange inlet and 3-1/2" male NH outlet.

## **PRIMARY REMOTE MONITOR CONTROL STATION (TURNTABLE)**

Task Force Tips primary control station for Monsoon remote control monitors shall be provided on the turntable. The control station shall be designed for flush panel mounting and include switches to control horizontal rotation, vertical elevation, and nozzle stream pattern, oscillate and stow. The switch enclosure shall be weatherproof and utilize weatherproof components such as a membrane switch, silicone seal, and hardware with O-rings and liquid tight electrical connections with strain relief fittings. A 10-foot long incoming power connection cable shall be supplied and can be used as a central connection point for other wired or wireless controls or monitor position display.

## **REMOTE MONITOR TOGGLE SWITCH CONTROL STATION**

Task Force Tips auxiliary control station for Monsoon remote control monitors shall be provided at the tip of the ladder. The control station shall be designed for surface mounting and include switches to control horizontal rotation, vertical elevation, and nozzle stream pattern. The control station will also include a circuit board to communicate with the Task Force Tips remote control monitor.

The switch enclosure shall be weatherproof and utilize weatherproof components such as silicone seal, and hardware with O-rings and liquid tight electrical connections with strain relief fittings. A preconnected 10-foot, four-conductor cable for power and communications shall be provided.

## **MONITOR COLOR**

The monitor shall be powder-coated silver by the monitor manufacturer and shall not be repainted by the OEM.

## **NOZZLE**

A Task Force Tips, model M-ERP1500-NN, Master Stream automatic electric nozzle with 3-1/2" NH thread swivel base shall be provided. The nozzle shall be capable of producing a stream at

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any volume from 300 to 1500 GPM. The nozzle shall feature an electric pressure adjustment knob, which allows the operating pressure to be adjusted to tactile detent settings between 70 and 120 PSI. The nozzle shall include rubber bumper incorporate "power fog" teeth for fully-filled, finger-free fog pattern. The nozzle shall be lightweight hard coat anodized aluminum for maximum resistance to corrosion and wear.

## **MONITOR SWEEP**

The monitor shall be capable of vertical positioning from -135 degrees to 0 degrees and horizontal positioning of 90 degrees from side to side, for a full 180-degree sweep.

## **MONITOR SAFETY INTERLOCK**

The monitor shall be equipped with a monitor safety interlock (MSI) that shall prevent the monitor or nozzle from coming into contact with the cab windshield and/or roof. The MSI shall automatically stop the operator from lowering the aerial into the cradle until the monitor has been fully raised to prevent damage. In addition, the blue bed zone indicator shall not illuminate until the ladder is aligned with the cradle and the monitor is in the fully raised position.

## **STOW FEATURE**

The monitor shall be equipped with a stow feature. When activated, the stow feature shall return the monitor to a pre-programmed or nested position. The stow feature shall be activated by a covered momentary switch on the turntable control console. A light shall be provided on the control console to advise when the monitor is in the nested position.

## **MONITOR CONTROLS**

The aerial master stream device shall have two (2) separate control stations. One station shall be at the main aerial turntable control console. The other station shall be located at the tip of the aerial ladder. Each station shall have the capability of controlling the nozzle pattern as well as the horizontal and vertical position of the device.

## **ROPE RESCUE PACKAGE**

An aerial rope rescue package shall be installed with the following components:

### **RESCUE ROLLER ASSEMBLY**

A rescue roller assembly shall be provided for use on the tip of the fly section. This assembly shall be used to keep rope that is pulled from the operator's turntable position from being frayed or rubbing on and uneven surface of the aerial ladder. Two (2) rollers shall be provided on the assembly, capable of passing 1/2" rope. The entire assembly shall be removable and the plate shall be coated with black Line-X, a thermoplastic polyurethane coating.

### **RESCUE ROLLER ASSEMBLY - MOUNTING BRACKET**

A mounting bracket shall be provided on the forward portion of the base section for storing the rescue roller assembly.

