Durham Fire Department
51 College Road ■ Durham, New Hampshire 03824-3585
Phone 603-862-1426 ■ Fax 603-862-1513
durham.fire@unh.edu

**TOWN OF DURHAM FIRE DEPARTMENT**

**New Hampshire**

**Contract #2023-A-DFD-Heavy-Rescue**

**BUILDING AND PURCHASE OF CUSTOM HEAVY RESCUE APPARATUS**

## INVITATION TO BID

The Town of Durham Fire Department will receive sealed bids until no later than 3:00 pm, prevailing time, August 31, 2023, at the Durham Fire Department Chief's Office, Durham Fire Department, 51 College Road, Durham, New Hampshire for Contract #2023-A-DFD-Heavy-Rescue for building a custom heavy rescue truck to include all necessary labor, equipment, and materials as outlined in the full specifications for the Town of Durham Fire Department listed below. Shortly thereafter, bids will be publicly opened and read aloud in any available office or conference room at the Durham Fire Department. Bids can be obtained at no charge from the Durham Fire Department. The Fire Chief reserves the right to waive defects in form and minor irregularities and to reject any or all bids determined to be in the best interest of the Town of Durham. The Fire Chief has the right to accept bids that can be proven to be equal to the building of a Heavy Rescue for the Town of Durham to provide competitive bidding.

**TOWN OF DURHAM FIRE DEPARTMENT**

**New Hampshire**

**Contract #2023-A-DFD-Heavy-Rescue**

**BUILDING AND PURCHASE OF CUSTOM HEAVY RESCUE APPARATUS**

## GENERAL PROVISIONS

1. BID PROCESS: Each bid shall be submitted in a sealed envelope clearly identified with the Bidder's name and marked "Town of Durham Contract #2023-A-DFD-Heavy Rescue" and will be received at the Durham Fire Departments Chiefs Office, Durham Fire Department, 51 College Road, Durham, New Hampshire until 3:00 PM, prevailing time August 17, 2023. Shortly thereafter, bids will be publicly opened and read aloud at any available office or conference room at the Durham Fire Department, Durham Fire Department, 51 College Road, Durham New Hampshire. Bids, when opened, shall be irrevocable for a period of thirty (30) calendar days following the bid opening date. Following a review of the bids by staff, the Fire Chief will award the bid.

2. RIGHT TO REJECT BIDS: The Town expressly reserves the right to reject any or all bids as the Fire Chief may determine and to waive defects in form or minor irregularities where the best interest of the Town of Durham would be served.

3. BID SUBMISSION: The bidder is to submit their Bid on the attached Vendor's Bid form showing a Lump Sum Price. The bid price shall not include Federal or State Taxes. If such are applicable, the successful Bidder shall furnish the Town with the necessary tax-exempt forms in triplicate upon submission of the invoice.

4. BID SECURITY: Each bid shall be accompanied by a Bid Bond, Certified Check, or Cashier's Check in an amount of not less than (5%) of the total bid price. The bid security shall be finished by the company that will manufacture the apparatus proposed. Biding securities by sales personnel or agents of the manufacturer are not acceptable. Bids must remain firm for a period of sixty (60) days after the opening.

5. PERFORMANCE SECURITY: If the successful bidder fails to execute a contract with the purchaser and provide a performance bond as required herein, the Bid Bond, Certified Check, or Cashier's Check shall be fortified to the purchaser.

6. CONTRACT EXECUTION: The successful bidder shall execute and deliver the contract agreement to the town of Durham within ten (10) calendar days of being awarded the contract.

7. TIME TO COMPLETE: Vendor will specify the time on the BID FORM by which all products will be supplied to the Town of Durham.

8. CONTRACT DOCUMENTS: The Contract Documents shall include the “Invitation to Bid”, “General Provisions”, “Specifications”, “Vendor’s Bid”, any issued addenda, and the final executed “Agreement”. These documents include all labor, materials, appliances, and services necessary for the proper execution of the work and the terms and conditions of payment thereof.

9. ADDENDA: Any change to this Bid's provisions or specifications shall be made by written addendum issues no later than four (4) working days before the bid opening date. Prospective Bidders shall be responsible for being aware of all addenda.

10. WORK GUARANTEES AND WARRANTIES: The Bidder will guarantee the work and the materials and the work and materials of all subcontractors for a period as specified in the specifications.

11. EXCEPTIONS: Any exceptions taken to the Bid Documents must be clearly noted by the Bidder in the Vendor’s Bid. Exceptions so taken not clearly outlined may be grounds for rejection of bids as determined by the Fire Chief to be in the best interest of the Town.

12. PAYMENT: The Fire Department will pay for the product once it is delivered and accepted as fully meeting the specifications.

13. CHANGE ORDERS: After execution of the Contract, there shall be no changes in the Bid Documents except by a written amendment executed in the same manner as the Contract or by Change Order as described below. The Fire Department, without invalidating the Contract, may order changes in the work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract sum, and the Contract time being adjusted accordingly. All such changes in the work shall be executed under the applicable conditions of the Contract Documents. The terms of any change order shall be mutually agreed to by the Contractor and the Fire Chief.

14. COMPLIANCE WITH LAWS: The bidder’s attention is drawn to the fact that they will observe and comply with all applicable Federal and State Laws and Regulations, Town Ordinances, and the rules and Regulations of all authorities having jurisdiction over the project, and these shall apply to the contract the same as though written out here in full, and the Contractor shall indemnify the Fire Department and the Town and its representatives against any claim or liability arising from or based on any such law, ordinance, rules, and regulation by themselves or by their employees.

15. INDEMNIFICATION: The Contractor shall be responsible for all damage to property, or injury to persons, arising out of their actions or failure to act. The Contractor shall indemnify and hold harmless the Fire Department and the Town of Durham from all demands, suits, or judgments arising in conjunction with or as a result of the Vendor’s performance of this contract.

16. NO COLLUSION: The Bidder shall not, either directly or indirectly, enter into any agreement, participate in any collusion, or otherwise take any action in restraint of free competitive bidding in connection with this bid.

17. INVESTIGATION OF BIDDERS: The Town of Durham Fire Department may make such investigations as it may deem necessary to determine the ability of the bidder to perform the services, and the bidder shall furnish the Durham Fire Department all such information for this purpose that the Durham Fire Department may request. The Durham Fire Department reserves the right to reject any bid if the evidence submitted by, or investigations of such bidder fails to satisfy the Durham Fire Department that such bidder is qualified to carry out the obligations of the contract.

**TOWN OF DURHAM FIRE DEPARTMENT**

**New Hampshire**

**Contract #2023-A-DFD-Heavy-Rescue**

**BUILDING AND PURCHASE OF CUSTOM HEAVY RESCUE APPARATUS**

## VENDOR'S BID FORM

To: Town of Durham Fire Department, NH

The undersigned, as a lawfully authorized agent for the below named bidder/contractor, has carefully examined the form of this bid, to be known as bid number ____, with the general provisions, specifications and other bid documents and binds himself/herself and his/her company on award to them by the Durham Fire Chief, a contract under this Bid to execute in accordance with such award, a contract agreement on such form and in such manner as is prescribed by the Town of Durham Fire Department and to provide all necessary equipment, labor, materials and other items or services needed to perform all the requirements for the building and purchase of custom heavy rescue apparatus.

LUMP SUM PRICE OF:

_____DOLLARS ($_____).

Respectfully submitted,

_____
Print Bidder/Vendor's Name

_____ _____
Print Representative's Name and Title Representative's Signature

_____ _____
Street City, State and Zip Code

_____ _____
Telephone and Fax Number Date

Person signing bid must be authorized to sign a contract with the Durham Fire Department, Durham, NH.

**TOWN OF DURHAM FIRE DEPARTMENT**

**New Hampshire**

**Contract #2023-A-DFD-Heavy-Rescue**

**BUILDING AND PURCHASE OF CUSTOM HEAVY RESCUE APPARATUS**

**SPECIFICATIONS**

## LIABILITY INSURANCE

The manufacturer shall furnish with the bid a certificate of insurance for.
Workman's Compensation and Employer's Liability Insurance covering all employees. General Liability (each occurrence) of $1,000,000.00. General Aggregate coverage of $2,000,000.00. Products-Completed / Operations Aggregate coverage of $2,000,000.00. Medical Expense coverage of $5,000 (any one person). Personal Injury of $1,000,000.00.

