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Aerial Certification

Each bidder shall submit evidence of compliance to NFPA 1901 Standard for Aerial Ladder Fire Apparatus, in its latest edition, Sections 18-20 and 18-21, regarding structural and stability requirements. Evidence of a minimum 2.5 to 1 factor of structural safety based on the results of analytical, experimental, and structural analysis shall be provided with the bid. The analysis shall be performed and verified by a third party registered professional engineer. Submission of "in-house" certifications do not meet the requirements of this section. Failure to comply with this requirement will render the bidder's proposal unresponsive and ineligible for contract award.

Certificate of Insurance

Each bidder shall furnish, with their proposal, a Certificate of Product Liability Insurance for a minimum of ten (10) million dollars. Failure to provide this documentation shall render the proposal non-responsive and the bid shall be rejected. This certificate shall be from the prime builder only. Certificates submitted from various sub-contractors in order to total the ten million dollar minimum will not be acceptable as meeting the requirements of this section.

If one of the major portions of the apparatus (i.e. chassis, aerial, or body) is not designed, fabricated, and assembled by the prime builder, a separate Certificate of Liability Insurance for a minimum of ten (10) million dollars must be provided by each additional contractor.

The Certificate must be made out to the City of Aurora and must be original. Submission of a non-original Certificate or a Certificate provided that is not made out to the City of Aurora will not meet the requirements of this section.

Intent of Specifications

It is the intent of these specifications to clearly describe the furnishing and delivery to the City of Aurora, a complete apparatus equipped as specified. The primary objective of these specifications is to obtain the most acceptable apparatus for service in the Fire Department. These specifications cover specific requirements as to the type of construction and tests the apparatus must conform, together with certain details as to finish, material preferences, equipment and appliances with which the successful bidder must conform.

The design of the apparatus must embody the latest approved automotive design practices. The workmanship must be of the highest quality in its respective field. Special consideration shall be given to service access to areas needing periodic maintenance, ease of operation, and symmetrical proportions. Construction must be heavy-duty and ample safety factors must be provided to carry loads as specified. The construction method employed will be in such a manner as to allow ready removal of any component for service or repair.

The apparatus shall conform to the National Fire Protection Association Standard for Automotive Fire Apparatus, number 1901, in its most recent edition, unless otherwise specified in this document. Only the specified firefighting support equipment listed in these specifications shall be provided.

The apparatus shall further conform to all Federal Motor Vehicle Safety Standards. No exception.

Each bidder shall furnish satisfactory evidence of their ability to design, engineer, and construct the apparatus specified and shall state the location of the factory producing the apparatus. They shall also substantiate they are in a position to render prompt and proper service and to furnish replacement parts for the apparatus.

Each bid must be accompanied by a set of detailed contractor's specifications consisting of a detailed description of the apparatus and equipment proposed. All bid proposal specifications must be in the same sequence as the advertised specification for ease of comparison. These specifications shall include size, location, type, and Model of all component parts being furnished. Detailed information shall be provided on the materials used to construct all facets of the apparatus body. Any bidder who fails to submit detailed construction specifications, or who photo copies and submits these specifications as their own construction details will be considered non-responsive and shall render their proposal ineligible for award. No exception.

Bids will be addressed and submitted in accordance with the instructions provided on the cover sheet. The words "Fire Apparatus Proposal", the date, and bid opening time shall be stated on the front of the bid envelope.

It shall be the responsibility of the bidder to assure that their proposal arrives at the location and time indicated. Late proposals, telegrams, facsimile, or telephone bids will not be considered. No exception.

All bidders are required to detail the payment terms for apparatus on the bidder's proposal page. Any required prepayments or progress payments must be explained in detail.

ISO Compliance

The manufacturer shall operate a Quality Management System meeting the requirements of ISO 9001:2000.

The International Organization for Standardization (ISO) is a recognized world leader in establishing and maintaining stringent manufacturing standards and values. The manufacturer's certificate of compliance affirms that these principles form the basis for a quality system that unswervingly controls design, manufacture, installation, and service.

The manufacturer's quality systems shall consist of, but not be limited to, all written quality procedures (aka QOP) and other procedures referenced within the pages of the manufacturer's Quality Manual, as well as all Work Instructions, Workmanship Standards, and Calibration Administration that directly or indirectly impacts products or processes. In addition, all apparatus assembly processes shall be documented for traceability and reference. The manufacturer shall also engage the services of a certified third party for testing purposes where required.

If the manufacturer operates more than one manufacturing facility each facility must be ISO certified.

By virtue of its ISO compliance the manufacturer shall provide an apparatus that is built to exacting standards, meets the customer's expectations, and satisfies the customer's requirements.

A copy of the manufacturer's certificate of ISO compliance for each manufacturing facility shall be provided with the bid.

Performance Bond

The successful bidder shall provide a Performance bond in the amount of the total contract price to the City of Aurora within ten (10) days of contract award. The bond must be underwritten by the bonding company of the apparatus manufacturer. Bonds submitted by the salesperson or agent shall not be accepted. The validity of the bond will be verified by the City of Aurora. The bonding company must be licensed to bond in this state. The performance bond must be submitted by the prime contractor and not a subcontractor. No exception.

Single Source Manufacturing - Aerial

In order to protect the City of Aurora from divided warranty responsibility between chassis, aerial, and body manufacturers, proposals will only be considered from apparatus builders who design, fabricate, and assemble the complete apparatus at their own facilities. This shall include the cab shell, chassis assembly, aerial device, and complete body structure. Private labeling of another manufacturer's chassis, aerial, or body will not meet the requirements of this section.

Overall Height Restriction

The apparatus shall overall height shall not exceed 11' 7".

Overall Length Restriction

The unit has no overall length restrictions.

NFPA Compliance

All supplied components of the apparatus shall be compliant with NFPA 1901, 2016 edition.

Equipment Capacity

Equipment allowance on the apparatus shall be 2500 lbs. This allowance is in addition to the weight of the ground ladders listed in the shop order as applicable.

BUMPER

Front Bumper

The vehicle shall be equipped with a one-piece 10" high bumper made from 10 gauge (0.135" nominal) polished stainless steel for corrosion resistance, strength, and long-lasting appearance. It shall be mounted directly to the front frame extensions for maximum strength.

The bumper shall incorporate two (2) stiffening ribs.

Bumper Extension

The bumper extension shall be approximately 24" from the face of the cab.

Bumper Gravel Shield

The extended front bumper gravel shield shall be made of 3/16" (.375") aluminum tread plate material.

FRAME ASSEMBLY

Frame Rail Construction

The chassis frame shall utilize an integral torque box type design. The integral torque box shall combine the chassis frame and aerial torque box into a single structure. The integral torque box shall provide an optimized design that lowers vehicle center of gravity, eliminates the need to torque aerial frame attachment bolts, and permits underslung outriggers to maximize body compartmentation.

The 18.875" high x 34" wide torque box shall be fabricated of 50,000-psi minimum yield, high strength, low alloy steel. The frame and torque box shall be made of 42.7 lbs. per foot structural channel with .375" thick top plate, .500" thick bottom plate and .500" integral bulkhead supports. Certified welders shall construct the torque box. The design shall utilize 100% welded joints for a totally sealed box. Skip welding shall not be acceptable. Complete Finite Element Analysis and strain gauge testing shall be employed to verify minimum safety factors for road traveling (5:1) and aerial operation (2.5:1).

The completed torque box shall have the following attributes:

Resistance to bending moment 13,470,000 in. lbs.

Section modulus 269.4 cu. in.

The frame section immediately forward of the torque box shall have the following attributes:

Resistance to bending moment 4,907,000 in. lbs.

Section modulus 98.14 cu. in.

The torque box shall incorporate a stainless-steel schedule 40 4" water pipe through the torque box for the aerial waterway inlet if applicable. In addition, the torque box shall have two (2) 3" conduits full length to encapsulate the hydraulic, air and electrical lines.

The entire assembly shall be sand-blasted and painted black before chassis assembly. A full lifetime warranty against defects in materials or workmanship shall be supplied by the apparatus manufacturer.

The custom chassis frame shall have a wheel alignment in order to achieve maximum vehicle road performance and to promote long tire life. The alignment shall conform to the manufacturer`s internal specifications. All wheel lug nuts and axle U-bolt retainer nuts shall be tightened to the proper torque at the time of alignment. The wheel alignment documentation shall be made available at delivery upon request.

Coated Fasteners

The custom chassis frame assembly shall be assembled using GEOMET 720 coated fasteners for corrosion resistance.

AXLE OPTIONS

Front Axle

The vehicle shall utilize an Meritor FL-943 5" drop beam front axle with a rated capacity of 20,000 lbs. It shall have "easy steer" knuckle pin bushings and 68.83" kingpin centers. The axle shall be of I-beam construction and utilize grease-lubricated wheel bearings. The vehicle shall have a nominal cramp angle of 45 degrees, plus two (+ 2) degrees to minus three (- 3) degrees.

The front axle hubs shall be made from ductile iron and shall be designed for use with 10 hole hub-piloted wheels in order to improve wheel centering and extend tire life.

The front springs shall be parabolic tapered, minimum 4" wide x 54" long (flat), minimum three (3) leaf, progressive rate with a capacity of 20,000 lbs. at the ground. The springs shall have Berlin style eyes and rubber bushings on each end with an additional standard wrap at the front eye. Tapered leaf springs provide a 20% ride improvement over standard straight spring systems.

The vehicle shall be equipped with a Sheppard Model M110 integral power steering gear, used in conjunction with a power assist cylinder. The steering assembly shall be rated to statically steer a maximum front axle load of 20,000 lbs. Relief stops shall be provided to reduce system pressure upon full wheel cut. The system shall be able to operate mechanically should the hydraulic system fail.

In order to achieve maximum vehicle road performance and to promote long tire life, there shall be a wheel alignment. The alignment shall conform to the manufacturer`s internal specifications. All

wheel lug nuts and axle U-bolt retainer nuts shall be tightened to the proper torque at the time of alignment. The wheel alignment documentation shall be made available at delivery.

Shock Absorbers Front

Koni Model 90 shock absorbers shall be provided for the front axle. The shocks shall be three way adjustable.

The shocks shall be covered by the manufacturer`s standard warranty.

Front Axle Oil Seals

The front axle shall have Stemco oil seals with sight glass to check the lubricant level of the axle spindles.

Front Axle Spiral Pins

The front suspension springs shall utilize Kaiser spring eyes/shackle pins. The pins shall be of the ”grease grooved” design. Spiral steer spring eye bushings, with integral grease seals, shall be provided.

Rear Axle

The vehicle shall utilize an Meritor RS-30-185 single rear axle with single reduction hypoid gearing and a manufacturer`s rated capacity of 33,000 lbs. The axle shall be equipped with oil-lubricated wheel bearings with Meritor oil seals.

The rear axle hubs shall be made from ductile iron and shall be designed for use with 10 hole hub-piloted wheels to improve wheel centering and extend tire use.

SUSPENSION

~~Rear Suspension~~

~~The rear suspension shall be a Reyco Model 79KB. The suspension shall include linear rate slipper type leaf springs that eliminate spring eyes and shackles. The suspension shall also include auxiliary "helper" leaf springs, one (1) fixed torque arm, one (1) adjustable torque arm and cast spring hangers. The suspension shall be rated for 35,000 lbs.~~

WHEEL OPTIONS

Front Wheels

The vehicle shall have two (2) polished (on outer wheel surfaces only) Alcoa aluminum disc wheels. They shall be forged from one-piece corrosion-resistant aluminum alloy and sized appropriately for the tires.

Front Wheel Trim Package

The front wheels shall have stainless steel lug nut covers. The front axle shall be covered with American made Real Wheels brand mirror finish, 304L grade, non-corrosive stainless-steel universal baby moons. All stainless-steel baby moons shall carry a lifetime warranty plus a 2 year re-buffing policy. There shall be two (2) baby moons and twenty (20) lug nut covers.

Rear Wheels

The vehicle shall have four (4) polished (on outer wheel surfaces only) Alcoa aluminum disc wheels. They shall be forged from one-piece corrosion-resistant aluminum alloy and sized appropriately for the tires.

Rear Wheel Trim Package

The rear wheels shall have stainless steel lug nut covers. The rear axle shall be covered with American made Real Wheels brand mirror finish, 304L grade, non-corrosive stainless steel, spring clip band mount high hats, DOT user friendly. All stainless-steel high hats shall carry a lifetime warranty plus a 2-year re-buffing policy. There shall be two (2) high hats and twenty (20) lug nut covers.

Valve Stem Extensions

Each inside rear wheel on the rear axle shall have valve extensions.

TIRE OPTIONS

Front Tires

The front tires shall be two (2) Michelin 365/70R22.5 tubeless type 18 PR radial tires with XZA highway tread.

The tires with wheels shall have the following weight capacity and speed rating:

21,000 lbs. @ 75 MPH.

The wheels and tires shall conform to the Tire and Rim Association requirements.

Rear Tires

The rear tires shall be Michelin 315R22.5 tubeless type radial tires with XDN2 GRIP all weather tread.

The tires with wheels shall have the following weight capacity:

33,080 lbs. (dual) @ 75 MPH. (Intermittent fire service max load 35,396 lbs)

The wheels and tires shall conform to the Tire and Rim Association requirements.

Tire Pressure Indicators

The apparatus shall be provided with Real Wheels AirGuard LED tire pressure indicating valve stem caps. When the tire is under inflated by 5-10 PSI, the LED indicator on the cap shall flash red. The indicator housings shall be shock resistant and constructed from polished stainless steel. The indicators shall be calibrated by attaching to valve stem of a tire at proper air pressure per load ratings and easily re-calibrated by simply removing and re-installing them during service.

BRAKE SYSTEMS

Front Brakes

The front axle shall be equipped with Meritor DiscPlus EX225H 17-inch disc brakes.

The brakes shall be covered by the manufacturer`s standard warranty which is two years, unlimited mileage and parts only.

Brake System

The vehicle shall be equipped with air-operated brakes and an anti-lock braking system (ABS). The brake system shall meet or exceed the design and performance requirements of the current Federal Motor Vehicle Safety Standard (FMVSS)-121, and the test requirements of the current NFPA 1901 Standard.

A dual-treadle brake valve shall correctly proportion the braking power between the front and rear systems. The air system shall be provided with a rapid pressure build-up feature, designed to meet current NFPA 1901 requirements, to allow the vehicle to begin its emergency response as quickly as possible.

A pressure-protection valve shall be installed to prevent use of the air horns or other air-operated devices should the air system pressure drop below 85 psi. This feature is designed to prevent inadvertent actuation of the emergency/parking brakes while the vehicle is in motion.

Two (2) air pressure needle gauges, one (1) each for front and rear air pressure, with a warning light and buzzer shall be installed at the driver`s instrument panel.

The braking system shall be provided with a minimum of three (3) air tank reservoirs for a total air system capacity of 5,214 cu. in. One (1) reservoir shall serve as the wet tank and a minimum of one (1) tank shall be supplied for each of the front and rear axles. The total system shall carry a sufficient volume of air to comply with FMVSS-121.

Tank Capacities in Cubic Inches:

Wet	Front	Rear	Total
1,738	1,738	1,738	5,214

Spring-actuated emergency/parking brakes shall be installed on the rear axle.

A Bendix-Westinghouse SR-1 valve, in conjunction with a double check valve system, shall provide automatic emergency brake application when the air brake system pressure falls below 40 psi in order to safely bring the vehicle to a stop in case of an accidental loss of braking system air pressure.

A four-channel Wabco ABS shall be provided to improve vehicle stability and control by reducing wheel lock-up during braking. This braking system shall be fitted to both front and rear axles. All electrical connections shall be environmentally-sealed for protection against water, weather, and vibration.

The system shall constantly monitor wheel behavior during braking. Sensors on each wheel transmit wheel speed data to an electronic processor, which shall detect approaching wheel lock-up and instantly modulate (or pump) the brake pressure up to five (5) times per second to prevent wheel lock-up. Each wheel shall be individually controlled. To improve field performance, the system shall be equipped with a dual-circuit design configured in a diagonal pattern. Should a malfunction occur in one circuit, that circuit shall revert to normal braking action. A warning light at the driver`s instrument panel shall signal a malfunction.

The system shall also be configured to work in conjunction with all auxiliary engine, exhaust, or driveline brakes to prevent wheel lock-up.

To improve maintenance troubleshooting, provisions in the system for an optional diagnostic tester shall be provided. The system shall test itself each time the vehicle is started, and a dash-mounted light shall go out once the vehicle is moving above 4 MPH.

A 3 year/300,000-mile parts and labor Anti-Locking Braking System (ABS) warranty shall be provided as standard by Meritor Automotive.

Park Brake Release

One (1) Bendix-Westinghouse PP-5 parking brake control valve shall be supplied on the lower dash panel within easy reach of the driver.

Electronic Stability Control

The apparatus shall be equipped with a G4 4S4M Electronic Stability Control (ESC) system that combines the functions of Roll Stability Control (RSC) with the added capability of yaw - or rotational – sensing.

RSC focuses on the vehicle's center of gravity and the lateral acceleration limit or rollover threshold. When critical lateral acceleration thresholds are exceeded, RSC intervenes to regulate the vehicle's deceleration functions. The added feature of ESC is to automatically intervene to reduce the risk of the vehicle rotating while in a curve or taking evasive action, prevents drift out through selective braking, and controlling and reducing vehicle speed when lateral acceleration limits are about to be exceeded.

Intervention by the system occurs in three forms - engine, retarder and brake control. The ESC system uses several sensors to monitor the vehicle. These include a steering wheel angle sensor, lateral accelerometer, and yaw position sensor. ESC constantly monitors driving conditions and intervenes if critical lateral acceleration is detected or if the vehicle begins to spin due to low friction surfaces. The system provides control of engine and retarder torque as well as automatically controlling individual wheels to counteract both over steer and under steer.

To further improve vehicle drive characteristics, the unit shall be fitted with Automatic Traction Control (ATC). This system shall control drive wheel slip during acceleration from a resting point. An extra solenoid valve shall be added to the ABS system. The system shall control the engine and brakes to improve acceleration slip resistance. The system shall have a dash mounted light that shall come on when ATC is controlling drive wheel slip.

A 3 year/300,000 miles parts and labor warranties for ESC, RSC, and ATC shall be provided as standard by Meritor Automotive.

Brake System Fittings

All air brake system hoses on the chassis shall be connected by use of compression fittings.

Rear Brakes

The rear axle shall be equipped with ArvinMeritor 16.5" x 8.625" P-Cast S-cam brakes with cast brake shoes. The brakes shall be furnished with Haldex automatic slack adjusters.

A 3 year/unlimited miles parts and 3-year labor rear brake warranty shall be provided as standard by ArvinMeritor Automotive. The warranty shall include bushings, seals, and cams.

AIR SYSTEM OPTIONS

Air Dryer

The chassis air system shall be equipped with a Bendix-Westinghouse AD-9 air dryer to remove moisture from the air in order to help prevent the air lines from freezing in cold weather and prolong the life of the braking system components.

Air Inlet

A 1/4" brass quick-release air inlet with a male connection shall be provided. The inlet shall allow a shoreline air hose to be connected to the vehicle, discharging air directly into the wet tank of the air brake system. It shall be located driver door jamb.

Isolated Air Reservoir

The air system shall have an additional 1738 cu. in. isolated reservoir. The supply side of the reservoir shall be equipped with a check valve and an 85-psi pressure protection valve.

Auxiliary Air Tank Plumbing

The auxiliary air tank to be plumbed to the chassis air horns only.

Heated Moisture Ejectors

All air reservoirs shall be equipped with a Bendix DV-2 automatic reservoir drain valve which shall automatically eject moisture and contaminants from the reservoirs. The moisture ejectors shall be heated.

Air Lines

Air brake lines shall be constructed of color-coded nylon tubing routed in a manner to protect them from damage. Brass fittings shall be provided.

Air Horns

Dual Grover air horns shall be provided, connected to the chassis air system. The horns shall be mounted through the front bumper. The front bumper shall have two (2) holes punched to accommodate the horns. A pressure protection valve shall be installed to prevent the air brake system from being depleted of air pressure.

Stainless Steel Mounting Straps

Stainless steel mounting straps shall be provided for all of the chassis air tanks.

ENGINE & TRANSMISSION

Vehicle Speed

Electronic speed limiting set at 60 MPH as required by NFPA 1901.

Engine/Transmission Package

Engine

The vehicle shall utilize a Cummins X12 engine as described below:

- 500 Horsepower
- Six (6) cylinder
- Variable Geometry Turbocharged
- Charge Air Cooled (CAC) 4-cycle diesel
- Cummins XPI high pressure fuel injection system
- Fuel cooler (air to liquid)
- 720 cu.in. (11.8 liter) displacement
- 500 gross BHP at 1800 RPM and a peak torque of 1695 lb.ft. at 1000 RPM with a governed RPM of 2000
- Bore and stroke shall be 5.2 x 5.67
- Engine lubrication system shall have a minimum capacity, to include filter, of 49 quarts
- Cooled Exhaust Gas Recirculation (EGR)
- Delco-Remy 39 MD-HD 12-volt starter
- 26 cubic foot per minute air compressor
- Single module after treatment system consisting of a oxidation catalyst and diesel particulate filter and selective catalyst reduction system
- Ember separator compliant with current NFPA 1901 standard
- The engine shall be compliant with 2018 EPA Emission standards

The engine air intake shall draw air through the front cab grill. The intake opening shall be located on the officer (right) side behind front cab face with a plenum that directs air to the air filter. The air cleaner intake piping shall be made from aluminized steel tubing with flexible rubber hoses. The intake piping clamps shall be heavy-duty, constant-torque, T-bolt style to ensure proper sealing under all temperatures in order to keep dust and other contaminants out of the engine intake air stream and protect the engine.

The air cleaner shall be an 11" diameter K&N for lower restriction and high air flow. The filtration media shall be washable and easily accessed for service. The air filter shall have a 3 year / 300,000-mile warranty.

The engine exhaust piping shall be a minimum of 4" diameter welded aluminized steel tubing. The muffler shall be mounted horizontally under the right-hand frame rail in back of the cab in order to minimize heat transmission to the cab and its occupants. The exhaust shall be directed away from the vehicle on the right side ahead of the rear wheels in order to keep exhaust fumes as far away as possible from the cab and pump operator position.

A 5-year/100,000 miles parts and labor warranty will be provided as standard by Cummins.

A copy of the Engine Installation Review stating the engine installation meets Cummins recommendations shall be provided as requested. The engine installation shall not require the operation of any type of "power-down" feature to meet engine installation tests.

Transmission

The vehicle shall utilize an Allison EVS4000P, electronic, 5-speed automatic transmission.

A transmission oil temperature gauge with warning light and buzzer shall be installed on the cab instrument panel to warn the driver of high oil temperatures that may damage the transmission.

The transmission shall have a gross input torque rating of up to 1850 lb. ft. and a gross input power rating of up to 600 HP.

The gear ratios shall be as follows:

1 - 3.51

2 - 1.91

3 - 1.43

4 - 1.00

5 - .74

R - 4.80

The transmission shall be equipped with a fluid level sensor (FLS) system, providing direct feedback of transmission oil level information to the operator.

The transmission shall have a lubricant capacity of 51 quarts.

A water-to-oil transmission oil cooler shall be provided to ensure proper cooling of the transmission when the vehicle is stationary (no air flow).

The transmission shall contain two engine driven PTO openings located at the 1 and 8 o`clock positions. The automatic transmission shall be equipped with a power lock-up device. The transmission lock-up shall prevent down shifting of transmission when engine speed is decreased during pump operations, thereby maintaining a constant gear ratio. Transmission lock-up shall be automatically activated when placing pump in gear. Transmission lock-up shall be automatically deactivated when disengaging pump for normal road operation.

A 5-year/unlimited miles parts and labor warranty shall be provided as standard by Allison Transmission.

Automatic Shift to Neutral

The transmission shall be programmed to comply with NFPA 1901 and automatically shift to neutral upon application of the parking brake.

Transmission Selector

A push-button transmission shift module, Allison Model 29538373, shall be located to the right side of the steering column within easy reach of the driver. The shift position indicator shall be indirectly lit for after dark operation. The shift module shall have a "Do Not Shift" light and a "Service" indicator light. The shift module shall have means to enter a diagnostic mode and display diagnostic data including oil life monitor, filter life monitor, transmission health monitor and fluid level. A transmission temperature gauge with warning light and buzzer shall be installed on the cab instrument panel.

Transmission Fluid

The transmission fluid shall be TranSynd, Shell Spirax S6ATF A295, or equivalent synthetic.

SECONDARY BRAKING

Transmission Retarder

The transmission shall have an integral output retarder using a hydrodynamic braking system. The retarder shall be activated by a 3-stage pressure apply system used in conjunction with the foundation brake using 4, 7, and 10 psi air pressure switches. A retarder enable switch to activate retarder system, a light to indicate retarder activation, and a retarder overheat indicator light shall be mounted in the cab.

Retarder Programming

The Allison transmission retarder shall be programmed at one third (1/3) activation when the accelerator is released (coasting), one third (1/3) when the brake pedal is depressed at four (4) psi and one third (1/3) when brake pedal is depressed at a full ten (10) psi.

EXHAUST OPTIONS

Exhaust Routing

The vertical exhaust shall be re-routed to below the body. Heat tape shall be provided as necessary to the exhaust piping.

Exhaust Outlet

The exhaust outlet shall be vertically oriented on the right side of the apparatus rearward of the cab.

Exhaust End Modification

The end of the exhaust tail pipe shall be modified to accommodate a Nederman in-house exhaust extraction system. The tail pipe will be at 90 degrees and straight out below side of body.