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## **RESCUE ROPE CHANGE OF DIRECTION ASSEMBLY**

A rescue rope change of direction assembly shall be provided for use with the roller assembly on the tip of the fly section. This assembly shall allow the rope to be pulled from different directions. The assembly shall be mounted at the base of the ladder. The entire assembly shall be removable.

## **RESCUE ROPE C.O.D. ASSEMBLY - MOUNTING BRACKET**

A mounting bracket shall be provided on the rear portion of the base section for storing the rescue rope change of direction assembly.

## **RUNG ILLUMINATION LIGHTING**

The aerial ladder sections shall be equipped with permanently installed blue LED rung illumination lights. The lights shall be mounted on the inside of the ladder sections, facing inward; on each aerial section in a "staggered" configuration. The blue colored lens shall serve to illuminate ladder rungs without inducing any glare, which would hinder safety. Each light shall be equipped with an integral guard to protect it from damage. The lights shall be positioned such that all light be directed inward toward the rungs of the aerial sections, maximizing safety for all personnel during night operations. The lights shall also aid the operator in locating aerial ladder section in conditions of reduced visibility.

Designs that use luminescent tape on the rungs shall not be permitted as they require previous exposure to sunlight and can wear off over time.

The rung lighting shall be controlled by a toggle switch located on the turntable control console.

## **AERIAL LADDER SIGNS**

Two (2) sign panels measuring 16" tall x 133" long shall be installed on the base section of the aerial ladder, one on each side. The sign panels shall be fabricated of 1/8" aluminum plate. The signs shall be large enough to accept a maximum lettering size of 12" high.

## **BASE SECTION MOUNTED STOKES BASKET STORAGE**

A storage box shall be provided on the base section for a Stokes basket. The box shall be on the officer's side of the base section to be the least obtrusive when viewing the aerial tip from the turntable control console. The box shall be fabricated from smooth aluminum and be painted to match the ladder. The box shall be attached to the aerial section using stainless steel fasteners. A painted aluminum lid shall be provided on the box to secure Stokes basket.

The stokes basket box will have a prox switch wired into the door-ajar warning light circuit to notify when the lid is open.

## **STRETCHER**

The stretcher shall be dealer/customer supplied.

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## **BASE SECTION MOUNTED ROOF LADDER**

One (1) roof ladder mounting bracket set shall be provided on the outside of the base section, on the driver's side, for a solid beam roof ladder. The brackets shall be formed using break and bend techniques for added strength and an outstanding appearance. To enhance durability, the brackets shall be coated with Line-X. Stainless steel fasteners shall be employed where the ladder bracket is bolted to the aerial section or ladder sign panel.

The roof ladder shall be secured using a spring-loaded handle, which is easily lifted away from the roof ladder with a gloved hand for safe access.

One (1) Duo-Safety, model 875-DR, 16' aluminum roof ladder with roof hooks on each end shall be provided.

## **FLY SECTION MOUNTED PIKE POLE**

One (1) pike pole mounting bracket shall be provided on the driver's side of the aerial fly section. A strap shall be provided to hold the pike pole in the bracket.

One (1) Fire Hooks Unlimited, model RH-8, 8' steel shaft pike pole with a New York Roof Hook and chisel end shall be provided.

## **CHASSIS PAINT**

The two-tone chassis cab shall be painted by the chassis manufacturer.

## **BODY PAINT PREPARATION**

The apparatus body and components shall be metal finished as follows to provide a superior substrate for painting:

- All aluminum sections of the body shall undergo a thorough cleaning process, starting with a phosphoric acid solution to begin the etching process, followed by a complete rinse. The next step shall consist of a chemical conversion coating applied to seal the metal substrate and become part of the aluminum surface for greater film adhesion.
- After the cleaning process, the body and its components shall be primed with a high solids primer and the seams shall be caulked.
- All bright metal fittings, if unavailable in stainless steel or polished aluminum, shall be heavily chrome plated. Iron fittings shall be copper underplated prior to chrome plating.