Automobile liability of $1,000,000.00 combined single limit (each accident), including any auto, all owned autos, scheduled autos, hired autos, non-owned autos, and garage liability.

Excess Umbrella Liability coverage of $4,000,000.00 for each occurrence, Aggregate of $4,000,000.00.

Garage Keepers Liability coverage of $4,000,000.00 combined limit.

All insurance policies must be;

- Maintained for the life of the contract,
- Must provide ten (10) days' notice before cancellation,
- Must cover all operations of the contractor or anyone employed by them.

## INTERNET IN-PROCESS SITE

The manufacturer shall post and maintain a website where the Durham Fire Department will be able to view digital images of their apparatus as it’s being built. The digital images shall be posted once a week starting when the body begins production or when the cab/chassis arrives and shall continue until the completion of the unit.

## VEHICLE STABILITY SUPPLIED WITH CAB/CHASSIS

The cab/chassis shall be equipped with a stability control system. The system shall have at a minimum, a steering wheel position sensor, a vehicle yaw sensor, a lateral accelerometer, and individual wheel brake controls.

## FIRE APPARATUS PERFORMANCE

The fire apparatus shall meet the requirements of this standard at elevations of 2000 ft (600 m) above sea level.

The fire apparatus shall meet all the requirements of this standard while stationery on a grade of 6 percent in any direction.

The fire apparatus shall meet the requirements of this standard in ambient temperature conditions between 32°F (O°C) and 110°F (43°C).

## HIGHWAY PERFORMANCE

The apparatus, when loaded to its estimated in-service weight, shall be capable of the following performance while on dry, paved roads that are in good condition:

1) Accelerating from 0 to 35 mph (55 km/hr) within 25 seconds on a 0 percent grade
2) Attaining a speed of 68mph (109 km/hr) on a 0 percent grade
3) Maintaining a speed of at least 20 mph (32 km/hr) on any grade up to and including 6 percent

The maximum top speed of fire apparatus with a GVWR over 26,000 lb (11,800 kg) shall not exceed either 68 mph (109 km/hr) or the manufacturer's maximum fire service speed rating for the tires installed on the apparatus, whichever is lower.

## SERVICEABILITY

The fire apparatus shall be designed to allow the manufacturer's recommended routine maintenance checks of lubricant and fluid levels to be performed by the operator without lifting the cab of a tilt-cab apparatus or without the need for hand tools.

Where special tools are required for routine service on any component of the apparatus, such tools shall be provided with the apparatus.

Apparatus components that interfere with the repair or removal of other major components shall be attached with fasteners, such as cap screws and nuts so that the components can be removed and installed with ordinary hand tools. These components shall not be welded or otherwise permanently secured into place.

## FIRE APPARATUS DOCUMENTATION

The contractor shall supply, at the time of delivery, at least two (2) electronic copies of the following documents:

1) The manufacturer's record of apparatus construction details, including the following documents:

a) Owner's name and address
b) Apparatus manufacturer, model, and serial number
c) Chassis make, model, and serial number
d) GAWR of front and rear axles and GVWR
e) Front tire size and total rated capacity in pounds (kilograms)
f) Rear tire size and total rated capacity in pounds (kilograms)
g) Chassis weight distribution in pounds (kilograms) with manufacturer-mounted equipment (front and rear)
h) Engine make, model, serial number, rated horsepower and related speed, and governed speed; and if so equipped, engine transmission PTO(s) make, model, and gear ratio
i) Type of fuel and fuel tank capacity
j) Electrical system voltage and alternator output in amps
k) Battery make, model, and capacity in cold cranking amps (CCA)
l) Chassis transmission make, model, and serial number; and if so equipped, chassis transmission PTO(s) make, model, and gear ratio
m) Ratios of all driving axles
n) Maximum governed road speed
o) Paint manufacturer and paint number(s)
p) Company name and signature of responsible company representative
q) Weight documents from a certified scale showing actual loading on the front axle, rear axle(s), and overall fire apparatus without personnel, equipment, and hose)

2) Certification of compliance with the optical warning system *(see 13.8.16)*
3) Siren manufacturer's certification of the siren *(see 13.9.1.1)*
4) Written load analysis and results of the electrical system performance tests *(see 13.14.1 and Section 13.15)*
5) Certification of slip resistance of all stepping, standing, and walking surfaces *(see 15.7.4.5)*
6) If the apparatus has a line voltage power source, the certification of the test for the power source *(see 22.15.7.2)*
7) If the apparatus is equipped with an air system, air tank certificates *(see 24.5.1.2)*, the SCBA fill station certification *(see 24.9.6)*, and the results of the testing of the air system installation *(see 24.14.5 and 24.15.4*)
8) Any other required manufacturer test data or reports

**OPERATIONS AND SERVICE DOCUMENTATION**

The contractor shall deliver with the fire apparatus complete operation and service documentation covering the completed apparatus as delivered and accepted.

The documentation shall address at least the inspection, service, and operations of the fire apparatus and all major components thereof.

The contractor shall also deliver with the fire apparatus the following documentation for the entire apparatus and each major operating system or major component of the apparatus:

1) Manufacturer’s name and address
2) Country of manufacture
3) Source for service and technical information
4) Parts replacement information
5) Descriptions, specifications, and ratings of the chassis, pump (if applicable), and aerial device (if applicable)
6) Wiring diagrams for low voltage and line voltage systems to include the following information: a) Pictorial representations of circuit logic for all electrical components and wiring
    a) Circuit identification
    b) Connector pin identification
    c) Zone location of electrical components
    d) Safety interlocks
    e) Alternator–battery power distribution circuits
    f) Input/output assignment sheets or equivalent circuit logic implemented in multiplexing systems
7) Lubrication charts
8) Operating instructions for the chassis, any major components such as a pump or aerial device, and any auxiliary systems
9) Precautions related to multiple configurations of aerial devices, if applicable
10) Instructions regarding the frequency and procedure for recommended maintenance
11) Overall apparatus operating instructions
12) Safety considerations
13) Limitations of use
14) Inspection procedures
15) Recommended service procedures
16) Troubleshooting guide
17) Apparatus body, chassis, and other component manufacturer’s warranties
18) Special data required by this standard
19) A material safety data sheet (MSDS) for any fluid that is specified for use on the apparatus
20) One copy of the latest edition of FAMA's *Fire Apparatus Safety Guide*

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

**NFPA REQUIRED DOCUMENTATION FORMAT - USB FLASH DRIVE**

The vehicle construction details, and the operations and service documentation as required per NFPA 1901 latest edition shall be provided on a USB Flash Drive. These manuals shall be divided into sections for ease of reference. There shall be two (2) USB flash drives provided with the completed vehicle.

## FIRE APPARATUS SAFETY GUIDE

A Fire Apparatus Safety Guide published by the Fire Apparatus manufacturer's Association shall be provided with the delivered vehicle. This manual includes essential safety information for fire fighters, fire chiefs, apparatus mechanics, and fire department safety officers. The guide applies to municipal, wildland, and airport firefighting apparatus manufactured on either custom or commercial chassis.

## STATEMENT OF EXCEPTIONS

The final-stage manufacturer shall deliver with the fire apparatus either a certification that the apparatus fully complies with all requirements of this standard or a Statement of Exceptions specifically describing each aspect of the completed apparatus that is not fully compliant with the requirements of this standard at the time of delivery.

The Statement of Exceptions shall contain, for each noncompliant aspect of the apparatus or missing the required item, the following information:

1) A separate specification of the section of the applicable standard for which compliance is lacking
2) A description of the particular aspect of the apparatus that is not in compliance therewith or required equipment that is missing
3) A description of the further changes or modifications to the delivered apparatus that must be completed to achieve full compliance
4) Identification of the entity that will be responsible for making the necessary post-delivery changes or modifications or for supplying and installing any missing required equipment to the apparatus to achieve full compliance with this standard

Before delivery of the apparatus, the Statement of Exceptions shall be signed by an authorized agent of the entity responsible for the final assembly of the apparatus and by an authorized agent of the purchasing entity, indicating mutual understanding and agreement between the parties regarding the substance thereof.