COOLING PACKAGE

Engine Cooling Package

Radiator

The cooling system shall include an aluminum tube-and-fin radiator with a minimum of 1,408 total square inches of frontal area to ensure adequate cooling under all operating conditions. There shall be a drain valve in the bottom tank to allow the radiator to be serviced. A sight glass shall be included for quick fluid level assessment. The radiator shall be installed at the prescribed angle in order to achieve the maximum operational effectiveness. This shall be accomplished according to established work instructions and properly calibrated angle measurement equipment.

Silicone Hoses

All radiator and heater hoses shall be silicone. Pressure compensating band clamps shall be used to eliminate hose pinching on all hoses 3/4" diameter and larger. All radiator hoses shall be routed, loomed, and secured so as to provide maximum protection from chafing, crushing, or contact with other moving parts.

Coolant

The cooling system shall be filled with a 50/50 mixture of water and antifreeze/coolant conditioner to provide freezing protection to minus 40 (- 40) degrees F for operation in severe winter temperatures.

Coolant Recovery

There shall be a coolant overflow recovery system provided.

Charge Air Cooler System

The system shall include a charge air cooler to ensure adequate cooling of the turbocharged air for proper engine operation and maximum performance.

Charge Air Cooler Hoses

Charge air cooler hoses shall be made from high-temperature, wire-reinforced silicone to withstand the extremely high temperatures and pressures of the turbocharged air. The hoses shall incorporate a flexible hump section to allow motion and misalignment of the engine relative to the charge air cooler. Charge air cooler hose clamps shall be heavy-duty, constant-torque, T-bolt clamps to ensure proper sealing under all temperatures in order to keep dust and other contaminants out of the engine intake air stream and protect the engine.

Fan/Shroud

The fan shall be 30" in diameter with eleven (11) blades for maximum airflow and dynamic balance. It shall be made of nylon for strength and corrosion resistance. The fan shall be installed with grade 8 hardware which has been treated with thread locker for additional security. A fan shroud attached to the radiator shall be provided to prevent recirculation of engine compartment air around the fan in order to maximize the cooling airflow through the radiator. The fan shroud shall be constructed of fiber-reinforced high temperature plastic. The shroud shall be specifically formed with curved surfaces which improves air flow and cooling.

Transmission Cooler

The cooling system shall include a liquid-to-liquid transmission cooler capable of cooling the heat generated from the transmission. When a transmission retarder is selected, the cooler shall have an increased capacity to handle the additional heat load.

FUEL SYSTEM

Fuel Re-Prime

An auxiliary 12-volt fuel pump shall be included in the fuel system. The electric pump shall permit re-priming of the fuel lines and engine. The pump may be manually operated with a switch located accessible to driver. The electric pump shall also automatically operate in conjunction with the mechanical fuel pump as long as engine oil pressure is present. The system shall be plumbed to allow full flow to by-pass the pump.

Fuel Shut-Off Valve

A shut-off valve shall be supplied to prevent drain back of fuel into the main supply line during filter changes. The valve shall be located: one (1) inlet side of OEM fuel filter.

Fuel Line

All fuel lines shall be rubber.

Fuel Tanks

Dual 30-gallon side-mounted fuel tanks shall be provided. Each tank shall be of an all-welded stainless-steel construction with anti-surge baffles and shall conform to all applicable Federal Highway Administration (FHWA) 393.65 and 393.67 standards. The tanks shall be mounted behind the rear axle. Each tank shall be secured by a wrap-around T-bolt type stainless steel strap. Each strap shall be fitted with protective rubber insulation and shall be secured with grade 8 hardware. This design allows for tank removal from below the chassis.

Each tank shall be equipped with a 2" filler neck, two (2) additional 80% draw pick-up/return connections, a vent with overturn leak protection, and a .50" NPT magnetic drain plug. The full 60-gallon capacity can be filled from either side of the vehicle. Fuel shall be drawn from one tank and returned to the other. The tanks shall be connected with a 1.0" crossover line for equalization.

A mechanical fuel pump sized to meet the engine requirements shall be provided.

ALTERNATOR

420 Amp Alternator

There shall be a 420-amp Leece Neville alternator installed as specified. The alternator shall be a Leece Neville brushless type with integral rectifier and adjustable voltage regulator with an output of 369 amps per NFPA 1901 rating (420 amps per SAE J56).

BATTERIES

Battery System

The manufacturer shall supply five (5) heavy duty Group 31 12-volt maintenance-free batteries. Each battery shall be installed and positioned so as to allow easy replacement of any single battery. Each battery shall be equipped with carrying handles to facilitate ease of removal and replacement. There shall be two (2) steel frame-mounted battery boxes, one (1) on the left frame rail and one (1) on the right frame rail. Each battery box shall be secured to the frame rail with Grade 8 hardware. The boxes shall hold two (2) batteries on the left side and three (3) on the right side. The batteries shall have a minimum combined rating of 5,000 (5 x 1000) cold cranking amps (CCA) @ 0 degrees Fahrenheit and 1025 (5 x 205) minutes of reserve capacity for extended operation. The batteries shall have 3/8-16 threaded stud terminals to ensure tight cable connections. The battery stud

terminals shall each be treated with concentrated industrial soft-seal after cable installation to promote corrosion prevention. The positive and negative battery stud terminals and the respective cables shall be clearly marked to ensure quick and mistake-proof identification.

~~Batteries shall be placed on non-corrosive rubber matting and secured with hold-down brackets to prevent movement, vibration, and road shock. The hold-down bracket J-hooks shall be cut to fit and shall have all sharp edges removed. The batteries shall be placed in plastic trays to provide preliminary containment should there be leakage of hazardous battery fluids. There shall be two (2) plastic trays, one (1) for each set of batteries. Each battery tray shall be equipped with a rubber hose to facilitate drainage. The rubber hose shall be routed to drain beneath the battery box. The batteries shall be positioned in well-ventilated areas.~~

One (1) positive and one (1) negative jumper stud shall be provided.

Batteries shall have a warranty of twelve (12) months that shall commence upon the date of delivery of the apparatus.

CHASSIS OPTIONS

Emergency Shut-Down

A swing gate cut-off valve shall be mounted between the charge air cooler outlet and engine intake manifold. The valve shall be electrically activated from a guarded switch within the cab. Fuel and air supply shall be cutoff after switch has been activated. An electronic reset shall be provided.

Engine Fan Clutch

The engine shall be equipped with a thermostatically controlled engine cooling fan. The fan shall be belt driven and utilize a clutch to engage when the engine reaches a specified temperature and / or the water pump is engaged (if equipped).

When disengaged, the fan clutch shall allow for improved performance from optional floor heaters, reduced cab interior noise, increased acceleration and improved fuel economy.

The fan shall be equipped with a fail-safe engagement so that if the clutch fails the fan shall engage to prevent engine overheating.

Drivelines

Drivelines shall have a heavy-duty metal tube and shall be equipped with Spicer 1810 series universal joints to allow full-transmitted torque to the axle. Drive shafts shall be axially straight, concentric with axis and dynamically balanced.

Front Tow Eyes

Two (2) 3/4" thick heavy-duty steel tow eyes shall be securely attached to the chassis frame rails at the front of the apparatus. They shall be mounted down below the front bumper.

Rear Tow Eyes

Two (2) heavy duty tow eyes made of 3/4" (0.75") thick steel having 2.5" diameter holes shall be bolted directly to the rear of the frame to allow towing (not lifting) of the apparatus. The tow eyes shall be protruding into the rear compartment or out the rear of the body. The tow eyes shall be painted chassis black.

Three (3) Underbody Receivers

An underbody three (3) way receiver assembly with three (3) winch connections shall be provided.

There shall be three (3) receivers provided below the rear of the body; one (1) rear facing winch/Class III hitch receiver and two (2) side facing winch receivers. The receivers shall be of an integral construction to the underbody support assembly.

The rearward facing Class III hitch/winch receiver shall include two (2) tow eye connections and an electrical connection for a portable winch application. The two (2) side facing winch receivers shall be located one (1) each side below the rearward most body compartment. Each side facing hitch receiver shall include an electrical connection for a portable winch application.

Rear receiver shall be rated as a Class III trailer hitch or a 9,000 lb. straight line pull winch receiver.

Each side facing portable winch connection shall be rated for a maximum of 9,000 lb. straight line pull.

Front Bumper Receiver

An under front bumper winch receiver shall be provided. The receiver shall be constructed of steel tubing and attached to the chassis framing. An electrical connection shall be provided for use with a portable winch.

The portable winch connection shall be rated for a 9,000 pound line pull.

Trailer Hitch Pre-Wire Harness

There shall be a pre-wire assembly provided for the trailer hitch. Includes stop, left turn, right turn, marker and ground wires. Does not include connector.

Trailer Wiring Connector

The trailer wiring shall be terminated with a 7-pin connector. The connector shall be wired to the stop/turn/tail circuits only.

Hydraulic Pump System

A fixed-displacement hydraulic pump system shall be provided to operate all outrigger and aerial functions as well as the chassis power steering system. This shared hydraulic system is desired because it heats the hydraulic fluid while driving to provide smoother operation to other systems in cold climate conditions, rather than utilizing a separate pump.

The hydraulic pump system shall allow the aerial system to be activated without having to shut down the water pump or reduce engine RPM`s by a switch located on the cab within easy reach of the driver. A system "engaged" indicator light shall be provided on the activation switch. Engagement of the aerial circuit shall only be allowed with the transmission in the neutral or pump gear and the parking brake engaged.

The system's hydraulic pump shall be engine mounted and able to supply thirteen (13) gpm of hydraulic fluid at a maximum pressure of 3,000 psi. The hydraulic system shall normally operate between 1,000 and 2,500 psi. It shall have flow controls to protect hydraulic components and it shall incorporate a relief valve set at 2,800 psi to prevent over-pressurization (2950 on HP78 Models).

DEF Tank

A diesel exhaust fluid (DEF) tank with a five (5) gallon capacity shall be provided.

The DEF tank shall include a heater fed by hot water directly from the engine block to prevent the DEF from becoming too cool to operate correctly per EPA requirements. The tank shall include a temperature sensor to control the heater control valve that controls the feed of hot water from the engine to the DEF tank heater.

A sender shall be provided in the DEF tank connected to a level gauge on the cab dash.

The tank shall be located left side below rear of cab.

CAB MODEL

Typhoon Cab

The vehicle shall be distinguished by an all-welded aluminum and fully enclosed tilt cab. The cab shall be designed exclusively for fire/rescue service and shall be pre-engineered to ensure long life. It shall incorporate an integral welded substructure of high-strength aluminum alloy extrusions that creates an occupant compartment that is essentially a protective perimeter. The end result is a distinctive structure that is aesthetically appealing, functionally durable, and characterized by increased personnel safety.

The cab shall be constructed from 3/16" (0.188") 3003 H14 aluminum alloy plate roof, floor, and outer skins welded to a high-strength 6063-T6 aluminum alloy extruded subframe. Wall supports and roof bows are 6061 T6 aluminum alloy. This combination of a high-strength, welded aluminum inner structure surrounded on all sides by load-bearing, welded aluminum outer skins provides a cab that is strong, lightweight, corrosion-resistant, and durable.

The inner structure shall be designed to create an interlocking internal "roll-cage" effect by welding two (2) 3" x 3" x 0.188" wall-thickness 6063-T5 aluminum upright extrusions between the 3" x 3" x 0.375" wall-thickness 6061-T6 roof crossbeam and the 2.25" x 3" x 0.435" wall-thickness 6063-T6 subframe structure in the front. An additional two (2) aluminum upright extrusions within the back-of-cab structure shall be welded between the rear roof perimeter extrusion and the subframe structure in the rear to complete the interlocking framework. The four (4) upright extrusions -- two (2) in the front and two (2) in the rear -- shall be designed to effectively transmit roof loads downward into the subframe structure to help protect the occupant compartment from crushing in a serious accident. All joints shall be electrically seam welded internally using aluminum alloy welding wire.

The subframe structure shall be constructed from high-strength 6061-T6 aluminum extrusions welded together to provide a structural base for the cab. It shall include a side-to-side 3" x 1.5" .375 thick C-channel extrusion across the front, with 3/4" x 2-3/4" (.75" x 2.75") full-width crossmember tubes spaced at critical points between the front and rear of the cab.

The cab floor shall be constructed from 3/16" (0.188") 3003 H14 smooth aluminum plate welded to the subframe structure to give the cab additional strength and to help protect the occupants from penetration by road debris and under-ride collision impacts.

The cab roof shall be constructed from 3/16" (0.188") 3003 H14 aluminum treadplate supported by a grid of fore-aft and side-to-side aluminum extrusions to help protect the occupants from penetration by falling debris and downward-projecting objects. Molded fiberglass or other molded fiber-reinforced plastic roof materials are not acceptable.

The cab roof perimeter shall be constructed from 4" x 6-5/8" (4" x 6.625") 6063-T5 aluminum extrusions with integral drip rails. Cast aluminum corner joints shall be welded to the aluminum roof perimeter extrusions to ensure structural integrity. The roof perimeter shall be continuously welded to the cab roof plate to ensure a leak-free roof structure.

The cab rear skin shall be constructed from 3/16" (0.188") 3003 H14 aluminum plate. Structural extrusions shall be used to reinforce the rear wall.

The left-hand and right-hand cab side skins shall be constructed from 3/16" (0.188") 3003 H14 smooth aluminum plate. The skins shall be welded to structural aluminum extrusions at the top, bottom, and sides for additional reinforcement.

The cab front skins shall be constructed from 3/16" (0.188") 3003 H14 smooth aluminum plate. The upper portion shall form the windshield mask, and the lower portion shall form the cab front. Each front corner shall have a full 9" outer radius for strength and appearance. The left-hand and

right-hand sides of the windshield mask shall be welded to the left-hand and right-hand front door frames, and the upper edge of the windshield mask shall be welded to the cab roof perimeter extrusion for reinforcement. The cab front shall be welded to the subframe C-channel extrusion below the line of the headlights to provide protection against frontal impact.

Cab Exterior

The exterior of the cab shall be 94" wide x 130" long to allow sufficient room in the occupant compartment for up to eight (8) fire fighters. The cab roof shall be approximately 101" above the ground with the flat roof option. The back-of-cab to front axle length shall be a minimum of 58".

Front axle fenderette trim shall be brushed aluminum for appearance and corrosion resistance. Bolt-in front wheel well liners shall be constructed of 3/16" (0.188") composite material to provide a maintenance-free, damage-resistant surface that helps protect the underside of the cab structure and components from stones and road debris.

A large stainless-steel cooling air intake grille with an open area of no less than 81% shall be at the front of the cab.

The cab windshield shall be of a two-piece replaceable design for lowered cost of repair. The windshield shall be made from 1/4" (0.25") thick curved, laminated safety glass with a 75% light transmittance automotive tint. A combined minimum viewing area of 2,550-sq. in. shall be provided. Forward visibility to the ground for the average (50th percentile) male sitting in the driver`s seat shall be no more than 11 feet 7 inches from the front of the cab to ensure good visibility in congested areas.

Windshield Wipers

Two (2) opposed radial style windshield wipers with two (2) separate electric motors shall be provided for positive operation. The wipers shall be tested beyond the minimum SAE requirement to a total of 3.3 million cycles. The wipers shall be a wet-arm type with a one (1) gallon washer fluid reservoir, an intermittent-wipe function, and an integral wash circuit.

Wiper arm length shall be approximately 20", and the blade length approximately 22". Each arm shall have a 90 degree sweep for full coverage of the windshield. The wipers shall be synchronized so as to wipe each windshield simultaneously.

Cab Mounts and Cab Tilt System

The cab shall be independently mounted from the body and chassis to isolate the cab structure from stresses caused by chassis twisting and body movements. Mounting points shall consist of two (2) forward-pivoting points, one (1) on each side; two (2) intermediate rubber load-bearing cushions located midway along the length of the cab, one on each side; and two (2) combination rubber shock mounts and cab latches located at the rear of the cab, one (1) on each side.

An electric-over-hydraulic cab tilt system shall be provided to provide easy access to the engine. It shall consist of two (2) large-diameter, telescoping, hydraulic lift cylinders, one (1) on each side of the cab, with a frame-mounted electric-over-hydraulic pump for cylinder actuation.

Safety flow fuses (velocity fuses) shall be provided in the hydraulic lift cylinders to prevent the raised cab from suddenly dropping in case of a burst hydraulic hose or other hydraulic failure. The safety flow fuses shall operate when the cab is in any position, not just the fully raised position.

The hydraulic pump shall have a manual override system as a backup in the event of an electrical failure. Lift controls shall be located in a compartment to the rear of the cab on the right side of the apparatus. A parking brake interlock shall be provided as a safety feature to prevent the cab from being tilted unless the parking break is set.

The entire cab shall be tilted through a 42-45 degree arc to allow for easy maintenance of the engine, transmission and engine components. A positive-engagement safety latch shall be provided to lock the cab in the full tilt position to provide additional safety for personnel working under the raised cab.

In the lowered position, the cab shall be locked down by two (2) automatic, spring-loaded cab latches at the rear of the cab. A "cab ajar" indicator light shall be provided on the instrument panel to warn the driver when the cab is not completely locked into the lowered position.

Cab Interior

The interior of the cab shall be of the open design with an ergonomically-designed driver area that provides ready access to all controls as well as a clear view of critical instrumentation.

The engine cover between the driver and the officer shall be a low-rise contoured design to provide sufficient seating and elbow room for the driver and the officer. The engine cover shall blend in smoothly with the interior dash and flooring of the cab. An all-aluminum subframe shall be provided for the engine cover for strength. The overall height of the engine enclosure shall not exceed 23" from the floor at each side and 27" in the center section. The engine cover shall not exceed 41" in width at its widest point.

The rear portion of the engine cover shall be provided with a lift-up section to provide easy access for checking transmission fluid, power steering fluid, and engine oil without raising the cab. The engine cover insulation shall consist of 3/4" dual density fiberglass composite panels with foil backing manufactured to specifically fit the engine cover without modification to eliminate "sagging" as found with foam insulation. The insulation shall meet or exceed DOT standard MVSS 302-1 and V-0 (UI subject 94 Test).

All cab floors shall be covered with a black rubber floor mat that provides an aggressive slip-resistant surface in accordance with current NFPA 1901.

The rear engine cover area shall be covered with molded 18 lb/cu. ft. (+/-0.5) flexible integral skinned polyurethane foam at a Durometer of 60 (+/- 5.0) per ASTM F1957-99. The cover shall be approximately .5" thick with a minimum skin thickness of 0.0625 inches. The cover shall be provided to reduce the transmission of noise and heat from the engine. The cover shall be black with a pebble grain finish for slip resistance.

A minimum of 57.25" of floor-to-ceiling height shall be provided in the front seating area of the cab and a minimum of 55.25" floor-to-ceiling height shall be provided in the rear seating area. A minimum of 36" of seated headroom at the "H" point shall be provided over each fenderwell.

The interior side to side dimensions shall be 87" from wall padding to wall padding and 89.5" from door to door.

The floor area in front of the front seat pedestals shall be no less than 24" side to side by up to 25" front to rear for the driver and no less than 24" side to side by up to 27" front to rear for the officer to provide adequate legroom.

Battery jumper studs shall be provided to allow jump-starting of the apparatus without having to tilt the cab.

All exposed interior metal surfaces shall be pretreated using a corrosion prevention system.

The interior of the cab shall be insulated to ensure the sound (dbA) level for the cab interior is within the limits stated in the current edition of NFPA 1901. The insulation shall consist of 2 oz. wadding and 1/4" (0.25") foam padding. The padding board shall be backed with 1/4" (0.25") thick reflective insulation. The backing shall be spun-woven polyester. Interior cab padding shall consist of a rear cab headliner, a rear wall panel, and side panels between the front and rear cab doors.

The vehicle shall use a seven-position tilt and telescopic steering column to accommodate various size operators. An 18" padded steering wheel with a center horn button shall be provided.

Storage areas, with hinged access doors, shall be provided below the driver and officer seats. The driver side compartment shall be approximately 20" deep x 12" wide x 3.5" high and the officer side compartment shall be approximately 14" deep x 12" wide x 11" high (height will be reduced with air or electric seat).

The front cab steps shall be a minimum of 8" deep x 24" wide. The first step shall be no more than 24.0" above the ground with standard tires in the unloaded condition per NFPA 1901 standards. The rear cab steps shall be a minimum 12" deep x 21" wide. The first step shall be no more than 24.0" above the ground with standard tires in the unloaded condition per NFPA 1901 standards. The front and rear steps shall incorporate full width intermediate steps for easy access to the cab. The step surfaces shall be aluminum diamond plate with a multi-directional, aggressive gripping surface incorporated into the aluminum diamond plate in accordance with current NFPA 1901.

A black grip handle shall be provided on the interior of each front door below the door window to ensure proper hand holds while entering and exiting the cab. An additional black grip handle shall be provided on the left and right side windshield post for additional handholds.

Cab Doors

Four (4) side-opening cab doors shall be provided. Doors shall be constructed of a 3/16" (0.188") aluminum plate outer material with an aluminum extruded inner framework to provide a structure that is as strong as the side skins.

Front cab door openings shall be approximately 36" wide x 72.5" high, and the rear cab door openings shall be approximately 33.75" wide x 72.5" high. The front doors shall open approximately 75 degrees, and the rear doors shall open approximately 80 degrees.

The doors shall be securely fastened to the doorframes with full-length, stainless steel piano hinges, with 3/8" (0.375") diameter pins for proper door alignment, long life, and corrosion resistance. Mounting hardware shall be treated with corrosion-resistant material prior to installation. For effective sealing, an extruded rubber gasket shall be provided around the entire perimeter of all doors.

The front door windows shall provide a minimum viewing area of 518 sq. in. each. The rear door windows shall provide a minimum viewing area of 554 sq. in. each. All windows shall have 75% light transmittance automotive safety tint.

The door handles on the exterior of the cab shall be a pull type with vertical orientation. The handles shall be made with corrosion free material and have a black finish. Each exterior door handle shall have an integral keyed lock.

Recessed paddle-style door latches shall be provided on the interiors of the doors. The latches shall be designed and installed to protect against accidental or inadvertent opening as required by NFPA 1901. The rear cab door handles shall have a vertical orientation making them easily accessible from forward or rearward outboard seating positions. Each cab door shall have a manually operated door lock actuated from the interior of each respective door.

Cab Instruments and Controls

Cab controls shall be located on the cab instrument panel in the dashboard on the driver`s side where they are clearly visible and easily reachable. Chassis operation switches shall be installed in removable panels for ease of service. The following gauges and/or controls shall be provided:

- Speedometer/Odometer
- Tachometer
- Engine hour meter
- Engine oil pressure gauge with warning light and buzzer
- Engine water temperature gauge with warning light and buzzer

- Transmission oil temperature gauge
- Two (2) air pressure gauges with a warning light and buzzer (front air and rear air)
- Fuel gauge with low fuel indicator light
- Voltmeter
- Master battery/ignition switch (rocker with integral guard)
- Engine start switch (rocker)
- Heater and defroster controls with illumination
- Marker light/headlight control switch (rocker)
- Panel light dimmer switch (rocker)
- Self-canceling turn signal control with indicators
- Windshield wiper switch with variable speed and washer controls
- Pump shift control with green "pump in gear" and "o.k. to pump" indicator lights
- Parking brake controls with red indicator light on dash
- Automatic transmission shift console
- Electric horn button at center of steering wheel
- Master warning light switch
- Cab ajar warning indicator
- Air filter restriction indicator

Controls and switches shall be identified as to their function by backlit wording adjacent to each switch, or indirect panel lighting adjacent to the controls.

Electrical System

The cab and chassis system shall have designated electrical distribution areas. All electrical components shall be located such that standard operations shall not interfere with or disrupt vehicle operation. An access cover shall be provided for maintenance access to the electrical distribution area. Circuit protection shall be provided by fuses, thermal reset breakers and / or solid state controls.

A 6 place, constantly hot, and 6 place ignition switched fuse panel and ground for customer-installed radios and chargers shall be provided at the electrical distribution area. Radio suppression shall be sufficient to allow radio equipment operation without interference.

All wiring shall be mounted in the chassis frame and protected from impact, abrasion, water, ice, and heat sources. The wiring shall be color-coded and functionally-labeled every 3" on the outer surface of the insulation for ease of identification and maintenance. The wiring harness shall conform to SAE 1127 with GXL temperature properties. Any wiring connections exposed to the outside environment shall be weather-resistant. All harnesses shall be covered in a loom that is rated at 280 degrees F to protect the wiring against heat and abrasion.

Daytime Running Lights

Two (2) dual rectangular chrome plated headlight bezels shall be installed on the front of the cab. The low beam headlights shall activate with the release of the parking brake to provide daytime

running lights (DRL) for additional vehicle conspicuity and safety. The headlight switch shall automatically override the DRL for normal low beam/high beam operation.

Fast Idle System

A fast-idle system shall be provided and controlled by a switch accessible by the driver. The system shall increase engine idle speed to a preset RPM for increased alternator output.

Cab Crashworthiness Requirement

The apparatus cab shall meet and/or exceed relevant NFPA 1901 load and impact tests required for compliance certification with the following:

Side Impact Dynamic Pre-Load per SAE J2422 (Section 5).

Testing shall meet and/or exceed defined test using 13,000 ft-lbs of force as a requirement. The cab shall be subject to a side impact representing the force seen in a roll-over. The cab shall exhibit minimal to no intrusion into the cab's occupant survival space, doors shall remain closed and cab shall remain attached to frame.

Cab testing shall be completed using 13,776 ft-lbs of force **exceeding** testing requirements.

Quasi-static Roof Strength (proof loads) per SAE J2422 (Section 6) / ECE R29, Annex 3, paragraph 5.