## **PAINT PROCESS**

The paint process shall follow the strict standards as set forth by AkzoNobel Guidelines.

The body shall go through a three-stage paint process: primer coat, base coat (color), and clear coat. In the first stage of the paint process, the body shall be coated with primer to achieve a total thickness of 2-4 mills. In the second stage of the paint process, the body shall be painted with BTLV650 High Solids Polyurethane Base Coat. A minimum of two to three coats of paint



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shall be applied to achieve covering. In the final stage of the paint process, the body shall be painted with a Clear Top Coat. A minimum of two to three coats shall be applied to achieve a total dry film thickness of 2-3 mills.

As part of the curing process, the painted body shall go through a Force Dry / Bake Cycle process. The painted components shall be baked at 185 degrees for 3 hours to achieve a complete coating cure on the finished product.

## **HAND POLISHED**

After the Force Dry / Bake Cycle and ample cooldown time, the coated surface shall be sanded using 3M 1000, 1200, and/or 1500 grit sandpaper to remove surface defects. In the final step, the surface shall be buffed with 3M super-duty compound to add extra shine to coated surface. No more than .5 mil of clear shall be removed in this process.

## **BODY PAINT COLOR**

The body shall be painted with AkzoNobel High Solids polyurethane Base Coat.

The non-metallic paint color of the single tone body shall be determined at the time of order entry.

## **AERIAL COMPONENT PROTECTION / PAINT**

All aerial device components above the rotation point that are not chrome plate, bright aluminum tread plate, or stainless steel shall be painted. All areas to be painted shall be sanded to remove any metal flakes and smooth any rough surfaces. All surfaces to be painted shall be phosphatized to remove metal impurities, aid paint adhesion and inhibit rust. The components shall be primed and finish painted with a high gloss polyurethane paint. The support structure and components below the rotation point shall be painted black.

The extending stabilizer beams, inner jack cylinder protective tubes, and stabilizer pads shall be hot dip galvanized. The extending stabilizer beams, inner jack tubes, and stabilizer pads shall be wheel-o-braided to remove any mill scale, or contamination prior to galvanizing.

Following this preparation, the individual components shall be hot dip galvanized. The galvanizing process requires that the entire assembly be completely submerged. Following the galvanizing process, the surface shall be ground smooth to remove dross. This preparation shall provide maximum protection for these critical components. Following surface preparation, components shall be coated with black water-based self-etching coating. No exceptions shall be allowed to this requirement.

The high gloss polyurethane paint, which shall be applied to the aerial ladder sections and other components above the rotation point, shall be cured at an elevated temperature for a period not less than 2 hours to enhance durability and appearance. The temperature shall not be less than 180 degrees Fahrenheit. Curing of the paint shall promote a chemical reaction within the substrate that shall harden the paint. The curing shall be performed in a clean, sealed, controlled atmosphere. The atmosphere shall comply with all environmental standards and any air entering the chamber shall be filtered.

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## **AERIAL DEVICE PAINT COLOR**

The aerial device shall be painted with AkzoNobel High Solids polyurethane enamel paint. The color shall be AkzoNobel #41876 white.

## **AERIAL CORROSION PROTECTION**

Internal structural members of the aerial structure shall be 100% concealed from oxygen or have corrosion protection applied. Totally sealed members are not subject to the possibility of corrosion attacking the metal from the interior.

The structural tubing of the aerial structure that contains drilled holes or is exposed to outside air and elements shall be protected to eliminate the possibility of corrosion occurring on the inside of the tube. No exceptions as this is imperative to the strength and integrity of the aerial structure.