## CARRYING CAPACITY

The GAWR and the GCWR or GVWR of the chassis shall be adequate to carry the weight of the completed vehicle when loaded to its estimated in-service weight. The manufacturer shall establish the estimated in-service weight during the design of the vehicle.
The estimated in-service weight shall include the following:

1. The chassis, body, and tank(s)
2. Full fuel, lubricant, and other chassis or component fluid tanks or reservoirs
3. *250 lb (114 kg) in each seating position
4. Fixed equipment such as generators, reels, and air systems as installed
5. An allowance for miscellaneous equipment that is the greatest of the following:

a) The values are shown for items 1 - 5
b) A purchaser-provided list of equipment to be carried with weights
c) A purchaser-specified miscellaneous equipment allowance
The manufacturer shall engineer and design the fire apparatus such that the completed apparatus, when loaded to its estimated in-service weight, with all movable weights distributed as close as is practical to their intended in-service configuration, do not exceed the GVWR.

A final manufacturer's certification of the GVWR or GCWR, along with a certification of each GAWR, shall be supplied on a label affixed to the vehicle.

The fire apparatus manufacturer shall permanently affix a high-visibility label in a location visible to the driver while seated.

The label shall show the height of the completed unequipped fire apparatus in feet and inches (meters), the length of the completed fire apparatus in feet and inches (meters), and the GVWR in tons (metric tons).

Wording on the label shall indicate that the information shown was current when the apparatus was manufactured and that, if the overall height changes while the vehicle is in service, the fire department must revise that dimension on the plate.

**TESTING**

**ROAD TEST**

Road test shall be conducted per this section to verify that the completed apparatus is capable of compliance with Roadability Section.

The tests shall be conducted at a location and in a manner that does not violate local, state or provincial, or federal traffic laws.

The tests shall be conducted on dry, level, paved roads that are in good condition. The apparatus shall be loaded to its estimated in-service weight.

The engine shall not operate more than the maximum governed speed. Acceleration tests shall consist of two runs in opposite directions over the same route. The fire apparatus shall attain a speed of 35 mph (55 km/hr) from a standing start within 25 seconds. The fire apparatus shall attain a top speed of 68 mph (109 km/hr).

If the apparatus is equipped with an auxiliary braking system, the Body Manufacturer shall road test the system to confirm that the system is functioning as intended by the auxiliary braking system manufacturer.

If the apparatus is equipped with an air brake system, the service brakes shall bring the apparatus, when loaded to its GVWR, to a complete stop from an initial speed of 20 mph (32.2

km/hr) in a distance not exceeding 35 ft (10.7 m) by actual measurement on a paved, level, dry surface road that is free of loose material, oil or grease.

If the apparatus is equipped with a hydraulic brake system, the service brakes shall bring the apparatus, when loaded to its GVWR, to a complete stop from an initial speed of 30 mph (48.2 km/hr) in a distance not exceeding 88 ft (26.8 m) by actual measurement on a paved, level, a dry surface road that is free of loose material, oil or grease.

## LOW VOLTAGE - ELECTRICAL SYSTEM PERFORMANCE TEST

The vehicle's low voltage electrical system shall be tested and certified by the manufacturer. The certified test results shall be delivered with the completed vehicle. Tests shall be performed when the air temperature is between 0°F and 110°F (–18°C and 43°C).

## TEST SEQUENCE

The following three (3) tests shall be performed in the order in which they appear below. Before each test, the batteries shall be fully charged until the voltage stabilizes at the voltage regulator set point and the lowest charge current is maintained for ten (10) minutes. Failure of any of these tests shall require a repeat of the sequence.

## 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 before attempting to restart the engine. The battery system shall then be capable of restarting the engine. Failure to restart the engine shall be considered a test failure of the battery system.

## 2. ALTERNATOR PERFORMANCE TEST

## 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 a battery discharge current. The detection of battery discharge current shall be considered a test failure.

## 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.

An alarm sounded by excessive battery discharge, as detected by the warning system required in 13.3.4, or a system voltage of less than 11.8 V dc for a 12 V nominal system, 23.6 V dc for a 24 V nominal system, or 35.4 V dc for a 42 V nominal system for more than 120 seconds shall be considered a test failure.

**3. LOW VOLTAGE ALARM TEST**

The following test shall be started with the engine off and the battery voltage at or above 12 V for a 12 V nominal system, 24 V for a 24 V nominal system, or 36 V for a 42 V nominal system.

With the engine 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.

The test shall be considered a failure if the alarm does not sound in less than 140 seconds after the voltage drops to 11.70 V for a 12 V nominal system, 23.4 V dc for a 24 V nominal system, or 35.1 V for a 42 V nominal system.

The battery system shall then be able to restart the engine. Failure to restart the engine shall be considered a test failure.

**LOW VOLTAGE - ELECTRICAL SYSTEM PERFORMANCE TEST DOCUMENTATION**

The manufacturer shall deliver the following with the fire apparatus:

1) Documentation of the electrical system performance tests
2) A written electrical load analysis, including the following:

    a) The nameplate rating of the alternator
    b) The alternator rating
    c) Each of the component loads specified that make up the minimum continuous electrical load
    d) Additional electrical loads that, when added to the minimum continuous electrical load, determine the total continuous electrical load
    e) Each intermittent electrical load

**UL 120/240 VAC CERTIFICATION**

The 120/240-volt electrical system shall be third-party, independent, audit-certified through Underwriters Laboratory (UL) to the current edition of NFPA 1901 to perform as listed below; The prime mover shall be started from a cold start condition, and the unloaded voltage and frequency shall be recorded.

The line voltage electrical system shall be loaded to at least 100% of the continuously rated wattage stated on the power source specification label. Testing with a resistive load bank shall be permitted.

The power source shall be operated in the manner specified by the apparatus manufacturer as documented on instruction plates or in operation manuals. The power source shall be operated at a minimum of 100% of the continuously rated wattage as stated on the power source specification label for a minimum of two (2) hours.

The load shall be adjusted to maintain the output wattage at or above the continuously rated wattage during the entire 2-hour test.

The following conditions shall be recorded at least every 1/2 hour during the test:

1) The power source output voltage, frequency, and amperes
2) The prime mover's oil pressure, water temperature, and transmission temperature, if applicable
3) The power source hydraulic fluid temperature, if applicable
4) The ambient temperature and power source air inlet temperature

The following conditions shall be recorded once during the test for power sources driven by dedicated auxiliary internal combustion engines:

1) Altitude
2) Barometric pressure
3) Relative humidity

If the generator is driven by the chassis engine and the generator allows for operation at variable speeds, the chassis engine speed shall be reduced to the lowest rpm allowed for generator operation and the voltage and frequency shall be recorded.

The load shall be removed, and the unloaded voltage and frequency shall be recorded.

The voltage shall be maintained within ±10% of the voltage stated on the power source specification label during the entire test. Frequency shall be maintained within ±3 Hz of the frequency stated on the power source specification label during the entire test.

The total continuous electrical loads, excluding those loads associated with the equipment defined in NFPA 22.15.7.3.11.2, shall be applied during the testing unless an auxiliary engine drives the power source.

**DOCUMENTATION**

The Body Manufacturer shall deliver the following with the fire apparatus:

The results of each test shall be recorded on an appropriate form and provided with the delivery of the fire apparatus.

## DIELECTRIC VOLTAGE WITHSTAND TEST

The line voltage wiring and permanently connected devices and equipment shall be subjected to a dielectric voltage to withstand the test of 900 volts for one (1) minute. The testing shall be performed after all bodywork has been completed.

The test shall be conducted as follows:

1) Isolate the power source from the panel board and disconnect any solid-state low voltage components
2) Connect one lead of the dielectric tester to all the hot and neutral buses tied together
3) Connect the other lead to the fire apparatus frame or body
4) Close any switches and circuit breakers in the circuit(s)
5) Apply the dielectric voltage for one (1) minute per the testing equipment manufacturer's instructions

The electrical polarity of all permanently wired equipment, cord reels, and receptacles shall be tested to verify that wiring connections have been properly made.

Electrical continuity shall be verified from the chassis or body to all line voltage electrical enclosures, light housings, motor housings, light poles, switch boxes, and receptacle ground connections that are accessible to firefighters in normal operations.

If the apparatus is equipped with a transfer switch, it shall be tested to verify operation and that all non-grounded conductors are switched.