Testing shall meet and/or exceed defined test using 22,046 lbs of mass as a requirement. Testing shall be completed using platen(s) distributed uniformly over all bearing members of the cab roof structure.

Cab testing shall be completed using 23,561 lbs of mass **exceeding** testing requirements. The cab shall exhibit minimal to no intrusion into the cab's occupant survival space and doors shall remain closed.

Additional cab testing shall be conducted using 117,336 lbs of mass **exceeding** testing requirements by **over five (5) times**. The cab shall exhibit minimal to no intrusion into the cab's occupant survival space and the doors shall remain closed.

Frontal Impact per SAE J2420.

Testing shall meet and/or exceed defined test using 32,549 ft-lbs of force as a requirement. The cab shall be subject to a frontal impact as defined by the standard. The cab shall exhibit minimal to no intrusion into the cab's occupant survival space, doors shall remain closed and cab shall remain attached to frame.

Cab testing shall be completed using 34,844 ft-lbs of force **exceeding** testing requirements.

Additional cab testing shall be conducted using 65,891 ft-lbs of force **exceeding** testing requirements by **over two (2) times**.

The cab shall meet all requirements to the above cab crash worthiness; **NO EXCEPTIONS**.

A copy of a certificate or letter verifying compliance to the above performance by an independent, licensed, professional engineer shall be provided upon request.

For any or all of the above tests, the cab manufacturer shall provide either photographs or video footage of the procedure upon request.

Seat Mounting Strength

The cab seat mounting surfaces shall be third party tested and in compliance with FMVSS 571.207.

Seat Belt Anchor Strength

The cab seat belt mounting points shall be third party tested and in compliance with FMVSS 571.210.

ISO Compliance

The manufacturer shall ensure that the construction of the apparatus cab shall be in conformance with the established ISO-compliant quality system. All written quality procedures and other procedures referenced within the pages of the manufacturer`s Quality Manual, as well as all Work Instructions, Workmanship Standards, and Calibration Administration that directly or indirectly impacts this process shall be strictly adhered to. By virtue of its ISO compliance the manufacturer shall provide an apparatus cab that is built to exacting standards, meets the customer`s expectations, and satisfies the customer`s requirements.

CAB ROOF TYPE

Cab Roof Notch

The cab roof shall be notched front to rear of the cab to minimize overall travel height of the vehicle.

CAB DOOR OPTIONS

Rear Cab Door Position

The cab rear doors shall be moved to the rear of the wheel opening. This door placement facilitates easier entry and egress by reducing the rear facing seat protrusion into the door opening.

Rear door position to the 58" or (medium cab).

Cab Door Locks

The cab shall have 1250 keyed door locks provided on exterior doors to secure the apparatus.

Cab Door Panels

The inner door panels shall be made from 1/8" (.125") aluminum plate painted Zolatone (to match cab interior paint) for increased durability. The cab door panels shall be split just below the the handrail and incorporate an easily removable panel for access to the latching mechanism and window regulator for maintenance or service.

Cab Door Map Pockets

A bolt on map pocket shall be mounted on the front cab doors, centered on the lower area of the door panel. The map pocket shall be constructed of 1/8" (.125") aluminum plate painted Zolatone gray.

The dimensions of the map pocket shall be approximately 10" high x 14" wide x 3" deep.

Cab Door Map Pockets

A bolt on map pocket shall be mounted on the rear cab doors, centered on the lower area of the door panel. The map pocket shall be constructed of 1/8" (.125") aluminum plate painted Zolatone gray.

The dimensions of the map pocket shall be approximately 10" high x 14" wide x 3" deep.

Cab Door Anodize Aluminum Trim

Each cab door shall have a anodize aluminum trim on the trailing edge of the door opening.

Rear doors shall have full vertical height trim; front cab doors shall be 50" tall on rear vertical edge above floor level.

Cab Door Locks

Each cab door shall have a manually operated door lock actuated from the interior of each respective door. Exterior of each cab door shall be provided with a keyed lock integrated with the cab door handle.

Cab Door Reflective Material

Reflexite V98 Red/Fluorescent Yellow Green striping shall be provided approximately 18" high on the lower cab door panels. The stripes shall run from the top outer corner to the bottom inside corner of the lower door area, forming a "A" shape when viewed from the rear. The reflective material shall meet NFPA 1901 requirements.

Door Mounted Flashing Lights

There shall be four (4) Weldon Model 8401-0000-20 door mounted amber 16" x .75" LED flashing arrow strip lights with clear lenses (one per door) provided.

The lights shall be located on each cab door in the outboard position.

Each light shall be activated by the cab door ajar circuit.

Cab Front Door Windows

Full roll-down windows shall be provided for the front cab doors with manually operated worm gear drive cable operation for positive operation and long life. Scissors or gear-and-sector drives are not acceptable.

Cab Rear Door Windows

Full roll-down windows shall be provided for the rear crew doors with manually operated worm gear drive cable operation for positive operation and long life. Scissors or gear-and-sector drives are not acceptable.

Cab Door Style

The cab doors shall extend down to cover lower step well.

CAB STEP OPTIONS

Cab Steps

The lower cab steps shall extend 3.5" past the side of the cab to provide increased surface area.

MIRRORS

Cab Mirrors

Two (2) Ramco Model 6001FFR remote controlled aluminum mirrors shall be installed. The mirrors shall incorporate a full face main section with a convex mirror with housing Model CAS750, mounted to the top. The adjustment of main sections shall be through dash mounted switches. Location: mounted on front corners of cab.

Mirror Extension

There shall be a 2" extension provided for each Ramco mirror.

Heated Mirrors

Driver and officer cab mirrors to be heated.

MISCELLANEOUS EXTERIOR CAB OPTIONS

Cab Canopy Window

There shall be a fixed window provided between the front and rear doors on the driver`s side and officer's side of the cab.

Front Mud Flaps

Black linear low-density polyethylene (proprietary blend) mud flaps shall be installed on the rear of the cab front wheel wells. The design of the mud flaps shall have corrugated ridges to distribute water evenly.

Handrails

Cab door assist handrails shall consist of two (2) 1.25" diameter x 18" long 6063-T5 anodized aluminum tubes mounted directly behind the driver and officer door openings one each side of the cab. The handrails shall be machine extruded with integral ribbed surfaces to assure a good grip for personnel safety. Handrails shall be installed between chrome end stanchions and shall be positioned at least 2" from the mounting surface to allow a positive grip with a gloved hand.

Handrails

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personnel safety. Handrails shall be installed between chrome end stanchions and shall be positioned at least 2" from the mounting surface to allow a positive grip with a gloved hand.

Rear Cab Wall Construction

The rear cab wall shall be constructed with the use of 3/16" aluminum diamond plate interlocking in aluminum extrusions.

Cab Wheel Well

The cab wheel well shall be increased in size to provide additional clearance for larger tires. The fender trim shall be adjustable in and out to better accommodate various wheel / tire offsets.

Receptacle Mounting Plate

A mounting plate shall be provided for the battery charger receptacle, battery charger indicator and if applicable the air inlet, etc. The plate shall be constructed of 14 gauge brushed finish stainless steel and be removable for service access to the receptacle(s) and indicator.

Roof Trim

The horizontal surface of the cab roof aerial trough shall be overlayed with 1/8" embossed aluminum diamond plate.

HVAC

Air Conditioning

An overhead air-conditioner / heater system with a roof mounted condenser shall be supplied.

The unit shall be mounted to the cab interior headliner in a mid-cab position, away from all seating positions. The unit shall provide fourteen (14) comfort discharge louvers, eight (8) to the back area of the cab, six (6) to the front area of the cab including one (1) each side outboard in the forward overhead console. These louvers will be used for both AC and heated air delivery. Two (2) additional large front louvers shall be damper controlled to provide defogging and defrosting capabilities to the front windshield as necessary.

The unit shall consist of a high output evaporator coil and heater core with one (1) high output dual blower for front air delivery, and two (2) high performance single wheel blowers for rear air delivery. For improved corrosion resistance the evaporator shall have a hydrophilic blue fin coating.

The control panel shall actuate the air-distribution system using electric actuators. The control panel shall allow blended airflow to both the comfort air vents and defrost vents. Separate three-speed blower switches shall be provided to independently control air speed for the front and rear blowers.

The condenser shall be roof mounted and have a minimum capacity of 65,000 BTU`s and have dual fans with a built-in receiver drier.

Performance Data: (Unit only, no ducting or louvers)

- AC BTU: 55,000
- Heat BTU: 65,000
- CFM : 1300 @ 13.8V (All blowers)

The compressor shall be a ten-cylinder swash plate type Seltec Model TM-31HD with a capacity of 19.1 cu.in. per revolution.

The system shall be capable of cooling the interior of the cab from 100 degrees ambient to 75 degrees or less with 50% relative humidity in 30 minutes or less.

HVAC Control Location

Heating and air conditioning controls shall be located in the center dash area.

Rear AC Control

An additional air conditioning control shall be provided for the rear facing AC vents.

Location shall be adjacent to the rear facing vents/filter on the officer side.

Supplemental Heat

A single 40,000 BTU water heater shall be supplied in the front area of the cab. The unit shall heat the lower section of the driver`s and officer`s footwell.

Dual 23,000 BTU water heaters with diamond plate covers shall be supplied in the rear of the cab to heat the rear cab lower section.

Dual climate control will be achieved via dual switches installed on a front instrument panel.

SEATS

Seating Capacity Tag

A tag that is in view of the driver stating seating capacity of six (6) personnel shall be provided.

Cab Seats

All cab seats shall be Valor brand.

Seat Cover Material

All seats shall have Valor Tech XD military grade upholstery material.

Seat Fabric Color

The color of all seats shall be black with red top stitching.

Officer Seat

A USSC Valor fixed SCBA seat shall be supplied for the officer`s position in front of the cab.

Features shall include:

- 95-Degree back angle
- Fixed headrest
- Magnetic SCBA harness securement

Driver Seat

A USSC Valor electric seat shall be supplied for the driver`s position.

Features shall include:

- Fore and aft adjustable track
- Adjustable seat backrest
- Integral headrest

Rear Facing Seat

One (1) rear facing USSC Valor fixed SCBA seat shall be provided for the driver`s side.

Features shall include:

- 95-Degree back angle
- Fixed headrest
- Magnetic SCBA harness securement

All seat positions shall have a bright red retractable 3-point lap and shoulder harness, providing additional safety and security for personnel. Extensions shall be provided with the seat belts so the male end can be easily grasped and the female end easily located while sitting in a normal position.

Rear Facing Seat

One (1) rear facing USSC Valor fixed SCBA seat shall be provided for the officer`s side.

Features shall include:

- 95-Degree back angle
- Fixed headrest
- Magnetic SCBA harness securement

Rear Wall Seats

Fold down jump seat shall be provided.

The seat shall be located on the rear wall driver's side outboard and officer's side outboard.

Features to include:

• Seat bottom cushion shall be constructed of high density foam with a heavy duty, wear resistant material.
• Seat bottom automatically folds up when not in use to provide increased room in the rear of the cab.

Seat Belts

All seat positions shall have a bright red retractable 3-point lap and shoulder harness, providing additional safety and security for personnel. Extensions shall be provided with the seat belts so the male end can be easily grasped and the female end easily located while sitting in a normal position.

Seat Belt Extender

ReadyReach seat belt extenders shall be provided. The extender shall include an arm that places the shoulder belt D-loop in a closer, easier to reach location.

The extenders shall be provided for the driver's seat, officer's seat, rear facing driver's side, and rear facing officer's side seat.

SCBA Bracket SmartDock

A IMMI SmartDock Gen2 SCBA storage bracket shall be provided. The SmartDock is a strap-free docking station that offers single-motion SCBA insertion and hands-free release when the

firefighter stands up to exit the seat. SmartDock has undergone extensive testing to ensure that it meets or exceeds industry standards. When evaluated to the NFPA 1901 Standard for Automotive Fire Apparatus, SmartDock met requirements for retaining both the cylinder and the pack in dynamic testing.

Location: officer's seat, rear facing driver's side, and rear facing officer's side.

Engine Cover Storage Box with Transverse Shelf

There shall be a full width shelf and storage box on rear engine cover. It shall be located on the rear of the engine cover. Storage box to be approximately 26.5" high x engine cover width x 22" deep with a cargo net on the rear. The box bottom shall rest on the step of the rear engine cover if applicable.

The shelf shall match the storage box dimensions but run full transverse if applicable. It shall have a 1" lip around the perimeter and be permanently fixed.

Finish shall match cab interior.

MAP BOX

Map Box

An aluminum map/storage box shall be installed in the cab. The map box shall be constructed of 1/8" (.125) smooth aluminum. Hinged drop down doors with push-button latches shall be installed on the front of the box for the access to two (2) storage areas. Each storage area shall have three (3) fixed shelves for storage of ring binders, map books, etc. Each latch shall have a 25 lb. rating.

The map box shall be mounted on the vertical uprights in the center of the cab between the driver and officer seating positions. The map box shall be secured and tested to meet with current NFPA requirements.

Approximate dimensions:

Divided storage area - 34" W x 12.50" H x 12" D.

Map Box Location

The map box suspended between the 3x3 vertical uprights shall be offset to the rear of the 3x3`s. The map box shall be mounted down low as possible as space permits.

Map Box Finish

The map box shall have Zolatone gray #20-64 finish.

MISCELLANEOUS INTERIOR CAB OPTIONS

Cab Interior Color

Cab instrument panel, overhead console, trim panels, headliner, and door panels shall be gray.

Sun Visors

Lexan sun visors shall be provided for the driver and officer matching the interior trim of the cab and shall be flush mounted into the underside of the overhead console.

Air Horn Lanyard

There shall be a "Y" style lanyard mounted in the center of the cab that allows the driver and officer to operate the air horns. The lanyard shall activate an electrical air switch.

Stainless Steel Window Bars

Stainless steel bars shall be installed across the rear cab door windows.

Engine Cover

The engine cover shall blend in smoothly with the interior dash and flooring of the cab. The upper left and right sides shall have a sloped transition surface running front to rear providing increased space for the driver and officer.

The engine cover and engine service access door cover shall be molded 18 lb/cu. ft. (+/-0.5) flexible integral skinned polyurethane foam at a Durometer of 60 (+/- 5.0) per ASTM F1957-99. The cover shall be approximately .5" thick with a minimum skin thickness of 0.0625 inches. The cover shall be provided to reduce the transmission of noise and heat from the engine. The cover shall be black and feature a pebble grain finish for slip resistance.

Mounting Plate on Engine Cover

An equipment mounting plate shall be provided between the driver and officer on the chassis engine cover. The plate shall be mounted to the engine access door spaced approximately 1/2" up to provide clearance for equipment mounting hardware. The plate shall be constructed of 3/16" aluminum plate and have a swirl finish.

Rear Engine Cover Trim

The rear portion of the engine cover shall have an overlay of aluminum diamond plate installed to provide additional wear resistance.

Cup Holder / Storage Tray

A cup holder and tray assembly shall be provided on the cab engine cover between the driver and officer. The tray shall be approximately 14" wide x 10" long x 1.5" tall and constructed from .125" aluminum plate. The top edge of the tray sides shall have a .5" lip and the front corners of the tray shall be tapered for dash access. The two (2) cup holders shall be constructed from 3.5" diameter pipe approximately 2.5" tall and be located one each side at the rear corners of the tray. The assembly shall be painted to match the cab interior color.

Overhead Console

An overhead console shall be provided in the front of the cab for the driver and officer. The areas in front of the driver and officer shall be removable panels that can be used for switches and other electrical items. The entire overhead console shall be hinged for service access.

The center of the overhead console shall have a lowered area for mounting of up to three (3) electrical components like siren heads, directional bar controllers, etc.

The overhead console shall be constructed of aluminum smooth plate painted to match the cab interior. The console shall be installed using stainless steel fasteners.

Cab Dash - Low Profile Severe Duty

The driver side and center dash shall be constructed from cast aluminum for durability and long life.

The driver side cast aluminum dash shall enclose the instrument cluster.

The center dash area shall be a low-profile design to provide optimal forward visibility. The driver and officer sides shall be angled for ergonomic access and designed for either a color display or switches. Access panels shall be provided on the top, front and officer side for easy service access.

The officer side dash shall be low profile and constructed from .125" smooth aluminum plate. A service access panel shall be provided in the top surface.

The driver, center and officer side dash shall be painted to match the cab interior.

The lower kick panels below the dash to be constructed from .125 aluminum plate painted to match the cab interior. The panels shall be removable to allow for servicing components that may be located behind the panels.

Cab Insulation Package

The cab shall be insulated to mitigate noise and ensure maximum cooling/heating capacity. The insulation package shall include 1" Polyester foam with Mylar facing for the front wall, rear wall, side walls, and ceiling, Reflectex (or equal) inside each cab door and 1" closed cell foam insulation below the front and rear facing seat risers.

CAB ELECTRICAL OPTIONS

Cab Dome Lights

Four (4) ceiling mounted dome light assemblies shall be provided.

Each light shall consist of a three-position assembly mounted rocker switch, LED (light emitting diode) 4" grommet mount white dome light, LED (light emitting diode) 4" grommet mount red dome light, and a plastic housing.

The white light activates with appropriate cab door and light assembly mounted rocker switch, the red light activates with assembly mounted rocker switch only.

Two (2) lights shall be located in both the front and rear of the cab.

Clamshell Switch

A heavy-duty metal clamshell switch shall be installed on the officer`s side of the engine cover to operate the Q2B and located seven (7) inches from the forward dash panel.

Siren Brake

A heavy-duty metal push-button switch shall be installed on the officer`s side switch panel to operate the Q2B siren brake.

~~Clamshell Switch~~

~~A heavy-duty metal clamshell switch shall be installed on the officer`s side of the engine cover to operate the air horns and located eight (8) inches from the forward dash panel.~~

Horn Button Switch

A two (2) position rocker switch shall be installed in the cab accessible to the driver and properly labeled to enable operator to activate the OEM traffic horn or air horn from the steering wheel horn button.

ATC Override

An Automatic Traction Control (ATC) override switch shall be provided. The switch shall be located within reach of the driver and allow for momentary disabling of the ATC system due to mud or snow conditions.

English Dominant Gauge Cluster

The cab operational instruments shall be located in the dashboard on the driver side of the cab and shall be clearly visible. The gauges in this panel shall be English dominant and shall be the following:

- Speedometer/Odometer
- Tachometer with integral hour meter
- Engine oil pressure gauge with warning light and buzzer
- Engine water temperature gauge with warning light and buzzer
- Two (2) air pressure gauges with a warning light and buzzer (front air and rear air)
- Fuel gauge
- Voltmeter
- Transmission oil temperature gauge

This panel shall be backlit for increased visibility during day and night time operations.

Headlights

The front of the cab shall have four (4) headlights. The headlights shall be mounted on the front of the cab in the lower position. The headlights shall be day time operational.

LED Cab Headlights

Peterson LED headlights shall be provided. LED lights shall be provided in the low and high beam position of the head lamp assembly.

Cab Turn Signals

There shall be a pair of Federal Signal FireRay Model FR6-ARROW LED (Light Emitting Diode) turn signal light heads with populated arrow pattern and amber lens mounted upper headlight bezel and wired with weatherproof connectors.

Daytime Running Lights

A pair of TecNiq LED (Light Emitting Diode) daytime running lights with clear lenses shall be installed on the front of the cab. The strip type lights shall be 1.25" high x 15" long and be mounted in a polished cast aluminum housing between the quad bezels. The lights shall be programed to switch off when the park brake is applied.

12 Volt Outlets

A plug-in type receptacle for hand held spotlights, cell phones, chargers, etc. shall be installed officer's switch panel, in cab officer side on 3 x 3 post rear facing just above engine cover, driver side dash, and center rear wall of center rear medical compartment up high. The receptacle shall be wired battery hot.

Cab USB Charging Ports

A dual USB charging port for cell phones, chargers, etc. shall be installed In cab officer side on 3 x 3 post rear facing just above engine cover (or seat riser if in a Hush), driver side dash, center rear wall of center rear medical compartment up high, and officer's switch panel. The receptacles shall be wired battery hot.

Customer Supplied Antennas

The customer supplied external antenna shall be mounted on the cab roof. The antenna shall be located driver side forward with coaxial cable terminating at the center of the dash board, driver side rearward with coaxial cable terminating at the center of the dash board, and officer side rearward with coaxial cable terminating at the center of the dash board.

Windshield Fans

Two (2) adjustable windshield defogger fans with individual switches shall be mounted in the cab centered below the overhead console. The fans shall be 12 volt and shall each be rated at 250 cfm. Location: rear facing mounted up high on vertical 3 x 3 posts.

Officer Speedometer

A speedometer shall be provided in the officer side multiplex display in the cab.

Battery Charger

An E-ONE LPC 40 battery charger with remote mounted LED display shall be installed.

A fully automatic charging system shall be installed on the apparatus. The system shall have a 120 volt, 60 hertz, 7 amp AC input with an output of 40 amps 12 volts DC. The battery charging system shall be connected directly to the shoreline to ensure the batteries remain fully charged while the vehicle is in the fire station or firehouse.

The system shall include a remote charging status indicator panel. The panel shall consist of two (2) LED lights to provide a visual signal if battery voltage is good or drops below 11.5 volts. The microprocessor shall be continuously powered from the battery to provide the charge status.

Battery Charger Location

The battery charger shall be located behind driver's seat.

Auto-Eject Battery Charger Receptacle

The battery charger receptacle shall be a Kussmaul 20-amp NEMA 5-20 Super Auto-Eject #091-55-20-120 with a cover. The Super Auto-Eject receptacle shall be completely sealed and have an automatic power line disconnect.

The receptacle shall be located outside driver's door next to handrail and the cover color shall be red.

DPF Regeneration Override

A momentary override switch shall be provided for the Diesel Particulate Filter (DPF) regeneration. The switch will inhibit the regeneration process until the switch is reset or the engine is shut down and restarted. The switch shall be located within reach of the driver.

Cab Door Step Area Lighting

There shall be eight (8) clear TecNiq Model D07 LED lights provided to illuminate the cab step well areas. Two (2) lights shall be located at each door area, one (1) above each step. The lights shall have polished stainless-steel housings. The lights shall be activated by the cab door ajar circuit.

BODY

Aerial Body

Performance

The apparatus body shall be constructed entirely of aluminum extrusions with interlocking aluminum plates. An extruded aluminum body is required due to the high strength-to-weight ratio of aluminum, corrosion-resistant body structure, easy damage repair, and lighter overall body weight to allow for increased equipment carrying capacity.

The apparatus shall incorporate a rescue style body design to maximize compartment space. The rescue style left and right side body shall combine upper and lower compartments to provide more efficient use of body storage capacity. The body design shall provide 252 cubic feet of storage, which exceeds the minimum NFPA 1901 Chapter 8.5 requirement of 40 cubic feet.

The entire vehicle shall be constructed of aluminum extrusions. Body designs that incorporate steel sub-frames connected to aluminum compartments are not as corrosion-resistant and not acceptable.

Body Mainframe

The body mainframe shall be entirely constructed of aluminum. The complete framework shall be constructed of 6061T6 and 6063T5 aluminum alloy extrusions welded together using 5356 aluminum alloy welding wire.

The mainframe shall incorporate a series of vertical frame components connected in series. Each vertical frame assembly shall be constructed with 3" x 3" extrusions welded together in a square frame configuration. The open center shall permit the installation of a tunnel for ground ladder storage. The mainframe shall be held together from front to rear by two (2) solid 1/2" x 3" aluminum braces on each side of the vertical frame components. The braces shall also serve as the connection point between the torque box and body frame. The body side compartments shall be connected and supported by the extruded aluminum mainframe assembly.

Body Side Assemblies

The left and right side body assemblies shall be framed with 6063T5 1-1/2" x 4" 3/16" wall extrusions. The body compartments shall be framed to make full height compartments ahead and behind the wheel well opening. The body side assemblies shall be designed so that the compartment walls are not required to support the body. The compartments shall be interlocked and welded to the side assembly extrusions.

The top of the body side assemblies shall be supplied with embossed diamond plate covers with polished corners to minimize maintenance and provide service access to electrical components.

Stabilizer Openings

The body shall be designed to accommodate a four (4) stabilizer aerial system. One (1) opening shall be supplied behind the rear axle as close to the wheel well opening as possible to maximize rear angle of departure and to prevent the stabilizer pads from contacting the ground during driving. The second set shall be mounted at the front of the body for optimum forward stability. The openings shall be framed in aluminum extrusions. A stabilizer cover made from treadplate shall be supplied on the extendable stabilizer. The cover shall provide a pleasing appearance and mounting location for a red stabilizer warning light as outlined in NFPA 1901.

The stabilizer openings shall be supplied with clear lights to illuminate the stabilizers and the ground surrounding the openings. The lights shall illuminate when any stabilizer is moved from the stored position.

Body Mounting System

The body shall attach to the integral torque box with grade 8 bolts connected through steel mounts welded on the side of the torque box. To isolate dissimilar metals a 1/4" fiber- reinforced rubber dielectric barrier between the aluminum body and steel torque box shall be supplied. Body designs that weld to the aerial torque box or chassis frame rails shall not be acceptable due to the stress imposed on the vehicle during road travel and aerial operations.

Rear Body Design

The rear body shall be designed to provide ground ladder storage, hose deployment, and service access to aerial components. The center rear of the body shall be open for ground ladder storage. The area below the ground ladder storage shall be for a waterway inlet, the stabilizer control panel, and have access doors to hydraulic components.

The aerial master control panel that is located on the rear of the body shall consist of a master switch, interlock light, and indicators that illuminate when each stabilizer is deployed. The stabilizer controls shall be divided into two (2) boxes located one (1) each side on the rear body so the operator may observe the stabilizers being deployed on each side of the apparatus as outlined in NFPA 1901.