The interior of exposed tubing shall be coated with a compound labeled NWAC 120-4. The application of the coating shall be applied after the welding process of the aerial structure is complete and shall cover 100% of the interior of the structural tube. NWAC 120-4 is an effective cavity corrosion inhibitor that provides long-term protection for both ferrous and non-ferrous metals. The resulting water-repellent, flexible, air-dried film has crevice penetrating, spreading and clinging characteristics. The product dries to a nearly transparent film and provides maximum corrosion protection for all void spaces subject to humidity and condensation.

## **AERIAL LADDER EGRESS PAINT COLOR**

The aerial ladder egress shall be painted with AkzoNobel High Solids polyurethane enamel paint. The color shall be red.

## **AERIAL LADDER SIGN PAINT COLOR**

The aerial ladder signs, mounted on the base section, shall be painted the same color as the body.

## **UNDERCOATING**

The apparatus shall undergo a two-step undercoating process. The first step shall be a rubberized polyurethane base compound applied after the body has been primed. The materials used incorporate unused paint products to reduce the amount of waste released into the environment. This coat shall be applied to all hidden pockets and surfaces that are not visible after completion.

As a final step, the entire underside of the body shall be coated with a bituminous based automotive type undercoating when the apparatus is completed. During this application, special care shall be taken to avoid spraying the product on air lines, cables, or other items that would hinder normal maintenance.

## **CORROSION PREVENTION**

One (1) 3.75-ounce tube of Electrolysis Corrosion Kontrol (ECK) shall be provided to use when additional items are mounted to the apparatus. ECK protects aluminum and stainless steel

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against electrolytic reaction, isolates dissimilar metals and gives bedding protection for hardware and fasteners. ECK contains an anti-seizing lubricant for threads. ECK is dielectric and perfect for use with electrical connectors.

## **LINE-X THERMOPLASTIC COATING**

In designated areas, Line-X XS-350, a two-component spray-in-place thermoplastic polyurethane system shall be used for maximum protection of the body and equipment. Line-X XS-350 is 100% high-performance aromatic solids pure Polyurea elastomeric membrane. The coating shall be a fast cure, textured surface, multi-purpose material designed for commercial and industrial applications. It shall adhere to the body and serve as a protective, abrasion resistant liner where applied.

The coating shall exhibit the following minimum typical physical properties:

- Tensile strength - 3,432 PSI (ASTM D-412)
- Elongation - 162% (ASTM D-412)
- Tear Strength - 783 PLI (ASTM D-624)
- Shore D Hardness - 60 +/-1 (ASTM D-2240)

## **SAMPLE PAINT CARD**

One (1) sample paint card shall be provided with the apparatus. The card shall show an example of the apparatus body color on one side and have the specific AkzoNobel paint formula printed on the reverse side.

## **REFLECTIVE LETTERING, DEALER SUPPLIED / DEALER INSTALLED**

### **RUB RAIL REFLECTIVE STRIPING**

There shall be 2" reflective striping installed in the rub rail channel. The reflective striping shall be diamond grade quality material for increased visibility. The reflective shall be ruby red in color.

### **REFLECTIVE STRIPING - STABILIZER BEAMS**

Retroreflective striping, utilizing a chevron pattern, shall be installed on the front and rear sides of the four (4) horizontally extending stabilizer beams for increased visibility when extended. The striping shall be applied at a 45-degree angle and shall be a minimum of 6" wide. The chevron color shall be the same color as the rear of the apparatus.

### **CHEVRON COLOR - RED/FLUORESCENT YELLOW-GREEN**

The chevron striping shall consist of red, 3M part number 1172 EC, and fluorescent yellow-green, 3M part number 3983, and shall meet the chevron color requirements in accordance with NFPA 1901, current edition.

Only 3M Diamond Grade VIP Reflective Striping shall be used. 3M Diamond Grade VIP

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Reflective Striping is a wide-angle prismatic lens reflective sheeting designed for the production of durable traffic control signs and delineators that are exposed vertically in service. This sheeting is designed to provide higher sign brightness than sheeting's that use glass bead lenses. It is intended to also provide high sign brightness in the legibility distance where other sheeting's do not. If something other than 3M is being used, third party documentation must be provided with the bid to prove it is compliant with Federal DOT and NFPA 1901, current edition.