Electrical light towers, floodlights, motors, fixed appliances, and portable generators shall be operated at their full rating or capacity for 30 minutes to ensure proper operation.

## PERFORMANCE BOND

The successful Bidder will be required to provide a 100% performance bond in the amount equivalent to the total amount of its bid including any additional options that may have been given.

The performance bond shall be provided within two (2) weeks after notice of award.

If the Bidder to whom the contract is awarded, refuses or neglects to execute or fails to furnish the required 100% performance bond within two (2) weeks after notification, the amount of the deposit may be forfeited and retained by the Durham Fire Department as liquidated damages.

The terms of the performance bond shall continue one (1) year after the completion and delivery of the apparatus. The balance of any warranty, if greater than 12 months, shall continue to be guaranteed solely by the Contractor.

**WARRANTY**

A full statement shall be provided of the warranties for the vehicle(s) being bid. Warranties should clearly describe the terms under which the vehicle manufacturer accepts responsibility for the cost to repair defects caused by faulty design, quality of work, or material, and for the applicable period after delivery.

Cost of repairs refers to all costs related thereto including, but not limited to, the cost of materials and the cost of labor.

The Body Manufacturer shall warrant all materials and accessories used on the vehicle(s), whether fabricated by the manufacturer or purchased from an outside source and will deal directly with the Durham Fire Department on all warranty work.

**GENERAL LIMITED WARRANTY - TWO (2) YEARS**

The vehicle shall be free of defects in material and workmanship for a period of two (2) years or 36,000 miles (or 57,936 kilometers), whichever occurs first starting after the date of delivery to the Durham Fire Department.

The Contractor must be the "single source" coordinator of all warranties on the vehicle.

**LOW VOLTAGE ELECTRICAL WARRANTY - FIVE (5) YEARS**

The vehicle's low voltage electrical system shall be free of defects in material and workmanship for a period of five (5) years or 60,000 miles (or 96,561 kilometers), whichever occurs first, starting thirty (30) days after the original invoice date.

-A NON-STRUCTURAL WARRANTY (2) YEARS

**STRUCTURAL WARRANTY - Fifteen (15) YEARS**

The body shall be free of structural or design failure or workmanship for a period of Fifteen (15) years starting thirty (30) days after the day of delivery.

**REPLACEMENT PARTS**

Replacement parts for all components manufactured by the manufacturer shall be available for a period of twenty (20) years.

## UNDERCOAT WARRANTY

The body undercoating shall have a warranty provided by the manufacturer for the lifetime of the vehicle or twenty (20) years, whichever occurs first. The warranty shall be transferable between vehicle owners. Should the undercoating material applied to the underside of the body and wheel wells of the vehicle ever flake off, peel, chip, or crack due to drying out, the damaged area shall be re-sprayed without charge to the vehicle owner.

## PAINT LIMITED WARRANTY - TEN (10) YEARS

The body shall be free of bubbling or peeling as a result of a defect in the method of manufacture for a period of ten (10) years or 100,000 miles (or 160,934 kilometers), whichever occurs first, starting thirty (30) days after the original invoice date. **Pro-rated warranties will not be acceptable.**

## GRAPHICS LIMITED WARRANTY

The 3M graphics installation shall be warranted for a period of two (2) years. The 3M materials installed on the completed vehicle shall be warranted for seven (7) years. The 3M Diamond grade film (if specified) shall be warranted for ten (10) years.

## CONSTRUCTION PERIOD

The completed vehicle shall be delivered within Three Hundred and Sixty-Five (365) days after receipt of a purchase order or contract.

The contractor shall not be held liable for delays in chassis delivery due to accidents, strikes, floods, or other events not subject to their control. The contractor shall provide immediate written notice to Durham Fire Department as to delays and to what extent these delays have in completing the vehicle within the stated construction period.

## OVERALL, HEIGHT REQUIREMENT

The overall height (OAH) restriction for this vehicle Shall be eleven feet five inches (11’.5”).

## OVERALL LENGTH REQUIREMENT

There is a Thirty-Four Feet (34’) overall length (OAL) restriction for this.

## OVERALL WIDTH

The overall width (OAW) of the body at drip rails shall be 102“(8' - 6"), and the body shall be 100" (8' - 4").

## ANGLE OF APPROACH

The angle of approach for this vehicle shall not be less than Twelve (12) degrees when it is loaded to the estimated in-service weight as specified by the current edition of NFPA 1901.

## ANGLE OF DEPARTURE

The angle of departure for this vehicle shall not be less than Twelve (12) degrees when it is loaded to the estimated in-service weight as specified by the current edition of NFPA 1901.

## PRE-CONSTRUCTION CONFERENCE

A pre-construction conference shall be required at the Contractor's factory for four (4) personnel from the Durham Fire Department to finalize all construction details before manufacturing. The Contractor shall, at his/her expense, provide transportation, lodging, rental car, and meal expenses during the pre-construction conference. Any travel distance greater than 250 miles shall be by non-stop commercial air travel.

## FINAL INSPECTION CONFERENCE

A final inspection conference shall be required at the Contractor's factory for four (4) personnel from the Durham Fire Department to inspect the vehicle and construction details before shipment of the completed vehicle. This inspection shall take place after any specified striping and lettering are installed.

The Contractor shall, at his/her expense, provide transportation, lodging, rental car, and meal expenses during the final inspection conference. Any travel distance greater than 250 miles shall be by non-stop commercial air travel.

## DELIVERY AND DEMONSTRATION

The Contractor shall be responsible for the delivery of the completed unit to the Durham Fire Department's location. On initial delivery of the apparatus, the Contractor shall supply a qualified representative to demonstrate the apparatus and provide initial instruction to representatives of the Durham Fire Department regarding the operation, care, and maintenance of the apparatus and equipment supplied at the Durham Fire Department location.

The Delivery Engineer shall set delivery and instruction schedule with the person appointed by Durham Fire Department.

After delivery of the apparatus, the Durham Fire Department shall be responsible for ongoing training of its personnel to proficiency regarding the proper and safe use of the apparatus and associated equipment.

## CHASSIS/CAB SPECIFICATION

### MODEL

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

### MODEL YEAR

The chassis shall have a vehicle identification number that reflects a 2023 or newer model year.

### COUNTRY OF SERVICE

The chassis shall be put in service in the country of the United States of America (USA).
The chassis will meet applicable U.S.A. federal motor vehicle safety standards per CFR Title 49 Chapter V Part 571 as clarified in the incomplete vehicle book per CFR Title 49 Chapter V Part 568 Section 4 which accompanies each chassis. _Manufacturer Chassis is not responsible for compliance with state, regional, or local regulations. Dealers should identify those regulations and order any necessary optional equipment from the Manufacturer and or Dealer of Chassis or their OEM needed to comply with those regulations.

### CAB AND CHASSIS LABELING LANGUAGE

The cab and chassis shall include the applicable caution, warning, and safety notice labels with text to be written in English.

### APPARATUS TYPE

The apparatus shall be a rescue vehicle designed for emergency service use which shall include the functions of a multipurpose vehicle that primarily provides support services at emergency scenes.

### VEHICLE TYPE

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

### AXLE CONFIGURATION

The chassis shall feature a 4 x 2 axle configuration consisting of a single rear drive axle with a single front steer axle.

## GROSS AXLE WEIGHT RATING FRONT

The front gross axle weight rating (GAWR) of the chassis shall be 23,000 pounds.
This front gross axle weight rating shall be adequate to carry the weight of the completed apparatus including all equipment and personnel.

## GROSS AXLE WEIGHT RATING REAR

The rear gross axle weight rating (GAWR) of the chassis shall be 27,000 pounds.
This rear gross axle weight rating shall be adequate to carry the weight of the completed apparatus including all equipment and personnel.

## CAB STYLE

The cab shall be custom and enclosed, with a 12.00-inch raised roof over the driver, officer, and crew area, designed and built specifically for use as an emergency response vehicle by a company specializing in the cab and chassis design for all emergency response applications. The cab shall be designed for heavy-duty service utilizing superior strength and capacity for the application of protecting the occupants of the vehicle. This style of cab shall offer up to five (5) seating positions.