Dual Fuel Fills

The apparatus shall be supplied with a fuel fill on each side of the body. The fuel fills shall have hinged treadplate doors attached with a 3/8" stainless steel hinge and a latch to keep the doors closed. The doors shall be labeled "Ultra Low Sulfer Diesel Fuel Only".

Turntable Access Staircase

Two (2) staircases shall be supplied on the rear body. The staircases shall be mounted inboard of the taillights and outboard of the ground ladder storage area. The staircases shall permit continuous egress from the turntable to the ground. The staircases shall form a double beavertail rear body design with 1 1/4" OD handrails mounted to the trailing edge of the beavertail. The handrail stanchions shall be located just below body level to prevent aerial contact with the handrails when the aerial is at low angles of operation.

Access steps shall be mounted in accordance with current NFPA requirements and shall not exceed a maximum stepping height of 18". The steps shall be a minimum of 4" deep x 15" wide. The top surface of the steps shall have a minimum of 35 sq. in. and shall have a slip-resistant surface. Access steps shall be able to support up to 500 pounds. Steps shall be located to provide a minimum of 8" clearance between the leading edge of the step and any obstruction.

Flop Down Steps

A pair of rear flop down steps shall be provided at the back of the unit to reduce the stepping height from the ground to tailboard. The steps shall be constructed of aluminum extrusions. Side brackets constructed of 1" by 1.5" aluminum shall support two skid-resistant oval rungs. The bottom rung shall be angled at 40 degrees. Each step shall be approximately 12" wide and come with locking devices to hold the steps up. In the stored position the steps shall not reduce the angle of departure.

Body Top

The top of the body between the side compartments shall be an open storage area approximately 70" wide x 10.5" deep and 105" long. This area shall be framed with 3"x3" 3/16" wall extrusions. The floor shall be 1/8" embossed diamond plate supported by the body mainframe extrusions. The body top shall have an access provision for aerial hydraulic oil fill and check.

Compartments

All body compartment walls and ceilings shall be constructed from 1/8" formed aluminum 3003 H14 alloy plate. Each compartment shall be modular in design and shall not be part of the body support structure.

Compartment floors shall be constructed of 1/8" aluminum diamond plate welded in place. Compartment floors that are over 15" deep shall be supported by a minimum 1.5" x 3" x 3/16" wall aluminum extrusions. The compartment seams shall be sealed using a permanent pliable silicone caulk. A series of louvers shall be supplied to facilitate ventilation of each compartment. Each louver shall be 3" wide by 3/4" tall and 1/2" deep.

Compartment Sizes

The approximate compartment sizes and locations shall be as follows:

Left Side:
There shall be one (1) transverse compartment (L1) above the forward stabilizer. The compartment shall be approximately 39.5" wide x 29.5" high x 26" deep (upper), 39.5" wide x 28" high x 16" deep (lower) and contain approximately 27.77 cubic feet of storage space. The door opening shall be approximately 39.5" wide x 57.5" high.

There shall be one (1) compartment (L2) rearward of the front stabilizer. The compartment shall be approximately 28.5" wide x 10.5" high x 11" deep (upper) and 28.5" wide x 53" high x 26" deep (lower) and contain approximately 24.63 cubic feet of storage space. The door opening shall be approximately 28.5" wide x 63.5" high.

There shall be one (1) compartment (L3) forward of the rear wheels. The compartment shall be approximately 48" wide x 10.5" high x 11" deep (upper) and 48" wide x 53" high x 26" deep (lower) and contain approximately 41.49 cubic feet of storage space. The door opening shall be approximately 48" wide x 63.5" high.

There shall be one (1) compartment (L4) over the rear wheels. The compartment shall be approximately 46" wide x 19" high x 26" deep (forward) and 23.5" wide x 19" high x 20" deep (rearward) and contain approximately 18.32 cubic feet of storage space. The door opening shall be approximately 69.5" wide x 19" high.

There shall be one (1) compartment (L5) above the rear stabilizer. The compartment shall be approximately 66" wide x 19" high x 20" deep (upper) and 25" wide x 28" high x 16" deep (lower)

and contain approximately 23.98 cubic feet of storage space. The door opening shall be approximately 66" wide x 47" high.

Right Side:
There shall be one (1) transvers compartment (R1) above the forward stabilizer. The compartment shall be approximately 39.5" wide x 29.5" high x 26" deep (upper) and 39.5" wide x 28" high x 16" deep (lower) and contain approximately 27.77 cubic feet of storage space. The door opening shall be approximately 39.5" wide x 57.5" high.

There shall be one (1) compartment (R2) rearward of the front stabilizer. The compartment shall be approximately 28.5" wide x 10.5" high x 11" deep (upper) and 28.5" wide x 53" high x 26" deep (lower) and contain approximately 24.63 cubic feet of storage space. The door opening shall be approximately 28.5" wide x 63.5" high.

There shall be one (1) compartment (R3) forward of the rear wheels. The compartment shall be approximately 48" wide x 10.5" high x 11" deep (upper) and 48" wide x 53" high x 26" deep (lower) and contain approximately 41.49 cubic feet of storage space. The door opening shall be approximately 48" wide x 63.5" high.

There shall be one (1) compartment (R4) over the rear wheels. The compartment shall be approximately 69.5" wide x 19" high x 20" deep and contain approximately 15.28 cubic feet of storage space. The door opening shall be approximately 69.5" wide x 19" high.

There shall be one (1) compartment (R5) above the rear stabilizer. The compartment shall be approximately 66" wide x 19" high x 20" deep (upper) and 25" wide x 28" high x 16" deep (lower) and contain approximately 23.98 cubic feet of storage space. The door opening shall be approximately 66" wide x 47" high.

Handrails

Access handrails shall be provided at all step positions, including, but not limited to, the rear staircase area and installed to NFPA 1901 15.8. All body handrails shall be constructed of maintenance-free, corrosion-resistant, extruded aluminum. Handrails shall be a minimum of 1.25" OD and shall be installed between chrome end stanchions at least 2" from the mounting surface to allow for access with a gloved hand. The extruded aluminum shall be ribbed to assure a good grip for personnel safety.

The handrails shall be installed as follows:

• Four (4) 42" handrails, two (2) each side, located on the aerial access stair case

Steps, Standing and Walking Surfaces

The maximum stepping distance shall not exceed 18", with the exception of the ground to first step. The ground to first step shall not exceed 24". The ground to first step shall be maintained

when the stabilizers are deployed by an auxiliary set of steps installed at the aerial access staircase. All steps or ladders shall sustain a minimum static load of 500 lbs. without deformation as outlined in NFPA 15.7.2.

All exterior steps shall be designed with a minimum slip resistance of 0.52 when tested wet using the Brungraber Mark II tester in accordance with the manufacturer's instructions.

Apparatus Warning Labels

A label shall be supplied on the rear body to warn personnel that riding in or on the rear step is prohibited as outlined in NFPA 1901 15.7.5. A label shall be applied to both sides of the apparatus and the rear to warn operators that the aerial is not insulated.

Rubrail

The body shall have a rubrail along the length of the body on each side and at the rear. The rubrail shall be constructed of minimum 3/16" thick anodized aluminum 6463T6 extrusion. The rubrail shall be a minimum of 2.75" high x 1.25" deep and shall extend beyond the body width to protect compartment doors and the body side.

The rubrail shall be of a C-channel design to allow marker and warning lights to be recessed inside for protection. The top surface of the rubrail shall have a minimum of five (5) serrations raised .1" high with cross grooves to provide a slip-resistant edge for the rear step and running boards. The rubrail shall be spaced away from the body using 3/16" nylon spacers. The ends of each section shall be provided with a rounded corner piece. The area inside the rubrail C-channel shall be inset with a reflective material for increased side and rear visibility.

ISO Compliance

The manufacturer shall ensure that the construction of the apparatus aerial body shall be in conformance with the established ISO-compliant quality system. All written quality procedures and other procedures referenced within the pages of the manufacturer`s Quality Manual, as well as all Work Instructions, Workmanship Standards, and Calibration Administration that directly or indirectly impacts this process shall be strictly adhered to. By virtue of its ISO compliance the manufacturer shall provide an apparatus aerial device that is built to exacting standards, meets the customer`s expectations, and satisfies the customer`s requirements.

BODY COMPARTMENT REAR

Rear Body Panels

The rear body panels shall be smooth 1/8" un-painted aluminum plate to facilitate rear body striping. The panels shall be bolt-on for a clean appearance and easier repair in the event of damage.

AERIAL BODY OPTIONS

Outrigger Covers

Two (2) piece outrigger covers constructed of .125" aluminum treadplate shall be provided for the jack leg openings. One piece of the cover shall be sized to cover just the extending outrigger in order to require a minimal amount of set-up space. The second piece of the cover shall be fixed and mounted to the body to cover the remaining outrigger opening.

Auxiliary Ground Pads

Four (4) auxiliary ground pads shall be provided. The pads shall be 24" x 24" x 1/2" thick aluminum plate with a 20-degree formed handle with cutout for hand hold. The pads shall be stored in brackets that are welded below the body.

Rear Pike Pole Storage

Pike poles storage shall be provided at the rear of the body for six (6) pike poles. The storage area shall be labeled for two (2) 6` poles, two (2) 8` poles, and two (2) 12` poles. The pike poles shall be secured by either "J" slotted locking tubes and/or hinged door(s) that matches the rear body finish.

Body Pike Pole Storage

Pike pole storage tubes in located in transverse compartments L1\R1 above the transverse shelf on the rearward wall for six (6) pike poles shall be provided. The tubes to be sized for 6' pike poles and shall have locking slots to hold the pike poles. Three (3) pike poles shall be accessible from L1 and three (3) poles accessible from R1.

Ladder Tunnel Door

A 3/16" (.188) lift-up door with D-ring style handle shall be installed for access to the rear ladder tunnel.

The door shall be constructed using a box pan configuration. The outer door pan shall match the rear body finish. The inner door pan shall be constructed from 3/32" (0.090") smooth aluminum plate and shall have threaded inserts to attach door hold-open hardware. The inner pan shall have a 95-degree bend to form an internal drip rail. A drain hole shall be installed in the lower corner of all inside door pans to assist with drainage.

The door shall open 20 degrees past horizontal to allow easy removal of ground ladders.

The door shall be boxed out as required for the ladder compliment optioned.

Rear Control Doors

The driver/officer jack and master control switch panels at the rear of the body shall be provided with access doors. The doors shall have the same finish as the rear of the body.

Turntable Trim

A trim ring shall be installed between the turntable disc and the top of the body. The trim shall be constructed from .125" aluminum diamond plate.

Fuel Fill Door

The fuel fills shall have hinged treadplate doors with a 1/8" stainless steel hinge and a latch to keep the doors closed. The doors shall be labeled "Diesel Fuel Only".

Open Storage Area Enclosure

Open storage area beneath aerial at top of body shall have roof top style compartments with hinged embossed diamond plate lids, gas shocks and recessed grab handles LED lights shall be provided to illuminate the interior when lids are open.

DOORS

Painted Roll Up Compartment Doors

A ROM brand roll up door painted job color shall be provided on a compartment greater than 45" tall. The door(s) shall be installed in the following location(s): L1, L2, L3, L5, R1, R2, R3, and R5.

The Robinson door slats shall be double wall box frame and manufactured from anodized aluminum. The slats shall have interlocking end shoes on each slat. The slats shall have interlocking joints with a PVC/vinyl inner seal to prevent any metal to metal contact and inhibit moisture and dust penetration.

The track shall be painted aluminum with a finishing flange incorporated to provide a finished look around the perimeter of the door without additional trim or caulking. The track shall have a replaceable side seal to prevent water and dust from entering the compartment.

The doors shall be counterbalanced for ease in operation. A full width latch bar shall be operable with one hand, even with heavy gloves. Securing method shall be a positive latch device.

A magnetic type switch integral to the door shall be supplied for door ajar indication and compartment light activation.

The door opening shall be reduced by 2" in width and approximately 8-9" in height depending on door height.

Drip Pan

A ROM drip pan shall be supplied for each roll-up door. The drip pan shall be made from a high strength aluminum alloy. The splashguard and end caps shall be made from extruded and injection molded high-impact plastic. Drip pan locations: L1, L2, L3, L5, R1, R2, R3, and R5.

~~Double Compartment Doors~~

~~Double compartment doors shall be constructed using a box pan configuration. The outer door pans shall beveled and shall be constructed from 3/16" (0.188") aluminum plate. The inner door pans shall be constructed from 3/32" (0.090") smooth aluminum plate and shall have nutsert fittings to attach hold-open hardware. The inner pans shall have a 90-degree bend to form an integral drip rail.~~

~~The compartment doors shall have a 1" x 9/16" (1" x 0.43") closed-cell "P" EPDM sponge gasket meeting ASTM D-1066 2A4 standards installed around the perimeter of the doors to provide a seal that is resistant to oil, sunlight, and ozone.~~

~~A drain hole shall be installed in the lower corner of the inside door pan to assist with drainage.~~

~~A polished stainless-steel Hansen D-ring style twist-lock door handle a with #459 latch shall be provided on the primary door. The 4-1/2" (4.5") D-ring handle shall be mounted directly to the door latching mechanism with screws that do not penetrate the door material for improved corrosion resistance.~~

~~The secondary door shall have a dual stage rotary latch with a 750 lb. rating to hold the door in the closed position. The latch shall be mounted at the top of the door. A stainless-steel paddle style handle shall be mounted on the interior pan of the door to actuate the rotary latch. The paddle handle shall be connected to the rotary latch by a 5/32" (.156") diameter rod. Cable actuation shall be deemed un-acceptable due to the potential for cable stretch and slippage. The striker pin shall be 3/8" (.38") diameter with slotted mounting holes for adjustment.~~

~~Double door latch to have latch brackets fabricated from .125 aluminum smooth plate, installed with "PULL" tags #1032993 for left side and #1032294 for right side.~~

~~The compartment doors shall be securely attached to the apparatus body with a full-length stainless steel 1/4" (0.25") rod piano-type hinge isolated from the body and compartment doors with a dielectric barrier. The doors shall be attached with machine screws threaded into the doorframe.~~

~~The doors shall have a gas-shock-style hold-open device. The gas shocks shall have a 30 lb rating and be mounted near the top of the door (when possible).~~

~~An anodized aluminum drip rail shall be mounted over the compartment opening to assist in directing water runoff away from the compartment.~~

~~The door(s) shall be installed in the following locations: L4 and R4.~~

SHELVES

Adjustable Shelves

There shall be an aluminum adjustable shelf provided for a compartment as specified.

The shelf shall be constructed of 3/16" (.187") smooth aluminum plate. The shelf shall have a minimum 2" front and rear lips to accommodate optional plastic interlocking compartment tile systems and shall be capable of holding 100 lbs. on compartments with tracks mounted on back wall (compartments up to approximately 12" deep) or shall be capable of holding 250 lbs. with tracks mounted on forward and rearward walls.

The shelf shall be sized, width and depth, to match the size and location in the compartment.

The shelves shall be located:

- L1 upper
- L2 upper
- L3 lower
- L3 upper qty 2
- L5 lower qty. 2
- R1 upper
- R2 upper
- R3 upper qty. 2
- R5 upper qty. 2 upper

TRAY/ TOOLBOARD

Roll-Out Tray

There shall be a floor mounted roll-out tray provided in a compartment as specified.

The roll-out tray shall be constructed of 3/16" (.187") smooth aluminum plate with a sanded finish and welded corners for increased strength and rigidity. The tray shall be sized in width and depth as applicable.

For greater tray accessibility, the drawer slides shall feature one hundred percent extension. The tray shall utilize a gas spring to secure the tray in the open or closed position.

The tray shall have a total capacity of 500 lbs.

Location: R3 rearward

Generator Tray

A roll-out generator tray shall be provided and floor-mounted in a compartment as specified.

The inverted pan style tray shall be constructed of 3/16" (.187") smooth aluminum plate with a sanded finish and shall be approximately 21" wide x 18" deep with 3" (downward) sides.

For greater tray accessibility, the drawer slides shall feature one hundred percent extension. The tray shall utilize a rotary latch to secure the tray in the open or closed position.

The tray shall include an interlock that shall require the tray to be extended from the compartment prior to operation of the generator.

Location: R3 forward.

~~Roll-Out Toolboard~~

~~One (1) adjustable heavy-duty tool board with 500 lbs. capacity shall be provided. Includes return style reinforcing bends on vertical front and rear edges of tool board, upper and lower adjustable track and gas shock actuated. Tool board sized to compartment height and depth as applicable.~~

~~Location: L3 rearward; 12 inches off of rear wall.~~

LADDER STORAGE

Rear Ladder Storage

A ladder storage tunnel shall be provided beneath the aerial device frame work. There shall be access to the ladders via an opening at the rear.

This tunnel shall be lined with .090" aluminum. The ladders will be held captive top and bottom by aluminum tracks and slide on friction reducing material. All ladders shall be removable individually without having to remove any other ladder.

The ladder tunnel shall hold: one (1) PEL-35 2-section extension ladder, one (1) PEL-28 2-section extension ladder, one (1) DRL-20 roof ladder, one (1) DRL-18 roof ladder, one (1) DRL-16 roof ladder, one (1) CJL-10 combination ladder, and one (1) FL-10 (with rubber block feet).

MISCELLANEOUS BODY OPTIONS

Mud Flaps

Black mud flaps shall be provided for the body wheel wells.

Floor Matting

This unit shall have all applicable compartment floors, shelves, and trays covered with a heavy-duty Turtle Tile brand Black floor matting.

Anodize Aluminum Trim

A anodize aluminum trim shall be located at the bottom edge of all body compartment openings with painted edges. The trim shall provide added protection of the painted surface of the body when equipment is removed from the compartment.

Tilt Jack Location

The cab tilt jack shall be located right side forward jack leg compartment low behind door in access panel.

Body Wheel Well

The body wheel well frame shall be constructed from 6063-T5 aluminum extrusion with a slot the full length to permit an internal fit of 1/8" (0.125") aluminum treadplate. The wheel well trim fenderette shall be constructed from rubber fenderette and shall extend 2.5" out from the mounting point. The wheel well liners shall be constructed of a 3/16" (.187") composite material. The liners shall be bolt-on and shall provide a maintenance-free and damage-resistant surface.

SCBA BOTTLE STORAGE

SCBA Bottle Storage

E-ONE designed (3) SCBA bottle storage constructed with aluminum plate with hinged door and push button latch shall be provided in the body wheel well area.

The door shall match wheel well area material and finish.

The door shall cover the recessed fuel fill if located adjacent to the SCBA storage.

U-shaped troughs made out of aluminum smooth plate with rubbert inserts shall be provided to store standard size SCBA bottles up to 6.75" in diameter and 24.5" in length. The upper two

troughs can also store a standard size 20lbs ABC Extinguisher or 2.5 gal Water Extinguisher in each trough.

Location: driver side rear wheel well offset forward, driver side rear wheel well offset rearward, and officer side rear wheel well offset forward.

Wheel Chock Storage

E-ONE designed Wheel Chock storage with hinged door and push button latch shall be provided in the body wheel well area.

The door shall match the wheel well area material and finish.

The door shall be wired to "Door Open" indicator inside cab.

The storage area shall be capable of holding (2) Zico Model SAC-44-E or comparable Wheel Chocks (not included).

Location: officer side rear wheel well offset rearward.

ELECTRICAL SYSTEMS

Multiplex Electrical System

Electrical System

The apparatus shall incorporate a Weldon V-MUX multiplex 12-volt electrical system. The system shall have the capability of delivering multiple signals via a CAN bus. The electrical system installed by the apparatus manufacturer shall conform to current SAE standards, the latest FMVSS standards, and the requirements of the applicable NFPA 1901 standards.

The electrical system shall be pre-wired for optional computer modem accessibility to allow service personnel to easily plug in a modem to allow remote diagnostics.

The electrical circuits shall be provided with low voltage over-current protective devices. Such devices shall be accessible and located in required terminal connection locations or weather-resistant enclosures. The over-current protection shall be suitable for electrical equipment and shall be automatic reset type and meet SAE standards. All electrical equipment, switches, relays, terminals, and connectors shall have a direct current rating of 125 percent of maximum current for which the circuit is protected. The system shall have electro-magnetic interference suppression provided as required in applicable SAE standards.

Any electrical junction or terminal boxes shall be weather-resistant and located away from water spray conditions.

Multiplex System

For superior system integrity, the networked multiplex system shall meet the following minimum component requirements:

• The network system must be Peer to Peer technology based on RS485 protocol. No one module shall hold the programming for other modules. One or two modules on a network referred to as Peer to Peer, while the rest of the network consists of a one master and several slaves is not considered Peer to Peer for this application.
• Modules shall be IP67 rated to handle the extreme operating environment found in the fire service industry.
• All modules shall be solid state circuitry utilizing MOS-FET technology and utilize Deutsch series input/output connectors.
• Each module that controls a device shall hold its own configuration program.
• Each module should be able to function as a standalone module. No "add- on" module will be acceptable to achieve this form of operation.
• Load shedding power management (8 levels).
• Switch input capability for chassis functions.
• Responsible for lighting device activation.
• Self-contained diagnostic indicators.
• Wire harness needed to interface electrical devices with multiplex modules.
• The grounds from each device should return to main ground trunk in each sub harness by the use of ultrasonic splices.

Wiring

All harnessing, wiring and connectors shall be manufactured to the following standards/guidelines. No exceptions.

• NFPA 1901-Standard for Automotive Fire Apparatus
• SAE J1127 and J1127
• IPC/WHMA-A-620 – Requirements and Acceptance for Cable and Wire Harness Assemblies. (Class 3 – High Performance Electronic Products)

All wiring shall be copper or copper alloys of a gauge rated to carry 125 of the maximum current for which the circuit is protected. Insulated wire and cable 8ga and smaller shall be SXL, GXL, or TXL per SAE J1128. Conductors 6ga and larger shall be SXL or SGT per SAE J1127.

All wiring shall be colored coded and imprinted with the circuit's function. Minimum height of imprinted characters shall not be less than .082" plus or minus .01". The imprinted characters shall repeat at a distance not greater than 3".

A coil of wire shall be provided behind electrical appliances to allow them to be pulled away from mounting area for inspection and service work.

Wiring Protection

The overall covering of the conductors shall be loom or braid.

Braid style wiring covers shall be constructed using a woven PVC-coated nylon multifilament braiding yarn. The yarn shall have a diameter of no less than .04" and a tensile strength of 22lbs. The yarn shall have a service temperature rating of -65 F to 194 F. The braid shall consist of 24 strands of yarn with 21 black and 3 yellow. The yellow shall be oriented the same and be next to each other.

Wiring loom shall be flame retardant black nylon. The loom shall have a service temperature of -40 F to 300 F and be secured to the wire bundle with adhesive-backed vinyl tape.

Wiring Connectors

All connectors shall be Deutsch series unless a different series of connector is needed to mate to a supplier's component. The connectors and terminals shall be assembled per the connector/terminal manufacturer's specification. Crimble/Solderless terminals shall be acceptable. Heat shrink style shall be utilized unless used within the confines of the cab.

NFPA Required Testing of Electrical System

The apparatus shall be electrical tested upon completion of the vehicle and prior to delivery. The electrical testing, certifications, and test results shall be submitted with delivery documentation per requirements of NFPA #1901. The following minimum testing shall be completed by the apparatus manufacturer:

1. Reserve capacity test:

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

2. Alternator performance test at idle:

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

3. Alternator performance test at full load:

The total continuous electrical load shall be activated with the engine running up to the engine manufacturer`s governed speed. The test duration shall be a minimum of two (2) hours. Activation of the load management system shall be permitted during this test. However, an alarm sounded by excessive battery discharge, as detected by the system required in NFPA #1901 Standard, or a system voltage of less than 11.7 volts dc for a 12 volt nominal system, for more than 120 seconds, shall be considered a test failure.

4. Low voltage alarm test:

Following the completion of the above tests, the engine shall be shut off. The total continuous electrical load shall be activated and shall continue to be applied until the excessive battery discharge alarm activates. The battery voltage shall be measured at the battery terminals. With the load still applied, a reading of less than 11.7 volts dc for a 12 volt nominal system shall be considered a test failure. The battery system shall then be able to restart the engine. Failure to restart the engine shall be considered a test failure.

NFPA Required Documentation

The following documentation shall be provided on delivery of the apparatus:

A. Documentation of the electrical system performance tests required above.

B. A written load analysis, including:

a. The nameplate rating of the alternator
b. The alternator rating under the conditions
c. Each specified component load
d. Individual intermittent loads

Vehicle Data Recorder

A vehicle data recorder system shall be provided to comply with the 2009 and 2016 editions of NFPA 1901. The following data shall be monitored:

- Vehicle speed MPH
- Acceleration (from speedometer) MPH/Sec.
- Deceleration (from speedometer) MPH/Sec.
- Engine speed RPM
- Engine throttle position % of full throttle

- ABS Event On/Off
- Seat occupied status Occupied Yes/No by position
- Seat belt status Buckled Yes/No by position
- Master Optical Warning Device Switch On/Off
- Time: 24 hour time
- Date: Year/Month/Day

Occupant Detection System

There shall be a visual and audible warning system installed in the cab that indicates the occupant buckle status of all cab seating positions that are designed to be occupied during vehicle movement.

The audible warning shall activate when the vehicle's park brake is released and a seat position is not in a valid state. A valid state is defined as a seat that is unoccupied and the seat belt is unbuckled, or one that has the seat belt buckled after the seat has been occupied.

The visual warning shall consist of a graphical representation of each cab seat in the multiplex display screen that will continuously indicate the validity of each seat position.

The system shall include a seat sensor and safety belt latch switch for each cab seating position, audible alarm and braided wiring harness.