## **CHEVRON STRIPING - REAR BODY**

Retroreflective striping shall cover at least 50% of the rear-facing vertical surfaces in accordance with NFPA 1901, current edition. The striping shall be in a chevron pattern sloping downward and away from the centerline of the apparatus at an angle of 45 degrees. Each stripe shall be a minimum of 6" in width. The striping shall consist of a solid base layer of reflective material and alternate between the exposed base layer material and durable, transparent, acrylic colored film.

The chevron pattern shall include rear face of the body. The torque box door shall be excluded from the chevron reflective striping.

## **CHEVRON STRIPING - FRONT BUMPER**

Retroreflective striping shall be installed on the vertical surfaces of the front bumper. The striping shall be a chevron pattern sloping downward and away from the centerline of the apparatus at an angle of 45 degrees. Each stripe shall be 6" wide and shall be applied to the majority of the flat surface of the front of the bumper. The chevron striping colors shall match that of the rear of the apparatus.

## **MATERIAL AND WORKMANSHIP WARRANTY**

OEM installed purchased parts and fabricated parts shall be free of defects in material and workmanship for a period of two (2) years starting thirty (30) days after the original invoice date. Full details shall be provided in the complete warranty document.

## **TEN (10) YEAR WARRANTY BODY STRUCTURAL INTEGRITY**

The body shall be free of structural or design failure or workmanship for a period of ten (10) years or 100,000 miles starting thirty (30) days after the original invoice date.

## **TORQUE BOX SUPERSTRUCTURE WARRANTY**

The torque box superstructure shall be free of structural or design failure or workmanship for a period of fifteen (15) years starting thirty (30) days after the original invoice date. Full details shall be provided in the complete warranty document.

## **TWENTY-FIVE (25) YEAR AERIAL STRUCTURAL INTEGRITY WARRANTY**

The aerial device shall be free of structural or design failure or workmanship for a period of twenty-five (25) years or 100,000 miles, starting thirty (30) days after the original invoice date. For further details, please refer to the complete warranty document.

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## **TEN (10) YEAR AERIAL WATERWAY AND WATERWAY SEALS LIMITED WARRANTY**

The aerial device waterway, including the waterway seals, shall be free of defects in design and workmanship for a period of ten (10) years starting thirty (30) days after the original invoice date.

## **STAINLESS STEEL PLUMBING LIMITED WARRANTY**

The stainless steel plumbing and piping shall be free from corrosion perforation for a period of ten (10) years starting thirty (30) days after the original invoice date. Full details shall be provided in the complete warranty document.

## **WATER TANK WARRANTY**

The tank shall be complete with a lifetime warranty. The tank manufacturer shall mark the tank and furnish notice that indicates proof of warranty. Full details shall be provided in the complete warranty document.

## **PAINT LIMITED WARRANTY**

The apparatus body and pump house shall be free of blistering, peeling and any other adhesion defect caused by defective manufacturing methods or paint material selection for exterior surfaces for a prorated period of three (3) years starting thirty (30) days after the original invoice date.

Paint on the undercarriage, body interior (Line-X coating included) or aerial structure related paint, if applicable, is covered only under the standard two (2) year limited warranty.

## **CORROSION PERFORATION LIMITED WARRANTY**

The body exterior paint shall be warranted against corrosion perforation for a prorated period of ten (10) years starting thirty (30) days after the original invoice date. Full details shall be provided in the complete warranty document.

## **PUMP WARRANTY**

The fire pump shall be warranted by Waterous for a period of seven (7) years from the date of delivery to the fire department or seven and one-half (7-1/2) years from the shipment date by Waterous, whichever period expires first. Full details shall be provided in the complete warranty document.

## **REFLECTIVE STRIPING, 3M DIAMOND GRADE, RED, ALL SHELVES & TRAYS**