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

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

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

## OCCUPANT PROTECTION

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

The system components shall include:

- Driver steering wheel airbag

- Driver dual knee airbags with energy management mounting and officer knee airbags.
- Large driver, officer, and crew area side curtain airbags
- APS advanced seat belt system - retractor pre-tensioners tighten the seat belts around the occupants, securing the occupants in seats and load limiters play out some of the seat belt webbings to reduce seat belt to chest and torso force upon impact as well as mitigate head and neck injuries
- Heavy truck Restraints Control Module (RCM) - receives inputs from the outboard sensors, selectively deploys APS systems, and records sensory inputs immediately before and during a detected qualifying event
- Integrated outboard crash sensors mounted at the perimeter of the vehicle - detect a qualifying front or side impact event and monitor and communicates vehicle status and real-time diagnostics of all critical subsystems to the RCM
- Fault-indicating Supplemental Restraint System (SRS) light on the driver's instrument panel

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

Rollover, side-impact, and ejection mitigation shall be provided by the outboard sensors and the RCM. In qualifying rollover or side-impact events, the outboard sensors provide inputs to the RCM. The RCM activates the side curtain airbags and advanced seat belts for each occupant in the cab. The RCM measures roll angle, lateral acceleration, and roll rate to determine if a rollover event or side-impact event is imminent or occurring.
In the event of a qualifying offset or other non-frontal impact, the RCM shall determine and intelligently deploy the front impact protection system, the side impact protection system, or both front and side-impact protection systems based on the inputs received from the outboard crash sensors.

**CAB UNDERCOAT**

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

**CAB SIDE DRIP RAIL**

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

## CAB PAINT EXTERIOR

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

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

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

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

## CAB PAINT MANUFACTURER

The cab shall be painted with PPG Industries paint.

## CAB PAINT

PPG FBCH 4217 Vermillion Red

## CAB PAINT PINSTRIPE

## CAB PAINT WARRANTY

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

## CAB PAINT INTERIOR

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

## CAB ENTRY DOORS

The cab shall include three (3 entry doors, two (2) front doors, and one rear door) crew door designed for ease of entering and egress when outfitted with an SCBA. The doors shall be constructed of extruded aluminum with a nominal thickness of 0.13 inches. The exterior skins shall be constructed of a 0.13-inch aluminum plate.

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

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

## CAB INSULATION

The cab ceiling and walls shall include 1.00-inch-thick foam insulation. The insulation shall act as a barrier absorbing noise as well as assisting in sustaining the desired climate within the cab interior.

## CAB INTERIOR STORAGE

There shall be one EMS compartment behind the driver's seat which shall have access from the interior and exterior of the apparatus.

There shall be a compartment on the interior for the storage of dry suits, ice rescue suits, water rescue ropes, life jackets, water rescue helmets.

## LH EXTERIOR REAR COMPARTMENT

The cab shall offer an exterior compartment on the left side of the cab behind the rear door. The compartment opening shall be 10.00 inches wide X 31.19 inches high. The compartment size shall be 11.34 inches wide X 31.19 inches high X 21.19 inches deep. The compartment shall have a 10.63 inch wide; 32.00 inches high and 1.50-inch-thick hinged box pan style flush mount door with a bright aluminum tread plate inner panel and a bent D-ring slam latch. There shall be a switch to activate a light inside the compartment and the open compartment warning light in the cab in the event the door is left ajar.

## LEFT-HAND EXTERIOR REAR COMPARTMENT LIGHTING

There shall be one (1) Sound Off Signal brand LED strip light installed to illuminate the exterior rear compartment on the left side of the cab. The strip light shall be 10.00 inches long and shall include three (3) bright white Gen3 LEDs.

## LH EXTERIOR COMPARTMENT INTERIOR FINISH

The interior of the left-hand exterior compartment shall have a multi-tone silver-gray texture finish.

## RH EXTERIOR REAR COMPARTMENT

The cab shall offer an exterior compartment on the right side of the cab behind the rear door. The compartment opening shall be 10.00 inches wide X 31.19 inches high. The compartment size shall be 11.34 inches wide X 31.19 inches high X 21.19 inches deep. The compartment shall have a 10.63 inch wide; 32.00 inches high and 1.50-inch-thick hinged box pan style flush mount door with a bright aluminum tread plate inner panel and a bent D-ring slam latch. There shall be a switch to activate a light inside the compartment and the open compartment warning light in the cab in the event the door is left ajar.

## RIGHT-HAND EXTERIOR REAR COMPARTMENT LIGHTING

There shall be one (1) Sound Off Signal brand LED strip light installed to illuminate the exterior rear compartment on the right side of the cab. The strip light shall be 10.00 inches long and shall include three (3) bright white Gen3 LEDs.

## RH EXTERIOR COMPARTMENT INTERIOR FINISH

The interior of the right-hand exterior compartment shall have a multi-tone silver-gray texture finish.

## CAB STRUCTURAL WARRANTY

Summary of Warranty Terms:

THE FOLLOWING IS A SUMMARY OF WARRANTY TERMS FOR INFORMATION ONLY. THE ACTUAL LIMITED WARRANTY DOCUMENT, WHICH IS ATTACHED TO THIS OPTION, CONTAINS THE COMPLETE STATEMENT OF THE _____ MOTORS USA LIMITED WARRANTY. COMPANY RESPONSIBILITY IS TO BE ACCORDING TO THE TERMS OF THE COMPLETE LIMITED WARRANTY DOCUMENT.

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

## CAB TEST INFORMATION

The cab shall have successfully completed the preload side-impact, static roof load application, and frontal impact without encroachment to the occupant survival space when tested per Section 4 of SAE J2420 COE Frontal Strength Evaluation Dynamic Loading Heavy Trucks, Section 5 of SAE J2422 Cab Roof Strength Evaluation Quasi-Static Loading Heavy Trucks and ECE R29

Uniform Provisions Concerning the Approval of Vehicles with regard to the Protection of the Occupants of the Cab of a Commercial Vehicles Annex 3 Paragraph 5.

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

## ELECTRICAL SYSTEM

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

## APPARATUS WIRING PROVISION

An apparatus wiring panel shall be installed in the center dash area behind the rocker switch panel which shall include eight (8) open circuits consisting of three (3) 20 amp, one (1) 30 amp, three (3) 10 amp, and one (1) 15-amp circuit, with relays and breakers with trigger wires which shall be routed to the rocker switch panel.

## MULTIPLEX DISPLAY

The multiplex electrical system shall include two Weldon Vista IV displays with an interactive touchscreen. The display shall be located on the left and right side of the dash in the switch panels. The Vista IV shall feature a full-color LCD screen that includes a message bar displaying the time of day and important messages requiring acknowledgment by the user which shall all be displayed on the top of the screen in the order that they are received. There shall be eight (8) push button virtual controls, four (4) on each side of the display for the onboard diagnostics. The display screen shall be video ready for backup cameras, thermal cameras, and DVD.

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

## LOAD MANAGEMENT SYSTEM

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

## DATA RECORDING SYSTEM

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

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

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

## ACCESSORY POWER

The electrical distribution panel shall include two (2) power studs. The studs shall be size #10 and each of the power studs shall be circuit protected with a fuse of the specified amperage. One (1) power stud shall be capable of carrying up to a 40-amp battery direct load. One (1) power stud shall be capable of carrying up to a 15-amp ignition switched load. The two (2) power studs shall share one (1) #10 ground stud. A 225-amp battery direct power and ground stud shall be provided and installed on the chassis near the left-hand battery box for OEM body connections.

## AUXILIARY ACCESSORY POWER

An auxiliary set of power and ground studs shall be provided and installed on the officer-side under-seat storage compartment. The power and ground studs shall be circuit protected with a 40-amp breaker. The studs shall be 0.38-inch diameter and be capable of carrying up to a 40-amp load switched with the master power switch.

A second auxiliary power junction box shall be mounted in the area behind the driver's seat. This box will be for charging accessories like flashlights and meters.

Auxiliary power shall be installed for electric tools as specified.

## EXTERIOR ELECTRICAL TERMINAL COATING

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

## ENGINE

The chassis engine shall be a Cummins X15 engine. The X15 engine shall be an in-line six (6) cylinder, four-cycle diesel-powered engine. The engine shall offer a rating of 565 horsepower at 1800 RPM and shall be governed at 2100 RPM. The torque rating shall feature 1850 foot-pounds of torque at 1150 RPM with 912 cubic inches (14.9 liters) of displacement.