Multiplex Display

The V-MUX multiplex electrical system shall include a Vista IV color display.

The display shall have the following features:

- Aspect ratio of 16:9 (Wide Screen)
- Diagonal measurement of no less than 7"
- Master warning switch
- Engine high idle switch
- Five (5) tactile switches to access secondary menus
- Eight (8) multi-function programmable tactile switches
- Specific door ajar indication
- Real time clock
- Provides access to the multiplex system diagnostics
- Video capability for optional back-up camera(s) and GPS display

The display shall be located officer's side engine cover and driver's side engine cover.

Electrical Connection Protection

The vehicle electrical system shall be made more robust by the application of a corrosion inhibiting spray coating on all exposed electrical connections on the chassis and body. If equipped with an aerial device, the exposed connections on the aerial components shall also be protected.

The coating shall use nanotechnology to penetrate at the molecular level into uneven surfaces to create a protective water repellant film. The coating shall protect electrical connections against the environmental conditions apparatus are commonly exposed to.

Smart Truck Technology

User Interface

The apparatus shall be equipped with a smart truck technology system designed specifically for first responder apparatus. The system shall interconnect major apparatus CAN networks including but not limited to the chassis J1939/OBD2 data, vehicle multiplex system, water pump pressure governor, electric valves and electric actuated deck gun. The system shall securely report real-time vehicle information from these systems via cellular data to a globally supported cloud computing service for storage and real time access via web dashboards. The dashboards shall be accessible by the department's computers, tablets and smartphones.

The smart truck technology installed on the apparatus shall provide real-time notification via text or e-mail when a check engine light is displayed. The notification shall include the fault code and brief explanation for the code to reduce down-time.

The system shall feature a truck down feature on the web-based user interface to allow instant notification of needed apparatus service to both the authorized dealership and OEM via text or e-mail.

The system shall provide remote diagnostics of vehicle subsystems such as VMUX, pressure governors, electric monitors and electric valves.

By use of the web-based user interface, the system shall allow for over the air programming updates to various subsystems should the need arise.

The web-based user interface shall also provide the following:

- Fuel and DEF levels
- GPS tracking
- Data logging for apparatus multiplex system
- Easy access to the NFPA VDR data

The smart truck technology shall also feature seamless integration to the HAAS ALERT Safety Cloud providing Responder to Vehicle (R2V) alerts to motorists using navigation apps such as WAZE.

The system shall be designed with an open architecture to incorporate future growth with new technology partners designed to enhance fireground operations

Hardware

Vehicle Gateway

The vehicle gateway module shall be rugged in construction using a durable cast aluminum enclosure designed for emergency vehicle applications. The module shall have sealed Deutsch connectors providing four (4) CAN network ports, one (1) RS-485 port, one (1) Ethernet RJ45 port, embedded cellular modem, Bluetooth and GPS capability. The IoT Core Vehicle Gateway shall be capable of 2-way vehicle telemetry, supporting both remote diagnostics and remote over-the-air software updates.

Antenna

A low-profile cellular antenna shall be installed on the cab roof.

Data Plan

A 5-year data plan shall be provided with the initial vehicle purchase. At the end of the 5-year period the department shall be given the option to extend service.

LIGHT BARS

Front Cab Light Bar

A Federal Signal Model VSLR8 8 pod Vision light system shall be provided. The system shall include two (2) individual (4) pod units.

Each pod unit shall contain four (4) Solaris LED rotating reflectors. Two (2) reflectors on driver bar and one (1) on officer bar shall be equipped with SpectraLux multicolor LED technology. Pods 2, 3 & 5 shall have multi-color functions. The lens configuration shall be clear.

The lightbar shall be installed in the following location: front cab corners.

Multi-Color Pod Programming

Federal Signal VSLR multi-color pods shall be programmed as follows: driver side pods to be blue and officer to be clear and change to red with park brake.

Rear Body Side Light Bar

A Federal Signal model VSLR8 8 pod Vision light system shall be provided. The system shall include two (2) individual (4) pod units.

Each pod unit shall contain four (4) Solaris LED rotating reflectors. Two (2) reflectors on driver bar and one (1) on officer bar shall be equipped with SpectraLux multicolor LED technology. Pods 2, 3 & 5 shall have multi-color functions. The lens configuration shall be clear.

The lightbar shall be installed in the following location: above L4/R4 outboard offset forward.

Multi-Color Pod Programming

Federal Signal VSLR multi-color pods shall be programmed as follows: driver side pods to be blue and officer to be clear and change to red with park brake.

Light Bar Shields

A cover shall be provided over the body mounted light bar. The cover shall be constructed of 1/8" (.125") diamond plate. The cover shall be mechanically fastened for serviceability.

WARNING LIGHT PACKAGES

Lower Level LED Warning Light Flash Rate

The lower level Federal Signal FireRay LED warning lights shall be set to QuadFlash 75 - Simultaneous pattern.

Lower Level Warning

Eight (8) Federal Signal FireRay Model FR6 LED light heads and two (2) Federal Signal MicroPulse Ultra Model MPS300U LED light heads shall be provided. The lights shall be Red with red lenses. Note: MicroPulse Ultra Series lights are only available with clear lenses.

The light heads shall be provided with chrome flanges (as applicable) mounted as close to the corner points of the apparatus (as is practical) as follows:

- Two (2) FR6 light heads on the front of the apparatus facing forward.
- Two (2) FR6 light heads on the rear of the apparatus facing rearward.
- Two (2) FR6 light heads each side of the apparatus, one (1) each side at the forward most point and one (1) centrally located to provide midship warning lighting.
- Two (2) MPS300U LED light heads shall be mounted one (1) each side at the rearward most point (as practical).

The side facing lights shall be located at forward most position, centered in rear wheel well, and side facing at rear of body in rubrail if equipped.

All warning devices shall be surface mounted in compliance with NFPA standards.

WARNING LIGHTS

Warning Lights

A pair of Federal Signal Model VSLR1-R2A02 LED rotating Vision beacons shall be provided. Each beacon shall contain one (1) Solaris red LED rotator with clear lens and one (1) IPX6 Solaris LED amber warning light with clear lens.

Lights shall be located: rear upper body on aerial style brackets.

Warning Lights

Federal Signal IMPAXX LED Model IPX302-4 w/ bezel shall be provided surfaced mounted with red lens.

Location: one (1) each side in rubrail just ahead of rearward outriggers, one (1) each side centered below forward compartments in rubrail, one (1) each side rear facing in the corners of tailboard in rubrail, and one (1) each side just behind rear wheels in rubrail.

Warning Lights

Federal Signal FireRay Model FR6 LED (Light Emitting Diode) light heads with bezels shall be provided.

The flashing lights shall be surface mounted where specified.

Location: one (1) each side of body rear facing up high (amber), one (1) each side in front quad inboard of NFPA warning light (red), one (1) each side of cab down low just ahead of rear doors (red), and one (1) each side above tail lights (blue).

Hazard (Door Ajar) Light

There shall be a .75" red LED hazard light installed as specified.

The light shall be located center overhead.

Opticom Emitter

One (1) GTT 794H LED Opticom emitter light head shall be installed behind the front cab grille.

DIRECTIONAL LIGHT BAR

Directional Traffic Warning Light

A Federal Viper EXT LED Signal Master Model 320862 light bar with amber lens shall be installed at the rear of the apparatus. The unit shall be 31.0" long with six (6) Viper EXT LED heads. Four operating modes are available: left arrow, right arrow, split (center/out) and a flashing warning pattern.

A Federal 331105 control shall be provided with LED indicators to emulate the warning pattern.

Light bar dimensions are 31.0" long x 3.30" deep x 2.70" high.

Directional Light Shield

There shall be a diamond plate shield mounted over the directional light to protect it from damage.

Directional Light Wired to Warning Lights

The rear directional light bar shall be activated when the upper level warning lights are activated to provide additional lighting, in addition to the warning lights, when the vehicle is responding to a scene.

Directional Light Bar Control Location

The directional light bar control head shall be located in the center of center dash upper tier (recessed, if required).

SIREN

Mechanical Siren

A chrome plated and pedestal mounted Federal Q2B-P coaster siren shall be installed on top of the front bumper extension. An electric siren brake switch shall be located in the cab accessible to the driver.

The siren shall be located driver side front bumper.

Q2B Cut-off Switch

A lever type disconnect switch shall be provided to disconnect the 12-volt power supply to the Q2B. The switch shall be located conveniently to the driver of the apparatus.

DOT LIGHTING

License Plate Light

One (1) Truck-Lite Model 15905 white LED license plate light mounted in a Truck-Lite Model 15732 chrome plated plastic license plate housing shall be mounted at the rear of the body.

LED Marker Lights

LED clearance/marker lights shall be installed as specified.

Upper Cab:
• Five (5)amber LED clearance lights on the cab roof.

Lower Cab:
• One (1) amber LED side turn/marker each side of cab ahead of the front door hinge.

Upper Body:
• One (1) red Trucklite LED clearance light each side, rear of body to the side.

Lower Body:
• Three (3) red Trucklite LED clearance lights centered at rear, recessed in the rubrail.
• One (1) red Trucklite LED clearance light each side at the trailing edge of the apparatus body, recessed in the rubrail.
• One (1) amber Trucklite LED clearance light each side front of body just in front of rear wheels, recessed in the rubrail.
• One (1) amber Trucklite LED clearance/auxiliary turn light each side front of body, recessed in the rubrail.

Marker Lights

One (1) pair of Britax Model L427.203L.12V LED amber/red marker rubber housed lights shall be provided. The lights shall be located on the rear body corners mounted in the down angle position. The red lenses shall illuminate to the rear of the apparatus and the amber shall illuminate to the front of the apparatus. The lights shall be wired to the marker light circuit.

Tail Lights

One (1) Federal Signal FireRay Model FR6-BTT red L.E.D. (Light Emitting Diode) light, one (1) Federal Signal FireRay Model FR6-ARROW amber LED light and one (1) Federal Signal FireRay Model FR6-BACKUP white LED light shall be installed horizontally with individual housings each side at rear and wired with weatherproof connectors.

Light functions shall be as follows:

• L.E.D. red running light with red brake light in upper position.
• L.E.D. amber populated arrow pattern turn signal in middle position.
• L.E.D. white backup light in lower position.

Third Brake Light

One (1) Whelen Model PSR01FCR LED red 3rd brake light shall be provided. The light shall be located rear of body rear facing up high below traffic advisor.

Turn Signals

A pair of Weldon Model 9186-8580-29 bubble style LED amber auxiliary turn signals with stainless steel bezels shall be installed.

Location: one (1) each side of cab centered over wheel well.

LIGHTS - COMPARTMENT, STEP & GROUND

Compartment Light Package

One (1) ROM V4 compartment light strip shall be mounted in each body compartment greater than 4 cu. ft. Transverse compartments shall have two (2) lights, located one (1) each side.

Each light bar shall include super bright white LEDs mounted to circuit boards that have acrylic conformal coating for corrosion protection. The LED circuit boards shall be mounted to an extruded aluminum base with lexan lens. The light shall produce 250 lumens per foot and be waterproof up to 1 meter (3.3 feet).

Compartment lights shall be wired to a master on/off rocker switch on the cab switch panel.

The wiring connection for the compartment lights shall be made with a weather-resistant plug in style connector. A single water and corrosion-resistant switch with a polycarbonate actuator and sealed contacts shall control each compartment light. The switch shall allow the light to illuminate if the compartment door is open.

Ground Lights

The apparatus shall be equipped with a sufficient quantity of lights to properly illuminate the ground areas around the apparatus in accordance with current NFPA requirements. The lights shall be Federal Signal Model 607141-05 4" circular LED (Light Emitting Diode) with clear lenses mounted in a resilient shock absorbent mount for improved bulb life. The wiring connections shall be made with a weather resistant plug in style connector.

Ground area lights shall be switched from the cab dash with the work light switch.

One (1) ground light shall be supplied under each side of the front bumper extension.

Lights in areas under the driver and crew area exits shall be activated automatically when the exit doors are opened.

Step Light Package

The apparatus shall be equipped with a sufficient quantity of lights to properly illuminate the steps around the apparatus in accordance with current NFPA requirements. The lights shall be 2" circular Whelen LED (Light Emitting Diode) Model T0CACCCR with clear lenses mounted in a resilient shock absorbent mount for improved bulb life. The wiring connections shall be made with a weather resistant plug in style connector.

The step lights shall be switched from the cab dash with the work light switch.

Ladder Tunnel Lights

Two (2) EON LED lights shall be provided to illuminate the ladder tunnel at the opening. The light shall be wired through the door ajar circuit on the ladder tunnel door.

LIGHTS - DECK AND SCENE

Deck/Scene Light Wired to Back-Up Lights

The rear deck or scene lights shall be activated when the chassis is placed in reverse to provide additional lighting, in addition to the back-up lights, when backing the vehicle.

Rear Work Lights

Two (2) FireTech LED lights Model FT-WL3500-FT shall be installed. The lights shall produce 1,981 effective lumens and have a black housing. The lights shall be switched with work light switch in the cab.

Location: one (1) each side over rear ladder tunnel.

LIGHTS - NON-WARNING

~~Map Light~~

~~A Federal "Little Light" map light shall be supplied. The map light shall be 12 volt with 18" flexible gooseneck with a on/off switch and matte black finish. It shall be located at officer's A post.~~

Spot Lights

Two (2) Golight Model 2067 12-volt 65-watt remote controlled spot lights shall be supplied.

The spotlight shall produce 400,000 candlepower and have a 135 degree vertical and 370 degree horizontal range of motion. The light shall be mounted in a white, heat resistant, high impact weather resistant housing.

The light shall be controlled by both a RadioRay wireless remote and a dash / console mounted control pad.

If one light is selected, it shall be mounted at the center of the cab roof to the rear of the light bar. If two are selected they shall be mounted one each side of the cab roof to rear of the light bar.

The light shall have a 3-year warranty.

Engine Compartment Light

There shall be lighting provided to illuminate the engine compartment area in compliance with NFPA 1901. The light shall be an Optronics ILL22 Series LED that has a polycarbonate lense, sealed / waterproof housing and integral switch. The light wiring circuit shall activate when the cab is tilted and master power is switched on.

CONTROLS / SWITCHES

Door Ajar Alarm

An audible alarm shall be provided through the multiplex displays in the cab wired into the door ajar or indicator.

Foot Switch

A heavy-duty metal floor mounted foot switch shall be installed to operate the air horns. It shall be located driver's side.

Foot Switch

A heavy-duty metal floor mounted foot switch shall be installed to operate the Q2B siren. It shall be located driver's side.

CAMERAS\INTERCOM

Two-Way Intercom

A Fire Research ACT two-way intercom system shall be installed to provide communications between the turntable control station and the aerial tip. The intercom system shall include two (2) speakers and two (2) control modules; one (1) with a push-to-talk button at the turntable control station and one (1) hands free at the aerial tip.

The control modules shall have push-button volume control and a LED volume display. The hands-free module shall constantly transmit to the other module unless the push-to-talk button is pressed.

The intercom shall have active noise cancellation and be designed for exterior use.

Back-Up Camera

There shall be a Voyager camera Model number VCCS150B provided mounted on the rear of the apparatus. The camera shall feature a wide-angle lens, IR LED assisted illumination for enhanced low-light performance, non-corrosive mounting bracket, and stainless-steel hardware. The camera shall be interlocked with the chassis transmission. When the apparatus is placed in reverse the camera shall automatically be activated and when the transmission is placed in any other gear the screen shall return to the previously displayed screen.

The camera shall have the following specifications:

- NTSC/PAL Video output signal format
- 150º Viewing angle
- Housing: Aluminum
- Waterproof: IPX7
- Built-in microphone
- Dimensions: 2.7" W x 1.7" H x 2.5" D

The camera shall be located at the rear of the truck, up as high as possible. Optimize mounting position using space not allocated by other equipment/options unless otherwise specified.

Camera Shield

A diamond plate protective shield shall be provided for the top and sides of a camera. The shield shall be designed not to impede in the operational envelope of the camera.

Officer Side Camera

There shall be a Voyager camera Model number VCMS36RCM provided mounted on the officer`s side front cab corner. The camera shall feature high performance color optics, a wide angle lense and IR LED assisted illumination for enhanced low-light performance. The camera shall be interlocked with the right turn signal. When the apparatus` right turn signal is activated the officer`s

side camera shall automatically be activated and when the turn signal is canceled shall return to the previously displayed screen.

The camera shall have the following specifications:

- Waterproof (IPX7 rated)
- NTSC Video Output Signal Format
- Sensitivity: 0 Lux
- 102º Horizontal viewing angle
- Dimensions: 1.68" W x 2.19" H x 3.31"D

MISCELLANEOUS ELECTRICAL

Alternating Headlights

The chassis high beam headlights shall alternately flash and shall be controlled by a switch inside the cab.

Rear Audible Indicator Alarm

An audible indicator alarm with two (2) rubber covered signal push buttons shall be provided.

The audible indicator alarm located in the interior of the cab provides communication between the cab personnel and the ground personnel at the rear of the unit. The two (2) rubber covered rear signal push buttons shall be mounted behind the driver`s and officer`s beavertail hand rail and be accessible from the ground.

Back-Up Alarm

An electronic back-up alarm shall be supplied. The 97 dB alarm shall be wired into the chassis back-up lights to signal when the vehicle is in reverse gear.

12-Volt Power Lead

One (1) 12-volt 12-gauge constant hot lead shall be provided. The lead shall be 24" long and include a ground wire and fuse.

The lead shall be located centered on rear cab wall below seat support channel.

Back-Up Sensor System

A Collision Avoidance System rear obstacle detection with voice distance indication shall be installed on the apparatus. The Model CAS-4HW system shall include four (4) heavy-duty stainless-steel sensors located at the rear of the vehicle, a weatherproof control box and a speaker in the cab near the driver. The system shall "warn" the driver with a "beeping" sound indicating potential obstacles at the rear of the vehicle and a clear voice shall "tell" the operator +a countdown of the remaining distance in feet as the vehicle reverses.

12 Volt DC Power Distribution Module

A Blue Sea Model 5032 12 place, split bus fuse block with ground, 12-volt DC power distribution module shall be provided. The module shall provide two isolated groups of six circuits and shall be wired through switched hot and battery hot and include a battery ground.

Location: behind officer's seat.

BREAKER BOX

Circuit Breaker Panel

An eight (8) place breaker box with up to six (6) appropriately sized ground-fault interrupter circuit breakers shall be supplied. The breaker box will include a master breaker sized according to the generator output which will occupy two (2) places.

Location: R3 forward wall.

LED LIGHTS

Front Cab Brow Light

One (1) FireTech 12-Volt LED Model FT-B-72-ML 72" black housing brow light with integral marker lights shall be provided. The light shall be installed on the front cab brow in place of the standard DOT marker lights. The light shall feature 54 LEDs` producing 19,665 usable lumens and five (5) DOT approved marker lights.

Side Cab Brow Lights

Two (2) FireTech 12V LED mini-brow flood lights Model FT-MB-27-W 35" long shall be provided. The light shall feature 27 LEDs` producing 9,317 usable lumens. The 135W 12V light shall draw 11.25 amps. A switch shall be provided, accessible to driver, for activation of light.

The light assembly shall be located driver and officer side over rear cab door.

Body Side Brow Light

One (1) FireTech 12-Volt LED Model FT-B-72 72" black housing scene shall be provided. The light shall feature 57 LEDs` producing 19,665 usable lumens.

Location: above L3 offset rearward and above R3 offset rearward.

RECEPTACLE

Receptacle

A 20-amp, 110 volt 3-prong straight blade NEMA 5-20 duplex household receptacle with stainless-steel cover plate shall be installed in a non-weather exposed area as specified by the department. The receptacle shall be wired to the inlet receptacle where it will have overcurrent protection from an external source.

Location: center rear wall of center rear medical compartment up high.

~~Power Strip Receptacles~~

~~A 15 amp, 110-volt 3-prong straight blade (NEMA #5-15) 8-outlet household power strip shall be installed and shall be wired to the shoreline.~~

~~Location: R3 forward wall.~~

~~AERIAL MODEL~~

~~110` Aerial Device~~

~~Aerial Ladder Requirements~~

~~It is the intent of these specifications to describe a telescopic aerial ladder of the open truss design that is compliant with NFPA 1901 (2016 edition) chapter 19 sections 19.2 through 19.6 and sections 19.17 through 19.25. Some portions of this specification exceed minimum NFPA recommendations and are to be considered a minimum requirement to be met.~~

~~The aerial ladder shall consist of four (4) extruded aluminum telescopic ladder sections operating from -2 degrees to 82 degrees and designed to provide continuous egress for firefighters and civilians from an elevated position to the turntable.~~

~~The aerial device shall have a vertical height of 110ft at full extension and elevation. The measurement of height shall be consistent with NFPA 1901 section 19.2.2.~~

~~The rated horizontal reach shall be 102ft. The measurement of horizontal reach shall be consistent with NFPA 1901 19.2.3. The measurement shall be from the outermost rung at full extension to the centerline of turntable rotation.~~

~~The aerial shall have a maximum stabilizer spread of 11ft from pin to pin.~~

~~The ladder shall be able to provide full operating capacities in up to 35 mph wind conditions.~~

~~Aluminum Aerial Ladder~~

~~The aerial ladder shall exceed the requirements of NFPA 1901 19.2 Aerial Ladder Requirements as detailed in these specifications. To ensure a high strength-to-weight ratio and an inherent corrosion resistance, the aerial ladder shall be completely constructed of high strength aluminum. All side rails, rungs, handrails, uprights and K-braces shall be made of structural 6061T6 aluminum alloy extrusions. All material shall be tested and certified by the material supplier. All ladder sections shall be semi-automatically welded by inert gas shielded arc welding methods using 5356 aluminum alloy welding wire. Structural rivets or bolts shall not be utilized in the ladder weldment sections.~~

~~Due to the unpredictable nature of fireground operations, a minimum safety factor of 2.5 to 1 is desired. This structural safety factor shall apply to all structural aerial components including turntable and torque box stabilizer components. Definition of the structural safety factor shall be as outlined in NFPA 1901 A.19.20.1:~~

~~**DL** = Dead load stress. Stress produced by the weight of the aerial device and all permanently attached components.~~
~~**RL** = Rated capacity stress. Stress produced by the rated capacity load of the ladder.~~
~~**WL**= Water load stress. Stress produced by nozzle reaction force and the weight of water in the water delivery system.~~
~~**FY** = Material yield strength. The stress at which material exhibits permanent deformation.~~

~~2.5 x DL + 2.5 x RL + WL equal to/less than FY~~

~~The minimum NFPA specification is exceeded in this paragraph by requiring safety margin above 2 to 1 while flowing water.~~

~~The stability factor or tip over safety margin shall be a minimum of 1.5 to 1 as defined by NFPA 1901 19.21.~~

~~All welding of aerial components, including the aerial ladder sections, turntable, torque box and outriggers shall be performed by welders who are certified to American Welding Society Standards D1.1, D1.2 and D1.3 as outlined in NFPA 1901 19.22.3.1.~~

~~The weldment assemblies of each production unit shall be tested visually and mechanically by an ASNT certified level II non-destructive test technician to comply with NFPA 1901 19.22.2. Testing procedures shall conform to the American Welding Society Standard B1.10 Guide for non-destructive testing. Test methods may include dye penetrate, ultrasound and magnetic particle where applicable.~~

Each ladder section shall consist of two (2) heavy extruded aluminum side rails and a combination of aluminum rungs, tubular diagonals, verticals and two (2) full-length handrails. The rungs on the lower three (3) sections as well as eleven (11) bays of the fly section shall be K-braced for maximum lateral stability. This K-bracing shall extend to the center of each rung to minimize ladder side deflection.

The ladder rungs shall be designed to eliminate the need for rubber rung covers. The rungs shall be spaced on 14-inch centers and have integral skid-resistant surface as outlined in NFPA 1901 19.2.5 through 19.2.5.3. An oval-shaped rung shall be utilized to provide a larger step surface at low angles and more comfortable grip at elevated positions. The minimum design load shall be 500 pounds distributed over a 3 1/2" wide area per rung as outlined in NFPA 1901 19.2.5.4.

The aerial ladder shall exceed NFPA 1901 sections 19.2.6 and 19.2.8 governing the minimum ladder section width and handrail height.

Section	**Width**	**Height**
Base Section	36"	28-1/2"
Second Section	29-3/4"	25"
Third Section	24-3/8"	21-1/2"
Fly Section	19-3/4"	18"

Ladder Extension Mechanism

Both power extension and retraction shall be furnished and meet the requirements of NFPA 1901 section 19.19, 19.20.3, and 19.5.3. Extension shall be by way of two (2) extending cylinders mounted on the underside of the base section of the ladder.

Extension Cylinder Size

Bore 3 ¼"
Stroke 94"

The cylinders shall operate through a block and tackle cable arrangement to extend and retract the ladder. Maximum extension of the ladder is to be automatically limited by the stroke of the cylinders. The normal operating cable safety factor shall be 5:1 and the stall safety factor shall be 2:1 based on the breaking strength of the cables. The minimum ratio of the diameter of wire rope used to the diameter of the sheave used shall be 1 to 12. The cables shall be treated with Pre-Lube 6 for increased service life.