The X15 engine shall feature a VGT™ Turbocharger, a high-pressure common rail fuel system, fully integrated electronic controls with an electronic governor, and shall be EPA certified to meet the 2023 emissions standards using cooled exhaust gas recirculation and selective catalytic reduction technology.

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

## DIESEL PARTICULATE FILTER CONTROLS

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

## ENGINE PROGRAMMING HIGH IDLE SPEED

The engine's high idle control shall maintain the engine idle at approximately 1400 RPM when engaged.

## ENGINE HIGH IDLE CONTROL

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

## ENGINE PROGRAMMING ROAD SPEED GOVERNOR

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

## AUXILIARY ENGINE BRAKE

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

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

## AUXILIARY ENGINE BRAKE CONTROL

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

- A valid gear ratio is detected.
- The driver has requested or enabled engine compression brake operation.
- The throttle is at a minimum engine speed position.
- The electronic controller is not presently attempting to execute an electronically controlled final drive gear shift.

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

## ELECTRONIC ENGINE OIL LEVEL INDICATOR

The engine oil shall be monitored electronically and shall send a signal to activate a warning in the instrument panel when levels fall below normal. The warning shall activate in a low oil situation upon turning on the master battery and ignition switches without the engine running.

## FLUID FILLS

The engine, transmission, power steering, and coolant fluid fills and checks shall be under the cab. The windshield washer fill shall be accessible through the front left side mid-step.

## ENGINE DRAIN PLUG

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

## ENGINE WARRANTY

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

## ENGINE PROGRAMMING REMOTE THROTTLE

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

## ENGINE FAN DRIVE

The engine cooling system fan shall incorporate a thermostatically controlled, Horton clutched type fan drive.

When the clutched fan is disengaged it shall facilitate improved vehicle performance, cab heating in cold climates, and fuel economy. The fan clutch design shall be fail-safe so that if the clutch drive fails the fan shall engage to prevent engine overheating due to the fan clutch failure.

## ENGINE COOLING SYSTEM

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

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

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

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

The cooling system shall be equipped with a surge tank that is capable of removing entrained air from the system. The surge tank shall be equipped with a low coolant probe and rearward-oriented sight glass to monitor the level of the coolant. The surge tank shall have a dual seal cap that meets the engine manufacturer's pressure requirements and allows for expansion and recovery of coolant into a separate integral expansion chamber.

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

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

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

## ENGINE COOLING SYSTEM PROTECTION

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

## ELECTRONIC COOLANT LEVEL INDICATOR

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

## COOLANT HOSES

The cooling system hoses shall be silicone heater hoses with rubber hoses in the cab interior. The radiator hoses shall be formed silicone coolant hoses with formed aluminized steel tubing. All heater hoses, silicone coolant hoses, and tubing shall be secured with stainless steel constant torque band clamps.

## ENGINE EXHAUST SYSTEM

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

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

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

The exhaust system after the treatment module shall be mounted below the frame in the inboard position.

The exhaust shall terminate with the plymovent exhaust accessories to accept the Durham Fire Department plymovent hose.

**DIESEL EXHAUST FLUID TANK (if needed)**

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

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

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

**ENGINE EXHAUST ACCESSORIES**

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

**ENGINE EXHAUST WRAP**

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

**TRANSMISSION**

The drive train shall include an Allison model EVS 4000 torque converting, automatic transmission which shall include electronic controls. The transmission shall feature two (2) 10-bolt PTO pads located on the converter housing.
The transmission shall include two (2) internal oil filters and Castrol TranSynd™ synthetic TES 295 transmission fluid which shall be utilized in the lubrication of the EVS transmission. An electronic oil level sensor shall be included with the readout located in the shift selector.

The transmission gear ratios shall be:

| | |
|---|---|
| 1st | 3.51:1 |
| 2nd | 1.91.1 |
| 3rd | 1.43:1 |
| 4th | 1.00:1 |
| 5th | 0.74:1 |
| 6th | 0.64:1 (if applicable) |
| Rev | 4.80:1 |

**TRANSMISSION MODE PROGRAMMING**

The transmission, upon start-up, will select a six (6) speed operation without the need to press the mode button.

**TRANSMISSION FEATURE PROGRAMMING**

The Allison Gen V-E transmission EVS group package number 127 shall contain the 227 vocational packages in consideration of the duty of this apparatus for rescue. This package shall incorporate an automatic neutral with selector override. This feature commands the transmission to neutral when the parking brake is applied, regardless of the driving range requested on the shift selector. This requires re-selecting the driving range to shift out of neutral for the override.

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

Function ID Description Wire assignment

| Function ID | Description | Wire assignment |
|---|---|---|
| Inputs | | |
| C | PTO Request | 143 |
| F | Aux. Function Range Inhibit (Special) | 101/142 |
| Outputs | | |
| G | PTO Enable Output (See Input Function C) | 130 |
| S | Neutral Indicator for PTO | 145 |
| | Single Return | 103 |

**ELECTRONIC TRANSMISSION OIL LEVEL INDICATOR**

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

## TRANSMISSION SHIFT SELECTOR

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

## TRANSMISSION PRE-SELECT WITH AUXILIARY BRAKE

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

## TRANSMISSION COOLING SYSTEM

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

## TRANSMISSION DRAIN PLUG

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

## TRANSMISSION WARRANTY

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

## LH PTO

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

## LH PTO MODEL

A ten (10) bolt Chelsea model 280-GMFJP-B5XV heavy-duty transmission driven PTO shall be installed. The clutched shifted PTO is designed specifically for the Allison world transmission and provides a continuous and intermittent torque rating of 318 lb. ft.

## PTO LOCATION

The transmission shall have two (2) power take-off (PTO) mounting locations, one (1) in the 8:00 o’clock position and one (1) in the 4:00 o’clock position.

## LH PTO CONTROL

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

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

## DRIVELINE

All drivelines shall be heavy-duty metal tubes and equipped with Spicer 1710 series universal joints. The shafts shall be dynamically balanced before installation to alleviate future vibration. In areas of the driveline where a slip shaft is required, the splined slip joint shall be coated with Glide Coat®.

## FUEL FILTER/WATER SEPARATOR

The fuel system shall have a Fleet guard FS1098 fuel filter/water separator as a primary filter. The fuel filter shall have a drain valve.

Water in the fuel sensor shall be provided and wired to an instrument panel lamp and audible alarm to indicate when water is present in the fuel/water separator.

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

## FUEL LINES

The fuel system supply and return lines installed from the fuel tank to the engine shall be reinforced nylon tubing rated for diesel fuel. The fuel lines shall be brown in color and connected with brass fittings.

## ELECTRIC FUEL PRIMER

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

## FUEL TANK

The fuel tank shall have a capacity of at least 50 gallons.

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

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

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

**FUEL TANK MATERIAL AND FINISH**

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

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

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

**FUEL TANK STRAP MATERIAL**

The fuel tank straps shall be constructed of #304 stainless steel. The fuel tank straps shall be powder-coated black and then painted to match the frame components if possible.

**FUEL TANK FILL PORT**

The fuel tank fill ports shall be provided with two (2) left fill ports located one (1) in the forward position and one (1) in the middle position and the right fill port located in the middle position of the fuel tank.

**FUEL TANK DRAIN PLUG**

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

## FRONT AXLE

The front axle shall be a Meritor Easy Steer Non-drive front axle, model number MFS-20. The axle shall include a 3.74-inch drop and a 71.00-inch kingpin intersection (KPI). The axle shall include a conventional style hub with a standard knuckle. The weight capacity for the axle shall be rated at 23,000 pounds. This rating shall require special approvals from the wheel manufacturers.

## FRONT AXLE WARRANTY

The front axle shall be warranted by Meritor for two (2) years with unlimited miles under the general service application. Details of the Meritor warranty are provided on the PDF document attached to this option.

## FRONT-WHEEL BEARING LUBRICATION

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

## FRONT SHOCK ABSORBERS

Two (2) Bilstein inert, nitrogen gas-filled shock absorbers shall be provided and installed as part of the front suspension system. The shocks shall be a monotubular design and fabricated using a special extrusion method, utilizing a single blank of steel without a welded seam, achieving an extremely tight peak-to-valley tolerance and maintaining consistent wall thickness. The monotubular design shall provide superior strength while maximizing heat dissipation and shock life.

The ride afforded through the use of a gas shock is more consistent and shall not deteriorate with heat, the same way a conventional oil-filled hydraulic shock would.

The Bilstein front shocks shall include a digressive working piston assembly allowing independent tuning of the compression and rebound damping forces to provide optimum ride and comfort without compromise. The working piston design shall feature fewer parts than most conventional twin tube and “road sensing” shock designs and shall contribute to the durability and long life of the Bilstein shock absorbers.

## FRONT SUSPENSION

The front suspension shall include a ten (10) leaf spring pack in which the longest leaf measures 53.38 inches long and 4.00 inches wide. The springs shall be shot-peened for long life and include a military double-wrapped front eye. The springs shall be bolted in place with M20 10.9 bolts and have replaceable rubber bushings in the spring eyes. The spring capacity shall be rated at 23,000 pounds.

## STEERING COLUMN/ WHEEL

The cab shall include a Douglas Autotech steering column which shall include a seven (7) position tilt, a 2.25-inch telescopic adjustment, and an 18.00-inch, four (4) spoke steering wheel located at the driver's position. The steering wheel shall be covered with black polyurethane foam padding.
The steering column shall contain a horn button, self-canceling turn signal switch, four-way hazard switch, and headlamp dimmer switch.

## ELECTRONIC POWER STEERING FLUID LEVEL INDICATOR

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

## POWER STEERING PUMP

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

## FRONT AXLE CRAMP ANGLE

The chassis shall have a front axle cramp angle of 48 degrees to the left and 44 degrees to the right.

## POWER STEERING GEAR

The power steering gear shall be a TRW model TAS 85 with an assist cylinder.

## CHASSIS ALIGNMENT

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

## REAR-AXLE

The rear axle shall be a Meritor model RS-25-160 single drive axle. The axle shall include precision-forged, single reduction differential gearing, and shall have a fire service rated capacity of 27,000 pounds.
The axle shall be built of superior construction and quality components to provide the rugged dependability needed to stand up to the fire industry's demands. The axle shall include rectangular-shaped, hot-formed housing with a standard wall thickness of 0.63 of an inch for extra strength and rigidity and a rigid differential case for high axle strength and reduced maintenance.

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

**REAR-AXLE DIFFERENTIAL LUBRICATION**

The rear axle differential shall be lubricated with oil.

**REAR-AXLE WARRANTY**

The rear axle shall be warranted by Meritor for two (2) years with unlimited miles under the general service application. Details of the Meritor warranty are provided on the PDF document attached to this option.

**REAR-WHEEL BEARING LUBRICATION**

The rear axle wheel bearings shall be lubricated with oil.

**VEHICLE TOP SPEED**

The top speed of the vehicle shall be approximately 68 MPH +/-2 MPH at governed engine RPM.

**REAR SUSPENSION**

The single rear axle shall feature a Reyco 79KB suspension which shall offer a vari-rate, self-leveling captive slipper type conventional multi-leaf spring suspension with 57.50 inch X 3.00-inch springs. One (1) adjustable and one (1) fixed torque rod shall be provided.

A helper spring shall be provided in addition to the standard spring pack to help prevent vehicle sway during aggressive cornering.

**REAR SHOCK ABSORBERS**

Two (2) Bilstein inert, nitrogen gas-filled shock absorbers shall be provided and installed as part of the rear suspension system. The shocks shall be a monotubular design and fabricated using a special extrusion method, utilizing a single blank of steel without a welded seam, achieving an extremely tight peak-to-valley tolerance and maintaining consistent wall thickness. The monotubular design shall provide superior strength while maximizing heat dissipation and shock life.

The ride afforded through the use of a gas shock is more consistent and shall not deteriorate with heat, the same way a conventional oil-filled hydraulic shock would.

The Bilstein front shocks shall include a digressive working piston assembly allowing independent tuning of the compression and rebound damping forces to provide optimum ride and comfort without compromise. The working piston design shall feature fewer parts than most conventional twin tube and “road sensing” shock designs and shall contribute to the durability and long life of the Bilstein shock absorbers.

**FRONT TIRE**

The front tires shall be Goodyear 425/65R-22.5 20PR "L" tubeless radial G296 MSA mixed service tread. Tire code shall be manufactured on the same year as the chassis.

The front tire stamped load capacity shall be 22,800 pounds per axle with a nominal speed rating of 68 miles per hour when properly inflated to 120 pounds per square inch.

The Goodyear Intermittent Service Rating maximum load capacity shall be 24,400 pounds per axle with a speed rating of 68 miles per hour when properly inflated to 120 pounds per square inch.

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

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

**REAR TIRE**

The rear tires shall be Goodyear 12R-22.5 16PR "H" tubeless radial G622 RSD mixed service tread. The tire code shall be manufactured in the same year as the chassis.
The rear tire stamped load capacity shall be 27,120 pounds per axle with a nominal speed rating of 75 miles per hour when properly inflated to 120 pounds per square inch.

The Goodyear Intermittent Service Rating maximum load capacity shall be 29,020 pounds per axle with a speed rating of 75 miles per hour when properly inflated to 120 pounds per square inch.
The Goodyear Intermittent Service Rating maximum speed capacity shall match the nominal speed rating.

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

## REAR-AXLE RATIO

The rear axle ratio shall be 5.38:1.

## TIRE PRESSURE INDICATOR

There shall be a Doran 360HD electronic tire pressure indication transmitter at each valve stem on the vehicle that shall transmit a signal to a display to be mounted in the cab by the body manufacturer. The display shall monitor if there is sufficient pressure in each specific tire. The display shall have programmable alarms to indicate pressure problems or a fast leak and shall retain up to ten (10) separate alarms with the date and time stamps.

## FRONT WHEEL

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

## REAR-WHEEL

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

## AUXILIARY LUBRICATION SYSTEM

A Groeneveld (CPL) automatic lubrication system shall be installed on the chassis. The system shall be capable of lubricating all applicable grease points on the chassis. A park brake interlock is incorporated into the ignition system to keep the system from operating while parked. The system shall be mounted on the left-hand frame rail.

## BRAKE SYSTEM

A rapid build-up air brake system shall be provided. The air brakes shall include two (2) air tanks, and three (3) reservoir systems with a total of 4152 cubic inches of air capacity. A floor-mounted treadle valve shall be mounted inside the cab for graduated control of applying and releasing the brakes. An inversion valve shall be installed to provide a service brake application in the unlikely event of primary air supply loss. All air reservoirs provided on the chassis shall be labeled for identification.

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

A four (4) sensor, and four (4) modulator anti-lock braking system (ABS) shall be installed on the front and rear axles to prevent the brakes from locking or skidding while braking during hard stops or on icy or wet surfaces. This in turn shall allow the driver to maintain steering control under heavy braking and in most instances, shorten the braking distance. The electronic monitoring system shall incorporate diagonal circuitry which shall monitor wheel speed during braking through a sensor and tone ring on each wheel. A dash-mounted ABS lamp shall be provided to notify the driver of a system malfunction. The ABS system shall automatically disengage the auxiliary braking system device when required. The speedometer screen shall be capable of reporting all active defaults using PID/SID and FMI standards.

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

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

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

**FRONT BRAKES**

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

**REAR BRAKES**

The rear brakes shall be Meritor 16.50-inch X 7.00-inch S-cam drum type. The brakes shall feature a cast iron shoe.

## PARK BRAKE

Upon application of the push-pull valve in the cab, the front and rear brakes will engage via mechanical spring force.

## PARK BRAKE CONTROL

A Meritor-Wabco manual hand control push-pull style valve shall operate the parking brake system. The control shall be yellow in color.

The parking brake actuation valve shall be mounted 6.00 inches to the left of the center of the dash within easy access of the driver. Same as our fleet.

## REAR BRAKE SLACK ADJUSTERS

The rear brakes shall include Meritor automatic slack adjusters installed on the axle which features a simple, durable design offering reduced weight. The automatic slack adjusters shall feature a manual adjusting nut that cannot inadvertently be backed off and threaded grease fittings for easy serviceability.