Ladder Cable Size

1st section (4 cables - 2 extend, 2 retract) 7/16" 6 x 19 galvanized cable

~~2nd section (4 cables - 2 extend, 2 retract) 5/16" 7 x 19 galvanized cable~~
~~3 rd section (4 cables - 2 extend, 2 retract) 5/16" 7 x 19 galvanized cable~~

~~The ladder assembly shall consist of four (4) separate weldments that shall extend and retract within each other. Nylatron NSM slide pads shall be utilized between each section to minimize friction. Nylatron NSM slide pads shall be installed at the tip of the lower three (3) sections to accommodate the sliding loads as the ladder is extended.~~

~~Aerial Extension Indicator~~

~~Reflective tape stripes shall be installed on the ladder top handrail of the base section to indicate extension in 5-foot increments. Numeric indicators shall be placed at 10-foot increments. A reflective dot on the base of the 2nd section shall provide a visual reference for the operator to estimate aerial elevation.~~

~~Aerial Finish~~

~~To reduce maintenance expense the aerial shall have a natural aluminum swirled finish. Visible inspection of all ladder weld joints shall be possible without having to remove paint or body filler to reveal the weld bead.~~

~~Operation Times~~

~~The aerial shall complete the NFPA 1901 19.2.12 time test in no more than 120 seconds. This test involves raising the aerial from the bedded position to full elevation and extension and rotating to 90 degrees. This test is to begin with the stabilizers deployed.~~

~~Time to extend ladder maximum 30 seconds~~
~~Time to retract ladder maximum 30 seconds~~
~~Time to raise ladder maximum 25 seconds~~
~~Time to lower ladder maximum 25 seconds~~
~~Time to rotate 180 degrees maximum 80 seconds~~

~~Aerial Ladder Rated Capacity~~

~~The aerial device shall have a rated capacity of 300 lbs. consistent with NFPA 19.3.1 through 19.3.2. The rated capacity shall include 250 lbs. in personnel allowance and 50 lbs. for equipment mounted at the tip of the ladder. The aerial device shall be rated in multiple configurations as outlined in 19.3.4. A sign mounted at the base of the aerial shall communicate the following ratings in the unsupported fully extended configuration while maintaining a 2.5 to 1 safety margin as defined in NFPA 1901 A.19.20.1. The loads in each configuration are in addition to 50 lbs. of equipment mounted at the tip.~~

~~Condition #1- Tip load only, no water flowing~~

Elevation	Capacity	Pounds
-2 to 30 degrees	1 person	250 lbs.
31 to 50 degrees	2 people	500 lbs.
51 to 82 degrees	3 people	750 lbs.

Condition #2- Distributed loads no water flowing. (These include one person at the tip)

Elevation	Capacity	Pounds
-2 to 21 degrees	1 person	250 lbs.
22 to 35 degrees	2 people	500 lbs.
36 to 50 degrees	4 people	1000 lbs.
51 to 82 degrees	8 people	2000 lbs.

Condition #3- Ladder tip load while flowing 1000 gpm with pre-piped waterway

Elevation	Capacity	Pounds
-2 to 25 degrees	0	0
26 to 45 degrees	1 person	250 lbs.
46 to 82 degrees	2 people	500 lbs.

Hydraulic System

The hydraulic plumbing shall consist of hydraulic stainless-steel tubing wherever possible in order to:

- Eliminate hose wear.
- Eliminate the corrosion associated with galvanized steel tubing.
- Provide a stronger medium to carry the hydraulic fluid.

An interlock device shall be provided to prevent activation of the aerial ladder hydraulic pump until either the transmission is placed in neutral and the parking brake is set, or the transmission is placed in drive and the rear driveline is disengaged as outlined in NFPA 19.17.3.

The hydraulic system shall be of the latest design and incorporate features to minimize heat buildup and provide smooth control of the aerial ladder. The system shall meet the performance requirement in NFPA 19.19.6 and 19.19.7, which requires adequate cooling under 2-1/2 hours of operations.

All hydraulic components that are non-sealing whose failure could result in the movement of the aerial shall comply with NFPA 19.19.1 and have burst strength of 4 to 1. Dynamic sealing components whose failure could cause aerial movement shall have a margin of 2 to 1 on maximum operating pressure per NFPA 19.19.1.1. All hydraulic hoses, tubes, and connections shall have minimum burst strength of 3 to 1 per NFPA 19.19.2.

A hydraulic oil pressure gauge shall be supplied at the base control location per NFPA 1901 19.19.4.

The hydraulic system shall consist of a 55-gallon reservoir mounted to the torque box and plumbed to the hydraulic pump. The tank shall be supplied with a removable top to access tank strainer filter. There shall be plumbing for a supply and return line and a tank drain on the reservoir. The reservoir cap shall be marked per NFPA 19.19.5.2. Gated valves under the tank shall facilitate filter changes.

The hydraulic system shall use 5w-20 multi-weight, SAE 32 grade oil and incorporate the following filters to provide dependable service:

Reservoir Breather: 10-micron
Magnetic Reservoir Strainer: 125-mesh
Pressure Filter (Torque Box): 3-micron

The aerial hydraulic system shall be designed in such a manner that a hydraulic pump failure or line rupture shall not allow the aerial or outriggers to lose position. Hydraulic holding valves shall be mounted directly on cylinders. To ensure reliable performance of holding valves, no hoses shall be permitted between a holding valve and cylinder.

The hydraulic system shall be designed with an auxiliary power unit meeting the guidelines of NFPA 1901 19.18.7. The auxiliary power unit shall be a 12-volt pump connected to the chassis electrical system. The pump shall provide operation at reduced speeds to store the aerial device and outriggers for road transportation. Self-centering switches shall be provided at the turntable and each stabilizer control station to activate the system. The system shall be designed to provide a minimum of five (5) minutes of hydraulic power to operate functions.

Hydraulic power to the ladder shall be transferred from the torque box by a hydraulic swivel.

Aerial Torque Box

The aerial shall utilize an integral torque box design. The integral torque box design shall serve to carry the chassis, body, and aerial device as an integrated system. The system design shall provide a lower center of gravity to enhance road performance, a mounting location for underslung stabilizers, and additional space for body compartments. The strength of the torque box shall be a minimum 12.6 million inch pounds resistance to bending moment. The stabilizers and turntable supports shall be welded directly to the torque box.

Stabilization

The unit shall be equipped with two (2) sets of extendable criss-cross underslung stabilizers. The stabilizers shall have a spread of 11 feet centerline to centerline of the stabilizer pads when fully

~~extended. One (1) set of stabilizers shall be mounted in the forward body area and a second set close to the rear axle to minimize impact on departure angle. The stabilizers shall have an inner and outer tube that slide on low friction pads for deployment. The stabilizers shall have a tip over safety margin of 1 1/2 times the rated load imposed by the aerial in any position the aerial device can be placed as outlined in NFPA 1901 19.21.2. The apparatus stabilization shall be accomplished without the assistance of the chassis suspension or tires in contact with the ground.~~

~~The aerial shall be able to sustain a 1 1/3 to 1 rated load on a 5 degree slope downward in the position most likely to cause overturning as outlined in NFPA 1901 19.21.3. The maximum ground slope the apparatus can be set up on is 12 percent. On the 12 percent slope the apparatus can be leveled within a 6 percent operating range for the apparatus.~~

~~The cylinders shall be supplied with dual pilot operated check valves on each stabilizer cylinder to hold the cylinder in the stowed or working position should a charged line be severed at any point in the hydraulic system. The stabilizers shall level side to side, corner to corner and front to rear on uneven terrain. Stabilizers shall contain safety lock valves. This assures there will be no "leak down" of stabilizer legs. Mechanical pins are not required. This feature contributes to efficient set up and field operation.~~

~~The stabilizer lift cylinders shall be sized to maximize ground penetration. The lift cylinders shall be mounted on the side of the torque box for protection and shall have the following dimensions:~~

~~Bore: 5"~~
~~Stroke: 11"~~

~~The stabilizer extension cylinders shall have the following dimensions:~~

~~Bore: 2"~~
~~Stroke: 26"~~

~~Each Stabilizer that can be extended from the body shall be supplied with a red warning light as outlined in NFPA 19.21.4.4. A stabilizer extended warning light shall be supplied in the cab to warn the driver of an extended stabilizer condition as outlined in NFPA 1901 13.11. A floodlight shall be supplied in each stabilizer location to illuminate the stabilizer and ground. The light shall automatically turn on with the deployment of the stabilizer.~~

~~The stabilizer ground contact area for each foot pad shall be 10" x 14" without auxiliary pads and 24" x 24" with auxiliary pads deployed. The ground pressure shall not exceed 75 psi with auxiliary pads deployed when the apparatus is fully loaded and the aerial device is carrying its rated capacity in every position. This shall be accomplished with the stabilizer pads deployed, as outlined in NFPA 19.21.4.2.~~

~~**Stabilizer Controls**~~

~~Four (4) electric solenoid valves shall control the stabilizers. The control switches shall be located at the rear of the apparatus, so the operator may observe the stabilizers during deployment. An audible alarm with a minimum 87 dBA shall also sound while the stabilizers are in motion as required by NFPA 19.21.4.1. Stabilizer deployment shall be completed in less than 60 seconds.~~

~~There shall be an interlock that prevents the operation of the ladder until the stabilizers are down and properly set as outlined in NFPA 19.17.5. Four (4) micro-switches, one (1) on each jackleg, shall sense when all four (4) jack feet are in firm contact with the ground. This condition shall be indicated when all four (4) yellow jacks-down indicator lights are on and the green interlock light is on. When the apparatus has been leveled, a manual transfer switch shall be used to shift hydraulic power to ladder operations. The interlock system shall have a manual override with access through a door on the rear control panel.~~

~~To simplify leveling the apparatus, two (2) color-coded level indicators shall be supplied at the rear of the apparatus. One (1) indicator shall be for front-to-rear level and one (1) for side-to-side level.~~

~~Forward Aerial Support~~

~~The aerial ladder support shall be fabricated from steel components and be welded directly to the torque box chassis. The ladder support uprights shall be constructed from 7/8" thick steel plate. Bolt-in diagonal bracing shall be installed on the support structure in an "X" pattern to restrict to side movement. This design shall allow for a pre-determined amount of flex preventing premature failure that can be found in an overly rigid structure. The support shall be located behind the rear wall of the cab.~~

~~Turntable Support Assembly~~

~~The aerial ladder turntable assembly shall be mounted at the rear of the apparatus. The turntable support assembly shall be welded to the integral torque box for efficient transfer of aerial loads to the stabilizers and shall permit storage of ground ladders in the center rear of the apparatus. The complete turntable support assembly shall be multi-pass welded to the sides of the combination chassis frame torque box.~~

~~The turntable support assembly shall be a steel weldment constructed of four (4) vertical 1/2" x 5" x 5" square tubing with identical tubing welded in between the top ends of the verticals.~~

~~A bearing mounting plate shall be welded to the top of the verticals and sides of the horizontals. The bearing mounting plate shall be 43" x 43" and shall have a 1-1/2" thickness. This bearing mounting plate shall be bulkheaded to a 3/4" steel plate that is welded to the bottoms of the horizontal tubing. The use of multi-pass welding shall be utilized wherever possible.~~

~~A 34-1/4" rotation bearing with a 3" face drive gear shall be bolted to the top of the bearing mounting plate with thirty (30) 3/4" grade 8 plated bolts. The gear tooth shall be stub tooth form.~~

~~Upper Turntable~~

~~The upper turntable assembly shall attach to the rotation bearing and the base of the ladder.~~

~~The turntable platform shall be a one-piece flanged steel plate that is a minimum of 96" in diameter and 3/8" thick. The working platform shall be covered with a non-skid material for operator safety. Three (3) railings 42" high shall be provided along the outside of the turntable disc as outlined in NFPA 1901 19.18.1. There shall be a control pedestal on the left side of the turntable. The turntable assembly shall provide a mounting base for the ladder and elevating cylinders. The turntable assembly shall be bolted to the turntable bearing by twenty (20) 3/4" grade 8 plated bolts.~~

~~The ladder pivot point shall connect to the upper turntable assembly by two (2) 2-1/4" ID spherical bearings.~~

~~Elevation Mechanism~~

~~The aerial shall utilize dual 5" bore 38-1/2" stroke elevating cylinders to attach the upper turntable assembly and bottom of the base ladder section. A 1-3/4" pin and bearing system shall connect to the turntable. A 2" pin and bearing system shall connect to the base section of the ladder. The elevation system shall be designed following NFPA 1901 19.5.1. The elevation hydraulic cylinders shall incorporate cushions on the upper limit of travel. The hydraulic elevation cylinders shall also serve as a locking device to hold the aerial in the stored position for road travel.~~

~~Rotation Mechanism~~

~~The aerial shall be supplied with a hydraulically-powered rotation system as outlined in NFPA 1901 19.5.2. The hydraulic rotation motor shall provide continuous rotation under all rated conditions and be supplied with a spring-applied brake to prevent unintentional rotation.~~

~~Aerial Electric Power~~

~~A hydraulic swivel shall be installed to provide hydraulic fluid transfer to the aerial ladder cylinders, electrical power to the aerial ladder, and water delivery to the pre-plumbed waterway while permitting continuous 360-degree rotation. The swivel shall provide two (2) hydraulic circuits, twenty-four (24) electrical circuits, and one (1) 4" passage for waterflow. The swivel shall be environmentally-sealed to prevent contamination of the hydraulic fluid.~~

~~Aerial Ladder Operating Position~~

~~An aerial ladder operator`s position shall be supplied as outlined in NFPA 1901 19.4. The operator`s position shall be located on the left side of the aerial turntable. The apparatus shall be supplied with labels to warn of electrocution hazard. The control console shall provide a service access door on the back and side of the console to access hydraulic and electrical connections. The electrical panel shall be contained in a junction box with labeled wires. The console shall be angled, labeled and supplied with lights for night operation.~~

~~Console Cover~~

~~A diamond plate contoured hinged cover shall be supplied to protect the console from the elements. The cover shall latch in the stored position and swing away from the console so as not to interfere with sight of the aerial device.~~

~~Aerial Ladder Control Levers~~

~~The control levers shall be arranged as outlined in NFPA 19.17.7. The first lever from the left shall be the extension control (forward for extend and back for retract). The second lever shall be for rotation (forward for clockwise and back for counter clockwise). The third handle shall control elevation (forward for down and back for up). The aerial shall employ direct hydraulic controls for precise control and dependable service with minimal electrical functions. A ring around the control console shall be provided to prevent unintentional movement as outlined in NFPA 19.17.6.2.~~

~~Rung Alignment Indicator~~

~~A light on the control console shall indicate when the ladder rungs are aligned for climbing.~~

~~Aerial Alignment Indicator~~

~~A reflective arrow mounted to the body and the turntable shall indicate when the aerial is aligned for travel bed.~~

~~Load Indication System~~

~~A lighted elevation/safe load indicator diagram shall be located on the lower left side of the base section to indicate safe load capacity at any angle of elevation. The safe load indicator shall be 15" x 15" in size and clearly communicate aerial capacity in any one of the following conditions: tipload, tipload with water flowing, and distributed load at full extension. The chart shall identify capacity using graphic characters to indicate each 250 lb. increment. The chart shall be equipped with lighting and warn of electrocution hazards from power lines and lightning.~~

~~Aerial Waterway~~

~~A 1000 gpm pre-piped waterway shall be supplied as outlined in NFPA 1901 19.6. The waterway shall telescope to the end of the third section (87ft level). A waterway of 4" internal diameter shall run through the turntable and a swivel joint to connect to the tubular aerial waterway. The tubular waterway shall run under the aerial ladder. The waterway tubes shall have the following sizes:~~

~~Base Section: 5" OD~~
~~Mid Section: 4-1/2" OD~~
~~3rd Section: 4" OD~~

~~The tubes shall be constructed of hard coat anodized aluminum and shall be telescopic with the aerial ladder through sealed slip joints. The slip joints shall be designed with grease zerk fittings to facilitate lubrication.~~

~~A 1-1/2" drain valve shall be installed and operated from the rear of the apparatus.~~

~~The water system shall be capable of flowing 1000 gpm at 100 psi nozzle pressure at full elevation and extension. The friction loss between the tip and below the swivel shall not exceed 100 psi while flowing 1000 gpm as outlined in NFPA 1901 19.6.1. and 19.6.2.~~

~~**Waterway Relief Valve**~~

~~An automatic relief valve preset at 250 psi shall be installed in the aerial waterway to prevent over-pressurization of waterway system. The relief valve shall be mounted in the lower portion of the waterway where it enters the aerial torque box frame and dumps under the apparatus.~~

~~**Ladder Tip Step**~~

~~Two (2) split design folding steps shall be located near the ladder tip to provide a position for a firefighter using the ladder pipe / monitor as outlined in NFPA 1901 19.2.9. The steps shall have a raised surface for traction and cut outs for deployment.~~

ISO Compliance

The manufacturer shall operate a Quality Management System meeting the requirements of ISO 9001:2000.

The International Organization for Standardization (ISO) is a recognized world leader in establishing and maintaining stringent manufacturing standards and values. The manufacturer`s certificate of compliance affirms that these principles form the basis for a quality system that unswervingly controls design, manufacture, installation, and service.

The manufacturer`s quality systems shall consist of, but not be limited to, all written quality procedures (aka QOP) and other procedures referenced within the pages of the manufacturer`s Quality Manual, as well as all Work Instructions, Workmanship Standards, and Calibration Administration that directly or indirectly impacts products or processes. In addition, all apparatus assembly processes shall be documented for traceability and reference. The manufacturer shall also engage the services of a certified third party for testing purposes where required.

If the manufacturer operates more than one manufacturing facility each facility must be ISO certified.

By virtue of its ISO compliance the manufacturer shall provide an apparatus that is built to exacting standards, meets the customer`s expectations, and satisfies the customer`s requirements.

A copy of the manufacturer`s certificate of ISO compliance for each manufacturing facility shall be provided with the bid.

AERIAL HYDRAULIC SYSTEM OPTIONS

Aerial Hydraulic Oil Level Gauge

A hydraulic oil level gauge shall be supplied for easy fluid level verification. The three-light system shall indicate full oil level with a green light, acceptable oil level with yellow light, and low oil level with a red light. The display shall be located next to aerial master panel.

Filter Isolation Kit

Three (3) valves shall be provided to minimize fluid loss when changing the aerial hydraulic filter elements during routine maintenance. One (1) 1" ball valve shall be installed at the inlet side of the return filter. Two (2) 3/4" check valves shall be installed on the pressure filter, one (1) on the inlet side and one (1) on the outlet side.

Aerial Cold Weather Package

The aerial hydraulic system shall be provided with a 1.5" suction hose to improve performance in cold weather climates.

AERIAL CONTROLS

Aerial Control System

The aerial hydraulic system shall be equipped with a microprocessor based electric over hydraulic control system. The system shall include electronic ramping to provide smooth acceleration and deceleration of aerial functions during sudden movements of the operator control levers. The ladder shall utilize three (3) combination proportional control valves for smooth aerial device movements. The hydraulic system valve body shall be located in the turntable console.

The switch modules on the console shall be CAN based for reliable operation. The system shall utilize 32-bit control module(s) rated for mobile applications.

The control system shall have manual overrides in the event of a system failure. The overrides shall be located directly on the electric / hydraulic control valve within easy reach of the turntable operator. The manual system shall be organized to match the base controllers with the functions clearly labeled.

Aerial Speed Switch

The control system shall be provided with a "creep speed" switch for precise aerial movement. When activated, the aerial shall operate a slow speed and the chassis engine will remain at idle speed.

Variable Ramping

A three (3) position switch shall be provided to select system ramping (ladder movement when initiating or ceasing movement of a control lever). The switch shall allow selection of normal (1/2 second), firm (1/4 second) or soft (3/4 second) ramping based on operator preference.

End of Stroke Cushioning

The aerial system shall monitor the aerial position and when the ladder is near full extension, retraction and elevation (up and down) will slow the ladder movement down for softer stops. The sensors shall be CAN based for accurate and reliable performance.

Body Protection

The aerial control system shall feature programming to prevent the aerial from contacting the body. The system shall feature multiple zones to optimize operational envelop based on a specific apparatus configuration. When approaching a protected zone the aerial shall automatically ramp down in speed to come to a soft stop. A momentary switch shall be provided to allow the aerial operator to by-pass the body protection zone.

Aerial Information System Display

The aerial device shall be equipped with a color display at the turntable console that provides critical information to the aerial operator for added safety.

Information shall be conveyed to the operator using J1939 protocol through multiple mission-specific screens, each tailored for a specific fireground activity. The screens display shall include available tip load, distributed load, master stream and aerial systems data.

The available tip load shall be represented in simple "Stick-Figure" type symbols that show the allowable quantity of people at the tip based on ladder position. The screen layouts shall be uncluttered allowing the symbols to be easily read at a glance. The system shall also feature programming that calculates the allowable tip load based on elevation and extension, allowing for increased tip capacity when possible. Systems that rely on hydraulic pressure to determine load shall not be acceptable.

In addition to available tip load, the display shall provide the following information:

- Ladder extension (%)
- Ladder inclination in degrees
- Ladder rotation position

- Rated distributed load
- Waterway flow
- Total waterway flow (with reset button)
- Waterway pressure
- Tip temperature
- Hydraulic oil pressure
- Hydraulic oil temperature
- Hydraulic oil level
- Aerial hourmeter
- Rung alignment status
- Cradle alignment status
- Aerial PTO status
- Aerial PTO engage
- Breathing air status (if equipped with breathing air)
- Fuel Level
- Transmission temperature
- Engine RPM
- Coolant temperature
- Engine oil pressure
- Battery voltage
- Pump in gear status (if equipped with a pump)
- OK to pump status (if equipped with a pump)
- Chassis engine start / stop
- Chassis air horn switch

The display shall be capable of showing system units in standard or metric values.

Audible Warnings

The system shall include alarms to indicate when tip temperature is greater than 300°F, tip temp below 32°F, hydraulic oil temperature is above 190°F and when breathing air is below 20% and 5% volume (if equipped),

Visual Warnings

In addition to the audible warnings, the system shall include visual warning indicators for high tip temperature, low tip temperature, high hydraulic oil temperature and low breathing air (if equipped),

Display Screen

- 7" bonded Transflective LCD screen (Sunlight viewable)
- 16-bit color format
- 800 x 480 resolution
- LED backlighted switches
- Environmentally sealed housing

- Fourteen (14) integrated tactile navigation buttons

Sensors

- Ladder extension
- Ladder inclination
- Turntable rotation
- Waterway pressure
- Waterway flow
- Tip temperature
- Hydraulic oil pressure
- Hydraulic oil temperature
- Hydraulic oil level
- Cradle alignment
- Rung alignment
- Breathing air pressure (If equipped with breathing air)

Cradle Assist Switch

The control system shall also include a momentary switch to assist in stowing the aerial. The switch, in conjunction with moving the "down" aerial control lever shall cause the aerial to rotate to center and lower into the cradle. The system shall be operational when the aerial is below 30 degrees in elevation and 30 degrees left or right of center.

Cradle Alignment Light

A green light shall be provided at the turntable control console to indicate when the aerial is aligned for bedding.

Monitor Stow Switch

The control system shall also include a switch to deploy and stow the waterway monitor (if equipped with a pre-piped waterway).

Emergency Stop Switch

An emergency stop switch shall be provided on the console that turns off the controllers and de-energizes the PTO in the event the aerial must be stopped immediately. The system shall include both visual and audible indicators that the switch has been activated.

Durability

The components shall be thoroughly tested and have a proven reliability in severe environments to ensure long life on the fireground. The system shall be capable of operating in a temperature range of -40°C through +85°C.

Diagnostics

The system shall feature diagnostic capabilities that includes an I/O status screen separated by component.

Aerial Console Cover Hold-Open

The aerial console cover shall be equipped with a gas shock-style hold-open device. The gas shock shall hold the cover open 90 degrees to the side.

MONITOR

1000 GPM Electric Monitor

The aerial ladder shall be equipped with an TFT Monsoon RC electrically controlled monitor with a powder coated silver finish. The monitor shall be equipped with Master Stream stacked tips YST-4NN with built in stream straightener capable of discharging 250-1,000 gpm at 100 psi nozzle pressure. This waterflow capability shall be available at any extension, elevation, or position without any restrictions while flowing 1,000 gpm. A minimum stability factor of 1.5 to 1 shall be maintained in this configuration.

The operational range of the electric monitor and nozzle shall be 135 degrees through the vertical plane (90 degrees upwards from a line perpendicular to the aerial ladder and 45 degrees downward), and 180 degrees through the horizontal plane (90 degrees to either side of the aerial ladder center line). The monitor shall be able to move in the horizontal and vertical axis simultaneously.

The monitor relay box shall include solid state components and shall be coated to resist corrosion. The monitor shall have fully enclosed motors and gears with built in manual override capability.

Control switches for horizontal movement, vertical movement and pattern selection shall be located at the control panel.

Monitor Tip Controls

In addition to the controls at the operator console, electric monitor directional and stream controls shall be installed in close proximity to the monitor on the ladder to allow operation by a firefighter on the ladder.

AERIAL WARNING LIGHTS

Ladder Tip Warning Lights

Two (2) Whelen Vertex Model VTX609R red Super-LED light heads with clear lenses shall be supplied and mounted one each side at the ladder tip. The lights shall include Model VTXFC chrome flanges.

The lights shall be wired to activate with the aerial master power switch.

AERIAL LIGHTING

Tip Light Locations

All spot, flood and quarts lights at the of the fly section shall be mounted back as far as possible from the tip of the ladder.

~~Ladder Climbing Lights~~

~~Luma-Bar Pathfinder LED lighting system shall be provided to illuminate the climbing area inside both sides of each ladder section. The strip type lights shall be located above ladder rung level and directed toward the centerline of the ladder to reduce glare. The lights shall be mounted to a 1.25" x .5" x .125" extruded aluminum channel and wired to not be an obstruction during climbing. The lights shall be controlled with the ladder lights switch at the operator`s control console.~~

~~The LED lights shall be Blue.~~

Base Flood/Spot Light

A pair of 12-Volt FireTech Model FT-WL3500-FT-W LED flood/spot lights shall be provided on the base section of the aerial device. Includes hardwired switch at turntable console.

Tip Light

A 12-Volt FireTech Model FT-WL-X-9-FT-W-SH LED combination spot / flood light with white housing shall be provided on the tip of the aerial device. The light shall produce 7,200 lumens and draw 4.3 amps. Includes switch on lighthead at turntable console. The light shall be located right side tip.

LED Outrigger Lights

Four (4) Whelen M6V2R Super LED red light heads with red lens shall be provided. The rectangular lights shall include chrome flanges. The lights shall be surface mounted on the

outrigger covers in compliance with current NFPA 1901. Warning and ground lights shall be activated with aerial master switch.

WATERWAY OPTIONS

Waterway Inlet

One (1) 4" inlet shall be provided at the rear of the apparatus and shall be connected to the vertical pedestal waterway piping to supply water to the aerial waterway from an outside source. All fabricated piping shall be constructed of a minimum of Schedule 10 stainless steel piping to help prevent corrosion. The threads shall be NST. A long handle chrome plated 4" NST cap shall be installed on the inlet.

Waterway Pressure Gauge

The waterway gauges shall be 4" (101mm) diameter Innovative Controls pressure gauges.

Each gauge shall have a rugged corrosion free stainless-steel case and clear scratch resistant molded crystals with captive O-ring seals to ensure distortion free viewing and seal the gauge.

The gauges shall be filled with a synthetic mixture to dampen shock and vibration, lubricate the internal mechanisms, prevent lens condensation and ensure proper operation from –40F to +160F.

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

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

Waterway Inlet Valve

Waterway Inlet Valve

A 4" diameter electrically operated Akron valve shall be installed in the auxiliary waterway inlet piping to allow control of the water flow into the aerial waterway.

The valve shall be an Akron 8840E HD series with a bronze flat ball design for ease of operation and increased abrasion resistance. The valve shall have a self-locking ball feature using an automatic friction lock design to balance the brass ball when in a throttle position with water flowing through it.
The valve shall be of the unique Akron Swing-out design to allow the valve body to be removed for servicing without disassembling the plumbing.

The valve shall utilize an electric driven worm gear actuator with a Navigator 9333 controller. The 9333 controller shall be located at the pump operator`s panel and contain indicator lights for open, closed and throttled valve positions. The valve may also be operated manually in case of electrical system failure.

The valve control and indicator shall be located adjacent to the Waterway inlet.

Waterway Inlet Relief Valve

A variable-pressure-setting relief valve shall be installed on the inlet side of the 4" shut-off valve. A bleeder shall be installed to allow air to be expelled from the supply line prior to feeding the aerial waterway.

All fabricated piping shall be a minimum of Schedule 10 stainless steel for superior corrosion resistance and decreased friction loss.

AERIAL EQUIPMENT

Axe Bracket

An axe bracket shall be provided on the aerial ladder. The bracket shall be Zico Model# H-AB blade guard and PAC TRAC Model# 1004 clamp for the handle. The bracket shall be designed to hold a 6 lb. axe.

Location: left side fly section.

Pike Pole Mount

There shall be an aluminum tube mounted directly on the ladder for storage of a 12` pike pole. The tube shall be located left side fly section.

Lifting Eye

A lifting eye shall be provided at the tip of the ladder. The eye shall be constructed of aluminum with a slotted hole to allow for webbing to easily pass through. The lifting eye shall allow for a load equal to the rated tip load capacity of the ladder, up to 500 pounds.

AERIAL LADDER BRACKETS

Roof Ladder Bracket

A lift-out style roof ladder mounting bracket shall be installed on the outside of the ladder base section. The bracket shall be designed to hold a PRL-16 on right side of base section.

SIGN PLATES

Aerial Sign Plate

Two (2) 22" x 144" x 1/8" (0.125") thick smooth aluminum plates shall be provided. The plates shall have 1" lips top and bottom for rigidity. Each sign plate shall be bolted on either side of the base section, approximately at the midpoint. The plates shall be provided to display the department`s name or other information. The plates shall be painted Job Color as specified by the customer.

AERIAL TESTING

Third-Party Flow Test

A flow test shall be conducted to determine that the water system is capable of flowing 1,000 gpm at 100 psi nozzle pressure with the aerial device at full extension and elevation. When the aerial apparatus is equipped with a fire pump, the test shall be conducted using the onboard pump. Intake pressure for the onboard pump shall not exceed 20 psi.

In addition to the flow test, a hydrostatic test shall be done on the waterway system. The permanent water system, piping, and monitor shall be hydrostatically tested at the maximum operating pressure required to flow 1,000 gpm at 100 psi nozzle pressure at maximum elevation and extension.

These results shall be certified by an independent, third-party testing organization, per NFPA 16.13.1 through 16.13.1.3.

Aerial Certification

All certification shall be performed by a certification organization that is accredited for inspection and testing systems on fire apparatus in accordance with ISO/IEC 17020.

The aerial ladder shall be tested in compliance with the current editions of NFPA 1901 and NFPA 1911. All critical structural components of the aerial shall include 100% nondestructive testing (NDT) before assembly and body mounting. All NDT testing shall be performed by Level II or Level III technicians who have been certified in the test methods used in accordance with ANSI/ASNT CP-189.

Welds for structural load-supporting elements shall be performed by certified welders under the guidelines of AWS. Each aluminum ladder section shall be subjected to 100% NDT visual weld inspection followed by Liquid Penetrant NDT inspection as required to qualify suspected weld defect indications. Each steel ladder section shall be subjected to 100% Magnetic Particle NDT weld inspection to assure the structural integrity of the welds.

A 100% Magnetic Particle weld inspection shall be conducted on the torque box, aerial support structure, outriggers, outrigger support structure and all other structural ferrous aerial components. This test shall be performed to assure the structural integrity of the weldment.

After the aerial is assembled and installed on the vehicle, an operational inspection shall be made and the aerial shall be tested to comply with the applicable standards in the current editions of NFPA 1901 and NFPA 1911.

In addition to the above tests, the aerial shall successfully complete the following operational tests:

1) The completed apparatus shall be placed on a firm, level surface with the aerial stabilizers extended and down. The aerial shall lift a test weight equal to the rated tip load capacity, as specified herein, with the aerial at full extension, 0 degrees elevation, and rotated 90 degrees to either side of the truck chassis. The test weight shall be lifted from 0 degrees to 15-20 degrees. The test weight shall be suspended from a position equal to the position of the outermost rung of the fly section or the center of the platform when so equipped. The aerial shall lift the test weight smoothly and evenly with no twisting or jerking. This test shall be performed at the normal hydraulic system relief valve setting. No temporary adjustments to the relief valve shall be allowed.

2) The completed apparatus shall be placed on a firm, level surface with the aerial ladder stabilizers extended and down. A test weight equal to 1.5 times the aerial`s rated tip load capacity, shall be suspended from a position equal to the position of the outermost rung of the fly section (or center of the platform when so equipped), with the aerial in the straight-ahead position. The aerial shall then be rotated a full 360 degrees around the vehicle with the aerial at full extension and at 0 degrees elevation (or high enough to clear vehicle-mounted equipment). The aerial and vehicle shall show no signs of instability. This test shall be performed with no water in the tank, or hose, ladders, or removable equipment that would act as a counterbalance in order to simulate a worst-case condition.

3) The completed apparatus shall be placed on a firm surface having a minimum 5 degrees side slope with the aerial stabilizers extended and down. A test weight equal to 1.5 times the aerial`s rated tip load capacity, shall be suspended from a position equal to the position of the outermost rung of the fly section (or center of the platform when so equipped), with the aerial in the straight-ahead position. The aerial shall then be rotated 90 degrees to the downhill side with the aerial at full

extension, 0 degrees elevation (or high enough to clear vehicle-mounted equipment). The aerial and vehicle shall show no signs of instability, and all of the stabilizers shall remain firmly on the ground. This test shall be performed with no water in the tank, or hose, ladders, or removable equipment that would act as a counterbalance in order to simulate a worst-case condition.

4) The completed apparatus shall be placed on a firm, level surface with the aerial stabilizers extended and down. A test weight equal to 2.0 times the aerial`s rated tip load capacity, shall be suspended from a position equal to the position of the outermost rung of the fly section (or center of the platform when so equipped), with the aerial in the straight-ahead position at full extension and at 8 degrees elevation (or high enough to clear vehicle-mounted equipment). After ten (10) minutes, the weight shall be removed, and the aerial shall be inspected for any abnormal twist or deflection.

5) The completed apparatus shall be placed on a firm, level surface with the aerial stabilizers extended and down. The aerial will be positioned at full extension at 0 degrees elevation at some position out of the travel rest and off the side or rear of the truck. For units without a pre-piped waterway to the tip, a test weight of 220# shall be applied horizontally and perpendicular to the tip of the aerial at the location of the outermost rung. The rotation brake shall not release nor shall the aerial`s deflection exceed the manufacturer`s accepted tolerances. For aerials with pre-piped waterways, a test weight of 350# will be applied at the location of water nozzle.

Upon satisfactory completion of all inspections and tests, an independent third-party inspection firm shall submit a certificate indicating that all specified standards have been met.

GROUND LADDERS

Alco-Lite Combo Ladder

One (1) Alco-Lite CJL-17, 17` combination extension/A-frame ladder shall be provided. The ladder may be used as an extension ladder or an `A` frame ladder.

Alco-Lite Extension Ladder

One (1) Alco-Lite PEL-28, 28` aluminum two-section extension ladder shall be provided.

Alco-Lite Extension Ladder

One (1) Alco-Lite PEL-35, 35` two-section extension ladder shall be provided.

Alco-Lite Folding Ladder with Shoes

This unit shall be supplied with one (1) Alco-Lite FL-10, 10` 6" long aluminum folding attic ladder with safety shoes.

Alco-Lite Roof Ladder

One (1) Alco-Lite DRL-20, 20` aluminum roof ladder shall be provided. Folding steel roof hooks and steel spikes shall be attached to each end of the ladder.

Alco-Lite Roof Ladder

One (1) Alco-Lite DRL-18, 18` aluminum roof ladder shall be provided. Folding steel roof hooks and steel spikes shall be attached to each end of the ladder.

Alco-Lite Roof Ladders

Two (2) Alco-Lite DRL-16, 16` aluminum roof ladders shall be provided. Folding steel roof hooks and steel spikes shall be attached to each end of the ladder.

MISCELLANEOUS LOOSE EQUIPMENT

Wheel Chocks

Two (2) Zico Model SAC-44 folding wheel chocks for up to 44" diameter tires shall be supplied and located per the customer. The SQCH-44-H horizontal holders and pair of chocks require a minimum storage area of 6" high, 10-1/2" wide and 22-3/8" deep.

DOT Required Drive Away Kit

Three (3) triangular warning reflectors with carrying case shall be supplied to satisfy the DOT requirement.

EXTERIOR PAINT

Paint Sample Spray Out

A paint sample spray out of the base cab / body paint color will be provided for approval prior to painting.

Painted Header Plate

The roll up door header plates shall be painted job color for all painted roll-up doors.

Paint Custom Cab

The apparatus cab shall be painted Sikkens FLNA3047 Red. The paint process shall meet or exceed current state regulations concerning paint operations. Pollution control shall include measures to protect the atmosphere, water, and soil. Contractor shall, upon demand, provide evidence that the manufacturing facility is in compliance with State EPA rules and regulations.

The aluminum cab exterior shall have no mounted components prior to painting to assure full coverage of metal treatments and paint to the exterior surfaces. Cab doors and any hinged smooth-plate compartment doors shall be painted separately to assure proper paint coverage on cab, door jambs and door edges.

Paint process shall feature Sikkens high solid LV products and be performed in the following steps:

- Corrosion Prevention - all aluminum surfaces shall be pre-treated with the Alodine 5700 conversion coating to provide superior corrosion resistance and excellent adhesion of the base coat.
- Sikkens Sealer/Primer LV - acrylic urethane sealer/primer shall be applied to guarantee excellent gloss hold-out, chip resistance and a uniform base color.
- Sikkens High Solid LVBT650 (Base coat) - a lead-free, chromate-free high solid acrylic urethane base coat shall be applied, providing excellent coverage and durability. A minimum of two (2) coats shall be applied.
- Sikkens High Solid LVBT650 (Clear coat) - high solid LV clear coat shall be applied as the final step in order to ensure full gloss and color retention and durability. A minimum of two (2) coats shall be applied.

Any location where aluminum is penetrated after painting, for the purpose of mounting steps, hand rails, doors, lights, or other specified components shall be treated at the point of penetration with a corrosion inhibiting pre-treatment (ECK Corrosion Control). The pre-treatment shall be applied to the aluminum sheet metal or aluminum extrusions in all locations where the aluminum has been penetrated. All hardware used in mounting steps, hand rails, doors, lights, or other specified components shall be individually treated with the corrosion inhibiting pre-treatment.

After the paint process is complete, the gloss rating of the unit shall be tested with a 20-degree gloss meter. Coating thickness shall be measured with a digital MIL gauge and the orange peel with a digital wave scan device.

Paint Body Large

The apparatus body shall be painted Sikkens FLNA3047 Red. The paint process shall meet or exceed current state regulations concerning paint operations. Pollution control shall include measures to protect the atmosphere, water, and soil. Contractor shall, upon demand, provide evidence that the manufacturing facility is in compliance with State EPA rules and regulations.

The aluminum body exterior shall have no mounted components prior to painting to assure full coverage of metal treatments and paint to the exterior surfaces of the body. Any vertically or horizontally hinged smooth-plate compartment doors shall be painted separately to assure proper paint coverage on body, door jambs and door edges.

Paint process shall feature Sikkens high solid LV products and be performed in the following steps:

- Corrosion Prevention - all aluminum surfaces shall be pre-treated with the Alodine 5700 conversion coating to provide superior corrosion resistance and excellent adhesion of the base coat.
- Sikkens Sealer/Primer LV - acrylic urethane sealer/primer shall be applied to guarantee excellent gloss hold-out, chip resistance and a uniform base color.
- Sikkens High Solid LVBT650 (Base coat) - a lead-free, chromate-free high solid acrylic urethane base coat shall be applied, providing excellent coverage and durability. A minimum of two (2) coats shall be applied.
- Sikkens High Solid LVBT650 (Clear coat) - high solid LV clear coat shall be applied as the final step in order to ensure full gloss and color retention and durability. A minimum of two (2) coats shall be applied.

Any location where aluminum is penetrated after painting, for the purpose of mounting steps, hand rails, doors, lights, or other specified components shall be treated at the point of penetration with a corrosion inhibiting pre-treatment (ECK Corrosion Control). The pre-treatment shall be applied to the aluminum sheet metal or aluminum extrusions in all locations where the aluminum has been penetrated. All hardware used in mounting steps, hand rails, doors, lights, or other specified components shall be individually treated with the corrosion inhibiting pre-treatment.

After the paint process is complete, the gloss rating of the unit shall be tested with a 20 degree gloss meter. Coating thickness shall be measured with a digital MIL gauge and the orange peel with a digital wave scan device.

Aerial Paint

The lift cylinders, extension cylinders and upper turntable steelwork (less turntable) shall be painted to match the primary job color.

Undercoating

Undercoating shall consist of a heavy coating of soft seal film sprayed on the entire underside of the vehicle to repel water and road elements. Shall be applied after customer final inspection.

Tip Paint

The tip of the aerial ladder shall be painted orange to assist firefighters in locating the ladder tip. The paint color shall be AkzoNobel FLNA20505. The last three rungs, uprights and beams from the tip shall be painted.

INTERIOR PAINT

Cab Interior Paint

The interior of the cab shall be painted Zolatone gray #20-64. Prior to painting, all exposed interior metal surfaces shall be pretreated using a corrosion prevention system.

PROTECTIVE COATINGS

LINE-X bumper package

LINE-X bumper package: Includes all visible diamond plate surfaces including gravel shield, exterior surface of trays and lids.

STRIPING

Reflective Stripe in Rubrail

The reflective stripe in the body rubrail shall be white.

Cab and Body Stripe

A single Scotchlite stripe, up to 6 inches in width shall be installed on the cab and body. The stripe shall have a hockey style design.

The stripe shall be NFPA compliant and the size, color and location shall be as specified by the customer.

Cab and Body Stripe

Two (2) additional Scotchlite stripes, up to 3 inches in width shall be installed on the cab and body.

The stripe shall be NFPA compliant and the design, size, color and location shall be as specified by the customer.

Pin Stripe

A 1/4" tape pin stripe, color as specified by the customer, shall be applied above and below the Scotchlite stripe.

Rear Body Reflective Striping

Chevron style Reflexite V98 striping shall be provided on the rear of the apparatus. The stripes shall consist of 6" Red/Fluorescent Yellow Green alternating stripes in an "A" pattern. The striping shall be located on the rear facing extrusions, panels and doors inboard and outboard of the beavertails if applicable.

Reflective Stripes on Stabilizers

The four (4) aerial ladder stabilizers which protrude beyond the side of the body shall be striped with alternating color Reflexite V98 film. The stripes shall run at a 45-degree gle sloping down and away from the center, forming an "A" shape when viewed from the front or rear of the unit. The reflective material shall meet NFPA 1901 requirements.

Stripe colors to be Red/Fluorescent Yellow Green.

Designated Standing / Walking Area Indication

1" wide yellow perimeter marking consisting of individual Reflexite diamonds shall be applied to indicate the outside edge of designated standing and walking areas above 48" from the ground in compliance with 2016 NFPA 1901. Steps, ladders and areas with a railing or structure at least 12" high are excluded from this requirement.

WARRANTY

Standard 1 Year Warranty

The apparatus manufacturer shall provide a full 1-year standard warranty. All components manufactured by the apparatus manufacturer shall be covered against defects in materials or workmanship for a 1-year period. All components covered by separate suppliers such as engines, transmissions, tires, and batteries shall maintain the warranty as provided by the component supplier. A copy of the warranty document shall be provided with the proposal.

Lifetime Frame Warranty

The apparatus manufacturer shall provide a full lifetime frame structural warranty. This warranty shall cover all apparatus manufacturer designed frame, frame members, and cross-members against defects in materials or workmanship for the lifetime of the covered apparatus. A copy of the warranty document shall be provided with the proposal. Frame warranties that do not cover cross-members for the life of the vehicle shall not be acceptable.

10 Year 100,000 Mile Structural Warranty

The apparatus manufacturer shall provide a comprehensive 10 year/100,000-mile structural warranty. This warranty shall cover all structural components of the cab and/or body manufactured by the apparatus manufacturer against defects in materials or workmanship for 10 years or 100,000

miles, whichever occurs first. Excluded from this warranty are all hardware, mechanical items, electrical items, or paint finishes. A copy of the warranty document shall be provided with the proposal.

10 Year Stainless Steel Plumbing Warranty

The apparatus manufacturer shall provide a full 10-year stainless steel plumbing components warranty. This warranty shall cover defects in materials or workmanship of apparatus manufacturer designed foam/water plumbing system stainless steel components for 10 years. A copy of the warranty document shall be provided with the proposal.

20 Year Aerial Device Structural Warranty

The aerial manufacturer shall provide a 20-year structural integrity warranty on the aerial device. This warranty shall cover structural components and shall be extended for a period of 20 years after the date on which the vehicle is delivered to the original City of Aurora. A copy of the warranty document shall be provided with the proposal. Please refer to warranty document for complete details and exclusions.

10 Year Paint and Corrosion Warranty

The apparatus manufacturer shall provide a 10-year limited paint and corrosion perforation warranty. This warranty shall cover paint peeling, cracking, blistering, and corrosion provided the vehicle is used in a normal and reasonable manner.

The paint shall be prorated for 10 years as follows:

Topcoat & Appearance:
(Gloss, Color Retention, Cracking)
0 to 72 months 100%
73 to 120 months 50%

Coating System, Adhesion & Corrosion:
(Includes Dissimilar metal corrosion, Flaking, Blistering, Bubbling)
0 to 36 months 100%
37 to 84 months 50%
85 to 120 months 25%

Corrosion perforation shall be covered 100% for 10 years. Corrosion perforation is defined as complete penetration through the exterior metal of the apparatus.

The warranty period shall begin upon delivery of the apparatus to the original user-City of Aurora. A copy of the warranty document shall be provided with the proposal.

UV paint fade shall be covered in a separate warranty supplied by Akzo Nobel (Sikkens) and shall be for a minimum of 10 years.

Meritor Front Axle Warranty

A 5-year/unlimited miles, 5-year parts and 5-year labor **front non-drive steer** axle warranty shall be provided by Meritor Automotive or a 2-year/unlimited miles, 2-year parts and 2-year labor **front drive steer** axle warranty shall be provided by Meritor Automotive.

Meritor Rear Axle Warranty

A 5-year/unlimited miles, 5-year parts and 5-year labor rear drive single or rear drive tandem axle warranty shall be provided by Meritor Automotive.

SUPPORT, DELIVERY, INSPECTIONS AND MANUALS

Training

The manufacturer shall provide three (3) days of training covering vehicle maintenance and operational familiarization.

This training shall be provided by a full time, manufacturer employee trainer who specializes in aerial training.

Approval Drawings

A general arrangement drawing depicting the vehicles appearance shall be provided. The drawing shall consist of left side, right side, front, and rear elevation views.

Vehicles requiring pump controls shall include a general arrangement view of the pump operator`s position, scaled the same as the elevation views.

Approval Drawings - Dash Panel Layout

A detailed large scale approval drawing of the dash/console panel layout shall be provided. The drawing shall be provided prior to the construction process.

Electronic Manuals

Two (2) copies of all operator, service, and parts manuals MUST be supplied at the time of delivery in digital format -NO EXCEPTIONS! The electronic manuals shall include the following information:

- Operating Instructions, descriptions, specifications, and ratings of the cab, chassis, body, aerial (if applicable), installed components, and auxiliary systems.
- Warnings and cautions pertaining to the operation and maintenance of the fire apparatus and firefighting systems.
- Charts, tables, checklists, and illustrations relating to lubrication, cleaning, troubleshooting, diagnostics, and inspections.
- Instructions regarding the frequency and procedure for recommended maintenance.
- Maintenance instructions for the repair and replacement of installed components.
- Parts listing with descriptions and illustrations for identification.
- Warranty descriptions and coverage.

The electronic document shall incorporate a navigation page with electronic links to the operator`s manual, service manual, parts manual, and warranty information, as well as instructions on how to use the manual. Each copy shall include a table of contents with links to the specified documents or illustrations.

The electronic document must be formatted in such a manner as to allow not only the printing of the entire manual, but to also the cutting, pasting, or copying of individual documents to other electronic media, such as electronic mail, memos, and the like.

A find feature shall be included to allow for searches by text or by part number.

These electronic manuals shall be accessible from any computer operating system capable of supporting portable document format (PDF). Permanent copies of all pertinent data shall be kept file at both the local dealership and at the manufacturer`s location.

NOTE: Engine overhaul, engine parts, transmission overhaul, and transmission parts manuals are not included.

Fire Apparatus Safety Guide

Fire Apparatus Safety Guide published by FAMA, latest edition. This safety manual is intended to point out some of the basic safety situations that may be encountered during the normal operation and maintenance of a fire apparatus and to suggest possible ways of dealing with these situations. This manual is NOT a substitute for the E-ONE`s fire apparatus operator and maintenance manuals or commercial chassis manufacturer`s operator and maintenance manuals.

Changes to Specifications Following May 24, 2019 Meeting

AERIAL MODEL

100` Aerial Device

Aerial Ladder Requirements

It is the intent of these specifications to describe a telescopic aerial ladder of the open truss design that is compliant with NFPA 1901 (2016 edition) chapter 19 sections 19.2 through 19.6 and sections 19.17 through 19.25. Some portions of this specification exceed minimum NFPA recommendations and are to be considered a minimum requirement to be met.

The aerial ladder shall consist of four (4) extruded aluminum telescopic ladder sections operating from -6 degrees to 81 degrees and designed to provide continuous egress for firefighters and civilians from an elevated position to the turntable.

The aerial device shall have a vertical height of 100 ft at full extension and elevation. The measurement of height shall be consistent with NFPA 1901 section 19.2.2.

The rated horizontal reach shall be 92 ft. The measurement of horizontal reach shall be consistent with NFPA 1901 19.2.3. The measurement shall be from the outermost rung at full extension to the centerline of turntable rotation.
The aerial shall have a maximum stabilizer spread of 11 ft from pin to pin.

The ladder shall be able to provide full operating capacities in up to 50 mph wind conditions.

Aluminum Aerial Ladder

The aerial ladder shall exceed the aerial ladder requirements found in section 19.2 of NFPA 1901 as detailed in these specifications. To ensure a high strength-to-weight ratio and an inherent corrosion resistance, the aerial ladder shall be completely constructed of high strength aluminum. All side rails, rungs, handrails, uprights and K-braces shall be made of structural 6061T6 aluminum alloy extrusions. All material shall be tested and certified by the material supplier. All ladder sections shall be semi-automatically welded by inert gas shielded arc welding methods using 5356 aluminum alloy welding wire. Structural rivets or bolts shall not be utilized in the ladder weldment sections.

Due to the unpredictable nature of fireground operations, a minimum safety factor of 2.5 to 1 is desired. This structural safety factor shall apply to all structural aerial components including turntable and torque box stabilizer components. Definition of the structural safety factor shall be as outlined in NFPA 1901 A.19.20.1:

DL = Dead load stress. Stress produced by the weight of the aerial device and all permanently attached components.
RL = Rated capacity stress. Stress produced by the rated capacity load of the ladder.
WL= Water load stress. Stress produced by nozzle reaction force and the weight of water in the water delivery system.
FY = Material yield strength. The stress level at which the material exhibits permanent deformation.

2.5 x DL + 2.5 x RL + WL equal to/less than FY

The minimum NFPA specification of 2.0 to 1 is exceeded in this paragraph by requiring a 2.5 to 1 safety margin on dead load and live load while flowing water.

The stability factor or tip over safety margin shall be a minimum of 1.5 to 1 as defined by NFPA 1901 19.21. The 1.5 to 1 stability factor shall be achieved in all ranges, including the front working area, without relying on the chassis front axle for stabilization.

An independent engineering firm shall verify the aerial safety factor. Design verification shall include computer modeling and analysis, and extensive strain gauge testing performed by an independent registered professional engineer. Verification shall include written certification from the independent engineering firm made available by the manufacturer upon request from the purchaser.

All welding of aerial components, including the aerial ladder sections, turntable, torque box and outriggers shall be performed by welders who are certified to American Welding Society Standards D1.1, D1.2 and D1.3 as outlined in NFPA 1901 19.22.3.1.

The weldment assemblies of each production unit shall be tested visually and mechanically by an ASNT certified level II non-destructive test technician to comply with NFPA 1901 19.22.2. Testing procedures shall conform to the American Welding Society Standard B1.10 Guide for non-destructive testing. Test methods may include dye penetrate, ultrasound and magnetic particle where applicable.

Each ladder section shall consist of two (2) heavy extruded aluminum side rails and a combination of aluminum rungs, tubular diagonals, verticals and two (2) full-length handrails. The rungs on all four (4) ladder sections shall be K-braced for maximum lateral stability. This K-bracing shall extend to the center of each rung to minimize ladder side deflection.

The ladder rungs shall be designed to eliminate the need for rubber rung covers. The rungs shall be spaced on 14-inch centers and have an integral skid-resistant surface as outlined in NFPA 1901 19.2.5 through 19.5.2.3. An oval-shaped rung shall be utilized to provide a larger step surface at low angles and more comfortable grip at elevated positions. The minimum design load shall be 500 pounds distributed over a 3 1/2 " wide area per rung as outlined in NFPA 1901 19.2.5.4.

The aerial ladder shall exceed NFPA 1901 sections 19.2.6 and 19.2.8 governing the minimum ladder section width and handrail height.

Section	**Width**	**Height**
Base Section	36"	28-1/2"
Second Section	29-3/4"	25-3/4"
Third Section	24-3/8"	23"
Fly Section	19-3/4"	20-3/8"

Ladder Extension Mechanism

Both power extension and retraction shall be furnished and meet the requirements of NFPA 1901 section 19.19, 19.20.3, and 19.5.3. Extension shall be by way of two (2) extending cylinders mounted on the underside of the base section of the ladder.

Extension Cylinder Size

Bore: 3-1/4"
Stroke: 94"

The cylinders shall operate through a block and tackle cable arrangement to extend and retract the ladder. Maximum extension of the ladder is to be automatically limited by the stroke of the cylinders. The normal operating cable safety factor shall be 5:1 and the stall safety factor shall be 2:1 based on the breaking strength of the cables. The minimum ratio of the diameter of wire rope used to the diameter of the sheave used shall be 1 to 12. The cables shall be treated with Pre-Lube 6 for increased service life.

Ladder Cable Size

1st section (4 cables - 2 extend, 2 retract)	1/2" 6 x 19 galvanized cable
2nd section (4 cables - 2 extend, 2 retract)	5/16" 6 x 25 galvanized cable
3rd section (4 cables - 2 extend, 2 retract)	5/16" 6 x 25 galvanized cable

The ladder assembly shall consist of four (4) separate weldments that shall extend and retract within each other. Nylatron NSM slide pads shall be utilized between each section to minimize friction. Nylatron NSM slide pads shall be installed at the tip of the lower three sections to accommodate the sliding loads as the ladder is extended.

Aerial Extension Indicator

Reflective tape stripes shall be installed on the ladder top handrail of the base section to indicate extension in 5 ft increments. Numeric indicators shall be placed at 10 ft increments. A reflective dot on the base of the 2nd section shall provide a visual reference for the operator to estimate aerial elevation.

Aerial Finish

To reduce maintenance expense the aerial shall have a natural aluminum swirled finish. Visible inspection of all ladder weld joints shall be possible without having to remove paint or body filler to reveal the weld bead.

Operation Times

The aerial shall complete the NFPA 1901 19.2.12 time test in no more than 120 seconds. This test involves raising the aerial from the bedded position to full elevation and extension and rotating to 90 degrees. This test is to begin with the stabilizers deployed.

Time to extend ladder	maximum 30 seconds
Time to retract ladder	maximum 30 seconds
Time to raise ladder	maximum 25 seconds
Time to lower ladder	maximum 25 seconds
Time to rotate 180 degrees	maximum 80 seconds

Aerial Ladder Rated Capacity

The aerial device shall have a rated capacity of 500 lbs. consistent with NFPA 19.3.1 through 19.3.2. The aerial device shall be rated in multiple configurations as outlined in 19.3.4. A sign mounted at the base of the aerial shall communicate the following ratings in the unsupported fully extended configuration while maintaining a 2.5 to 1 safety margin as defined in NFPA 1901 A.19.20.1. The loads in each configuration are in addition to 75 lbs. of equipment mounted at the tip.

Condition #1- Tip load only, no water flowing.

Elevation	**Capacity**	**Pounds**
- 6 to 30 degrees	2 person	500 lbs.
31 to 50 degrees	3 people	750 lbs.
51 to 81 degrees	4 people	1000 lbs.

Condition #2- Distributed loads no water flowing. (These include one person at the tip)

Elevation	**Capacity**	**Pounds**
- 6 to 20 degrees	3 person	750 lbs.
21 to 40 degrees	4 people	1000 lbs.
41 to 60 degrees	6 people	1500 lbs.
61 to 81 degrees	10 people	2500 lbs.

Condition #3- Ladder tip load while flowing pre-piped waterway

Elevation	**Capacity**	**Pounds**
-6 to 44 degrees	2 people	500 lbs.
45 to 81 degrees	3 people	750 lbs.

Hydraulic System

The hydraulic plumbing shall consist of hydraulic stainless-steel tubing wherever possible in order to:

- Eliminate hose wear.
- Eliminate the corrosion associated with galvanized steel tubing.
- Provide a stronger medium to carry the hydraulic fluid.

An interlock device shall be provided to prevent activation of the aerial ladder hydraulic pump until either the transmission is placed in neutral and the parking brake is set, or the transmission is placed in drive and the rear driveline is disengaged as outlined in NFPA 19.17.3.

The hydraulic system shall be of the latest design and incorporate features to minimize heat build up and provide smooth control of the aerial ladder. The system shall meet the performance requirement in NFPA 19.19.6 and 19.19.7, which requires adequate cooling under 2 1/2 hours of operations.

All hydraulic components that are non-sealing whose failure could result in the movement of the aerial shall comply with NFPA 19.19.1 and have burst strength of 4 to 1. Dynamic sealing components whose failure could cause aerial movement shall have a margin of 2 to 1 on maximum operating pressure per NFPA 19.19.1.1. All hydraulic hoses, tubes and connections shall have minimum burst strength of 3 to 1 per NFPA 19.19.2
.
A hydraulic oil pressure gauge shall be supplied at the base control location per NFPA 1901 19.19.4.

The hydraulic system shall consist of a 55-gallon reservoir mounted to the torque box and plumbed to the hydraulic pump. The tank shall be supplied with a removable top to access tank strainer filter. There shall be plumbing for a supply and return line and a tank drain on the reservoir. The reservoir cap shall be marked per NFPA 19.19.5.2. Gated valves under the tank shall facilitate filter changes.

The hydraulic system shall use 5w-20 multi-weight, SAE 32 grade oil and incorporate the following filters to provide dependable service:

Reservoir Breather:	10-micron
Magnetic Reservoir Strainer:	125-mesh
Pressure Filter (Torque Box):	3-micron
Return Filter:	10-micron

The aerial hydraulic system shall be designed in such a manner that a hydraulic pump failure or line rupture shall not allow the aerial or outriggers to lose position. Hydraulic holding valves shall be mounted directly on cylinders. To ensure reliable performance of holding valves, no hoses shall be permitted between a holding valve and cylinder.

The hydraulic system shall be designed with an auxiliary power unit meeting the guidelines of NFPA 1901 19.18.7. The auxiliary power unit shall be a 12-volt pump connected to the chassis electrical system. The pump shall provide operation at reduced speeds to store the aerial device and outriggers for road transportation. Self-centering switches shall be provided at the turntable and each stabilizer control station to activate the system. The system shall be designed to provide a minimum of five (5) minutes of hydraulic power to operate functions.

Hydraulic power to the ladder shall be transferred from the torque box by a hydraulic swivel.

Aerial Torque Box

The aerial shall utilize an integral torque box design. The integral torque box design shall serve to carry the chassis, body and aerial device as an integrated system. The system design shall provide a lower center of gravity to enhance road performance, a mounting location for under-slung stabilizers, and additional space for body compartments. The strength of the torque box shall be a minimum 12.6 million-inch pounds resistance to bending moment. The stabilizers and turntable supports shall be welded directly to the torque box.

Stabilization

The unit shall be equipped with two (2) sets of extendable crisscross under-slung stabilizers. The stabilizers shall have a spread of 11 feet centerline to centerline of the stabilizer pads when fully extended. One (1) set of stabilizers shall be mounted in the forward body area and a second set close to the rear axle to minimize impact on departure angle. The stabilizers shall have an inner and outer tube that slide on low friction pads for deployment. The stabilizers shall have a tip over safety margin of 1 1/2 times the rated load imposed by the aerial in any position the aerial device can be placed as outlined in NFPA 1901 19.21.2. The apparatus stabilization shall be accomplished without the assistance of the chassis suspension or tires in contact with the ground.

The aerial shall be able to sustain a 1 1/3 to 1 rated load on a 5-degree slope downward in the position most likely to cause overturning as outlined in NFPA 1901 19.21.3. The maximum ground slope the apparatus can be set up on is 12 percent. On the 12 percent slope the apparatus can be leveled within a 6 percent operating range for the apparatus.

The cylinders shall be supplied with dual pilot-operated check valves on each stabilizer cylinder to hold the cylinder in the stowed or working position should a charged line be severed at any point in the hydraulic system. The stabilizers shall level side to side, corner to corner and front to rear on uneven terrain. Stabilizers shall contain safety lock valves. This assures there will be no "leak down" of stabilizer legs. Mechanical pins are not required. This feature contributes to efficient set-up and field operation.

The stabilizer lift cylinders shall be sized to maximize ground penetration. The lift cylinders shall be mounted on the side of the torque box for protection and shall have the following dimensions:
Bore: 5"
Stroke: 11"

The stabilizer extension cylinders shall have the following dimensions:
Bore: 2"
Stroke: 26"

Each Stabilizer that can be extended from the body shall be supplied with a red warning light as outlined in NFPA 19.21.4.4. A stabilizer extended warning light shall be supplied in the cab to warn the driver of an extended stabilizer condition as outlined in NFPA 1901 13.11. A floodlight shall be

supplied in each stabilizer location to illuminate the stabilizer and ground. The light shall automatically turn on with the deployment of the stabilizer.

The stabilizer ground contact area for each foot pad shall be 10" x 14" without auxiliary pads and 24" x 24" with auxiliary pads deployed. The ground pressure shall not exceed 75 psi with auxiliary pads deployed when the apparatus is fully loaded and the aerial device is carrying its rated capacity in every position. This shall be accomplished with the stabilizer pads deployed, as outlined in NFPA 19.21.4.2.

Stabilizer Controls

Four (4) electric solenoid valves shall control the stabilizers. The control switches shall be located at the rear of the apparatus so the operator may observe the stabilizers during deployment. An audible alarm with a minimum 87 dBA shall also sound while the stabilizers are in motion as required by NFPA 19.21.4.1. Stabilizer deployment shall be completed in less than 60 seconds.

There shall be an interlock that prevents the operation of the ladder until the stabilizers are down and properly set as outlined in NFPA 19.17.5. Four (4) micro-switches, one (1) on each jack leg, shall sense when all four (4) jack feet are in firm contact with the ground. This condition shall be indicated when all four (4) yellow jack-down indicator lights are on and the green interlock light is on. When the apparatus has been leveled, a manual transfer switch shall be used to shift hydraulic power to ladder operations. The interlock system shall have a manual override with access through a door on the rear control panel.
To simplify leveling the apparatus, two (2) color-coded level indicators shall be supplied at the rear of the apparatus. One (1) indicator shall be for front to rear level and one (1) for side to side level.

Forward Aerial Support

The aerial ladder support shall be fabricated from steel components and be welded directly to the torque box chassis. The ladder support uprights shall be constructed from 7/8" thick steel plate. Bolt-in diagonal bracing shall be installed on the support structure in an "X" pattern to restrict to side movement. This design shall allow for a pre-determined amount of flex preventing premature failure that can be found in an overly rigid structure. The support shall be located behind the rear wall of the cab.

Turntable Support Assembly

The aerial ladder turntable assembly shall be mounted at the rear of the apparatus. The turntable support assembly shall be welded to the integral torque box for efficient transfer of aerial loads to the stabilizers and shall permit storage of ground ladders in the center rear of the apparatus. The complete turntable support assembly shall be multi-pass welded to the sides of the combination chassis frame torque box.

The turntable support assembly shall be a steel weldment constructed of four (4) vertical 1/2" x 5" x 5" square tubing with identical tubing welded in between the top ends of the verticals.

A bearing mounting plate shall be welded to the top of the verticals and sides of the horizontals on the turntable pedestal. The bearing mounting plate shall be 43" x 43" and shall have a 1-1/2" thickness. This bearing mounting plate shall be attached to a 3/4" steel plate that is welded to the bottoms of the horizontal tubing. The use of multi-pass welding shall be utilized wherever possible.

A 34-1/4" rotation bearing with a 3" face drive gear shall be bolted to the top of the bearing mounting plate with thirty (30) 3/4" grade 8 plated bolts. The gear tooth shall be stub tooth form.

Upper Turntable

The upper turntable assembly shall attach to the rotation bearing and the base of the ladder.

The turntable working platform shall be a fabricated steel structure covered with a non-skid 3/16" thick aluminum material for operator safety. Two (2) railings 42" high shall be provided along the perimeter of the turntable as outlined in NFPA 1901 19.18.1. Two (2) Mansaver bars shall be provided to allow access to the turntable area. There shall be a control pedestal mounted on the left side of the turntable. The turntable assembly shall provide a mounting base for the ladder and elevating cylinders. The turntable assembly shall be bolted to the turntable bearing by twenty (20) 3/4" grade 8 plated bolts.

An 11" high step shall be installed on the turntable deck to provide convenient access to the ladder sections for egress.
Two (2) lights shall be provided in the turntable step to illuminate the turntable deck area per NFPA requirements.

The ladder pivot point shall connect to the upper turntable assembly by two (2) 2-1/4" ID spherical bearings.

Elevation Mechanism

The aerial shall utilize dual 5" bore 42 5/8" stroke elevating cylinders to attach the upper turntable assembly and bottom of the base ladder section. A 1 3/4" pin and bearing system shall connect to the turntable. A 2" pin and bearing system shall connect to the base section of the ladder. The elevation system shall be designed following NFPA 1901 19.5.1. The elevation hydraulic cylinders shall incorporate cushions on the upper limit of travel. The hydraulic elevation cylinders shall also serve as a locking device to hold the aerial in the stored position for road travel.

Rotation Mechanism

The aerial shall be supplied with a hydraulically-powered rotation system as outlined in NFPA 1901 19.5.2. The hydraulic rotation motor and planetary gear drive system shall provide continuous rotation under all rated conditions and be supplied with a spring-applied brake to prevent unintentional rotation.

Aerial Electric Power

A hydraulic swivel shall be installed to provide hydraulic fluid transfer to the aerial ladder cylinders, electrical power to the aerial ladder, and water delivery to the pre-plumbed waterway while permitting continuous 360-degree rotation. The swivel shall provide two (2) hydraulic circuits, twenty-four (24) electrical circuits, and one (1) 4" passage for waterflow. The swivel shall be environmentally sealed to prevent contamination of the hydraulic fluid.

Aerial Ladder Operating Position

An aerial ladder operator`s position shall be supplied as outlined in NFPA 1901 19.4.1. The operator`s position shall be located on the left side of the aerial turntable. The apparatus shall be supplied with labels to warn of electrocution hazard. The control console shall provide a service access door on the front and side of the console to access hydraulic and electrical connections. The electrical panel shall be contained in junction box with labeled wires. The console shall be angled, labeled, and supplied with lights f or night operation.

Console Cover

A diamond plate contoured hinged cover shall be supplied to protect the console from the elements. The cover shall latch in the stored position and swing away from the console so as not to interfere with sight of the aerial device.

Aerial Ladder Control Levers

The control levers shall be arranged as outlined in NFPA 19.17.7. The first lever from the left shall be the extension control (forward for extend and back for retract). The second lever shall be for rotation (forward for clockwise and back for counter clockwise). The third handle shall control elevation (forward for down and back for up). The aerial shall employ direct hydraulic controls for precise control and dependable service with minimal electrical functions. A ring around the control console shall be provided to prevent unintentional movement as outlined in NFPA 19.17.6.2.

Rung Alignment Indicator

A light on the control console shall indicate when the ladder rungs are aligned for climbing.

Aerial Alignment Indicator

A reflective arrow mounted to the body and the turntable shall indicate when the aerial is aligned for travel bed.

Load Indication System

A lighted elevation/safe load indicator diagram shall be located on the lower left side of the base section to indicate safe load capacity at any angle of elevation. The safe load indicator shall be 15" x 15" in size and clearly communicate aerial capacity in any one of the following conditions: tip load only, tip load with water flowing, and distributed load at full extension. The chart shall identify capacity using graphic characters to indicate each 250 lb. increment. The chart shall be equipped with lighting and warn of electrocution hazards from power lines and lightning.

Aerial Waterway

A pre-piped waterway shall be supplied as outlined in NFPA 1901 19.6. The waterway shall telescope to the end of the fourth section. A waterway of 4" internal diameter shall run through the turntable and a swivel joint to connect to the tubular aerial waterway. The tubular waterway shall run under the aerial ladder. The waterway tubes shall have the following sizes:

Base Section: 5" OD
Mid Section: 4-1/2" OD
3rd Section: 4" OD
Fly Section: 3-1/2" OD

The tubes shall be constructed of hard coat anodized aluminum and shall be telescopic with the aerial ladder through sealed slip joints. The slip joints shall be designed with grease zerk fittings to facilitate lubrication.

A 1-1/2" drain valve shall be installed and operated from the rear of the apparatus.
The water system shall be capable of flowing 1000 gpm at 100 psi nozzle pressure at full elevation and extension. The friction loss between the tip and below the swivel shall not exceed 100 psi while flowing 1000 gpm as outlined in NFPA 1901 19.6.1 and 19.6.2.

Waterway Relief Valve

An automatic relief valve preset at 250 psi shall be installed in the aerial waterway to prevent over-pressurization of waterway system. The relief valve shall be mounted in the lower portion of the waterway where it enters the aerial torque box frame and dumps under the apparatus.

Ladder Tip Step

Two (2) split design folding steps shall be located near the ladder tip to provide a position for a firefighter using the ladder pipe/monitor as outlined in NFPA 1901 19.2.9. The steps shall have a raised surface for traction and cut outs for deployment.

WATERWAY OPTIONS

Pinned Waterway Upgrade

A remote-controlled monitor/nozzle assembly shall be attached to a ladder fly section through C-channel slide pads which shall allow the monitor/nozzle assembly to be positioned at the tip of a section for maximum master stream reach or at the tip of the next section down for unobstructed rescue capabilities. The monitor/ nozzle assembly shall be pinned at either operating location with a single stainless steel "T" handle locking ball pin. A monitor control station shall be attached to the sliding monitor/nozzle assembly and shall move with it.

The turntable monitor controls shall be connected to the sliding monitor system using an electronic multiplexing system that sends all monitor control signals over a shielded pair of wires through a spring retract electric cable reel. The collector rings in the cable reel shall be specifically designed for accurate transmission of electronic signals.

A gel-cell rechargeable battery shall be located on the sliding monitor assembly. A dedicated ground wire and 12VDC positive charging wire shall be routed from the turntable control station through the electric cable reel to the monitor battery. The charging wire shall be directly connected to the chassis 12VDC battery system through a 20 amp auto reset circuit breaker.

The moveable monitor/nozzle assembly shall be capable of flowing from 300 gpm to 1000 gpm while maintaining a constant 80-100 psi nozzle pressure for maximum stream projection.

Aerial Scene Light

One (1) FireTech 12-Volt LED double stacked flood light Model FT-MB-2.9-W 11" long with a Model FT-MBKIT-PX bracket mount shall be provided. The light shall feature 18 LEDs` producing 6,653 usable lumens. The 90W 12V light shall draw 7.5 amps. A switch shall be provided, accessible in platform, for activation of light.
The light assembly shall be located mounted below aerial at tip of fly section.

Power Strip Receptacles

A 15 amp, 110-volt 3 prong straight blade (NEMA #5-15) 8-outlet household power strip shall be installed and shall be wired to the shoreline.

Location: R3 back wall.

Rear Suspension

The vehicle shall be equipped with Hendrickson ROADMAAX rear air suspension system. The suspension shall include dual height control valves that allow uneven, side heavy loads to be balanced, Quik-Align for easy axle alignment and two (2) hydraulic shock absorbers. The suspension shall have a maximum capacity of 35,000 lbs.

Battery Boxes

Batteries shall be placed on non-corrosive rubber matting and secured with hold-down brackets to prevent movement, vibration, and road shock. The hold-down bracket J-hooks shall be cut to fit and shall have all sharp edges removed.

The batteries shall be placed in stainless steel trays to provide preliminary containment should there be leakage of hazardous battery fluids. Each battery tray shall be equipped with a rubber vent hose to facilitate drainage. The rubber vent hose shall be routed to drain beneath the battery box. The batteries shall be positioned in well-ventilated areas.

The batteries shall have stainless steel covers provided to protect the batteries from the weather. The covers shall be lined with rubber matting preventing the batteries from accidental arcing.

Roll-Out Toolboards

Two (2) adjustable heavy-duty tool boards with 500 lbs. capacity shall be provided. Includes return style reinforcing bends on vertical front and rear edges of tool board, upper and lower adjustable track and gas shock actuated. Tool board sized to compartment height and depth as applicable.

Location: L3 rearward 24 inches off of rear wall.

DOORS

Single Compartment Doors

A single compartment door shall be constructed using a box pan configuration. The outer door pan shall beveled and shall be constructed from 3/16" (0.188") aluminum plate. The inner door pan shall be constructed from 3/32" (0.090") smooth aluminum plate and shall have nutsert fittings to attach hold-open hardware. The inner pan shall have a 95-degree bend to form an integral drip rail.

The compartment door shall have a 1" x 9/16" (1" x 0.43") closed-cell "P" EPDM sponge gasket meeting ASTM D-1066 2A4 standards installed around the perimeter of the door to provide a seal that is resistant to oil, sunlight, and ozone.

A drain hole shall be installed in the lower corner of the inside door pan to assist with drainage.

A polished stainless-steel Hansen D-ring style twist-lock door handle a with #459 latch shall be provided on the door. The 4-1/2" (4.5") D-ring handle shall be mounted directly to the door latching mechanism with screws that do not penetrate the door material for improved corrosion resistance.

The compartment door shall be securely attached to the apparatus body with a full-length stainless steel 1/4" (0.25") rod piano-type hinge isolated from the body and compartment door with a dielectric barrier. The door shall be attached with machine screws threaded into the doorframe. The door shall have gas shock-style hold-open devices.

An anodized aluminum drip rail shall be mounted over the compartment opening to assist in directing water runoff away from the compartment.

The doors shall be installed in the following locations: L4 and R4.

Ladder Climbing Lights

Luma-Bar Pathfinder LED lighting system shall be provided to illuminate the climbing area inside both sides of each ladder section. The strip type lights shall be located above ladder rung level and directed toward the centerline of the ladder to reduce glare. The lights shall be mounted to a 1.25" x .5" x .125" extruded aluminum channel and wired to not be an obstruction during climbing. The lights shall be controlled with the ladder lights switch at the operator`s control console.

The LED lights shall be Red.

LINE-X: Aerial Turntable Plate Work

A LINE-X package for the Aerial Turntable: Includes turntable console, turntable deck platework and access steps and any other storage boxes or brackets fabricated out of diamond plate installed on the turntable shall be provided.

FSI Supplied Loose Equipment

The following loose equipment shall be provided by FSI:

1	Honda Gas Generator with Electric Start
2	Folding Wheel Chocks
2	Holder for Folding Wheel Chock
1	Clips and Short Footplate Backplate w\o strap
2	6' I-Beam Pike Pole (LHT-DBY-6AH-B) Leatherhead Tools
3	8' I-Beam Pike Pole (LHT-DBY-8AH-B) Leatherhead Tools
2	12' I-Beam Pike Pole (LHT-DBY-12AH-B) Leatherhead Tools
2	8 lb. Pickhead Axe with 36" Fiberglass Handle (LHT-PAY-8) Leatherhead Tools
2	8 lb. Flathead Axe with 36" Fiberglass Handle (LHT-FAY-8) Leatherhead Tools

1	24" Tri-Bar Halligan Tool (Silver) (LHT-LB-24) Leatherhead Tools
75	12" x12"Cushion Tile
2	Set of double spanner wrench holder w KO1 Spanners
1	Set of 4 Spanners with Holder
1	Flat Head Axe Hanger Kit
2	Pick Head Axe Hanger Kit
1	Ironslock
2	Streamlight Vulcan 180 LED Handlight with vehicle charging base