## AIR DRYER

The brake system shall include a Bendix AD-9 fully self-contained air dryer which shall not require an extra purge tank or additional valves. The AD-9 system shall include a spin-off desiccant filter with a 12-volt, 75-watt thermostatically controlled heating element. The air dryer shall feature 3.9 pounds of premium, high crush strength desiccant which shall be produced with a composition that shall be more effective and longer lasting than other desiccants. It shall also offer protection against contamination and desiccant breakdown. The air dryer shall be mounted behind the battery box on the left-hand side.

## FRONT BRAKE CHAMBERS

The front brakes shall be provided with MGM type 24 long stroke brake chambers.

## REAR BRAKE CHAMBERS

The rear axle shall include TSE 30/36 brake chambers which shall convert the energy of compressed air into mechanical force and motion. This shall actuate the brake camshaft, which in turn shall operate the foundational brake mechanism forcing the brake shoes against the brake drum. The TSE Type 36 brake chamber has a 36.00 square inch effective area.

## AIR COMPRESSOR

The air compressor provided for the engine shall be a Wabco® SS318 single-cylinder pass-through drive type compressor which shall be capable of producing 18.7 CFM at 1200 engine RPMs. The air compressor shall feature a higher delivery efficiency translating to more air

delivery per horsepower absorbed. The compressor shall include an aluminum cylinder head which shall improve cooling, reduce weight and decrease carbon formation. Superior piston and bore finishing technology shall reduce oil consumption and significantly increase the system component life.

**AIR GOVERNOR**

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

**MOISTURE EJECTORS**

Manual petcock-type drain valves shall be installed on all reservoirs of the air supply system.

**AIR SUPPLY LINES**

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

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

**AIR INLET CONNECTION**

A Kussmaul air automatic eject connection for the shoreline air inlet shall be supplied.

The air auto eject connection shall be red in color.

**AIR INLET LOCATION**

The air inlet shall be on the left side, rear of the rear door.

**AIR INLET/ OUTLET FITTING TYPE**

The air connector supplied shall be a 0.25-inch size Tru-Flate Interchange style manual connection which is compatible with Milton ‘T’ style, Myers 0.25 inch Automotive-style, and Parker 0.25-inch 10 Series connectors.

**REAR AIR TANK MOUNTING**

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

**WHEELBASE**

The chassis wheelbase shall be 215.50 inches.

**FRAME**

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

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

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

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

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

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

**FRAME PAINT**

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

- Mainframe “C” channel or channels

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

- Steering gear bracket
- Front splayed rails and fish plates
- Bumper extensions

- Cross members
- Cross member gussets
- Fuel tank mounting brackets
- Fuel tank straps (unless material/finish is specified in 3130 sub cat)
- Air tanks (unless color-coded tanks are specified in 3205 sub cat)
- Air tank mounting brackets
- Exhaust mounting brackets
- Air cleaner skid plate
- Radiator skid plate
- Battery supports, battery trays, and battery covers
-

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

- Suspension components
- Front and rear axles

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

The chassis undercarriage consisting of a frame, axles, driveline running gear, air tanks, and other assorted chassis-mounted components shall then be painted the primary lower cab color. Paint shall be applied before airline and electrical wiring installation.

**FRAME ASSEMBLY STRUCTURAL**

Purchaser shall receive a Frame Assembly Structural Fifty (50) Years or 250,000 Miles limited warranty following, and subject to, warranty certificate RFW0305. The warranty certificate is incorporated by reference into this proposal and included with this proposal or available upon request.

**FRAME RAIL CORROSION**

Purchaser shall receive a Frame Rail Corrosion (Zinc Plate and Powder Coat) Twenty Five (25) Years or 150,000 Miles limited warranty following, and subject to, warranty certificate RFW0316. The warranty certificate is incorporated by reference into this proposal and included with this proposal or available upon request.

**FRAME COMPONENTS CORROSION**

Purchaser shall receive a Frame Components Corrosion (Powder Coat) Three (3) Years or 48,000 Miles limited warranty following, and subject to, warranty certificate RFW0313. The warranty certificate is incorporated by reference into this proposal and included with this proposal or available upon request.

## FRONT BUMPER

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

## FRONT BUMPER EXTENSION LENGTH

The front bumper shall be extended approximately (16.0) 16.00 inches ahead of the cab.
If needed to meet max overall length of 34 feet the bumper length should be shortened rather than compromise compartment space.

## FRONT BUMPER PAINT

The front bumper shall be painted the same as the lower cab color. Add Chevron to the front surface.

## FRONT BUMPER APRON

The 16.00-inch extended front bumper shall include an apron constructed of a 0.19-inch thick embossed aluminum tread plate.

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

Bell shall be mounted to the front bumper in a location determined by Durham Fire Department.

A chrome-plated bell shall be mounted on the front bumper as specified by the Durham Fire Department.

## MECHANICAL SIREN

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

## MECHANICAL SIREN LOCATION

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

**AIR HORN**

The front bumper shall include two (2) Hadley brand E-Tone air horns which shall measure 21.00 inches long with a 6.00 inch round flare. The air horns shall be trumpet style with a chrome finish on the exterior and a painted finish deep inside the trumpet.

**AIR HORN LOCATION**

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

**AIR HORN RESERVOIR**

One (1) air reservoir, with a 1200 cubic inch capacity, shall be installed on the chassis to act as a supply tank for operating air horns. The reservoir shall be isolated with a 90 PSI pressure protection valve on the reservoir supply side to prevent depletion of the air to the air brake system.

**ELECTRONIC SIREN SPEAKER**

There shall be two (2) Cast Products Inc. model SA4301, 100-watt speakers provided. Each speaker shall measure 6.20 inches tall X 7.36 inches wide X 3.06 inches deep. Each speaker shall include a flat mounting flange which shall be polished aluminum.

**ELECTRONIC SIREN SPEAKER LOCATION**

The one (1) electronic siren speaker shall be located on the front bumper face between the frame rails in the Center positions.

**FRONT BUMPER TOW EYES**

The bumper shall include two (2) chrome-plated tow eyes that shall be installed through the front bumper. The eyes shall be fabricated from 0.75 inches thick #1020 ASTM-A36 hot rolled steel. The inside diameter of the eye shall be 2.00 inches and include inside/outside chamfered edges.

**CAB TILT SYSTEM**

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

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

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

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

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

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

## CAB TILT AUXILIARY PUMP

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

## CAB TILT LIMIT SWITCH

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

## CAB TILT CONTROL RECEPTACLE

The cab tilt control cable shall include a receptacle which shall be located on the driver's side door opening to plug in the cab tilt remote control pendant. The tilt pump shall include 8.00 feet of cable with a six (6) pin Deutsch receptacle with a cap.

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

## CAB TILT LOCKDOWN INDICATOR

The cab dash shall include a message located within the dual air pressure gauge which shall alert the driver when the cab is unlocked and ajar. The alert message shall cease to be displayed when the cab is in the fully lowered position and the hold-down hooks are secured and locked to the cab mounts.
In addition to the alert message, an audible alarm shall sound when the cab is unlocked and ajar and the parking brake is released.

## CAB WINDSHIELD

The cab windshield shall be of a two (2) piece wraparound design for maximum visibility.

The glass utilized for the windshield shall include standard automotive tint. The left and right windshield shall be fully interchangeable thereby minimizing stocking and replacement costs. Each windshield shall be installed using black self-locking window rubber.

## GLASS FRONT DOOR

The front cab doors shall include a window that is 27.00 inches in width X 26.00 inches in height. These windows shall have the capability to roll down completely into the door housing. This shall be accomplished using electric actuation. The left and right front door windows shall be controlled using a switch on each respective side inner door panel. The driver's door shall include a switch for each powered door window in the cab.

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

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

## GLASS TINT FRONT DOOR

The windows located in the left and right front doors shall include a ceramic dark gray automotive tint which shall allow Seventy-five percent () (75%) light transmittance. The dark ceramic tint shall aid in cab cooling and help protect passengers from radiant solar energy.

## GLASS REAR DOOR RH

The rear right-hand side crew door shall include a window that is 27.00 inches in width X 26.00 inches in height. The window shall be a powered type and shall be controlled by a switch on the inner door panel and the driver's control panel.

## GLASS TINT REAR DOOR RIGHT HAND

The window located in the right-hand side rear window shall include a ceramic dark gray automotive tint which shall allow Thirty-Five percent (35%) light transmittance. The dark ceramic tint shall aid in cab cooling and help protect passengers from radiant solar energy.

## GLASS REAR DOOR LH

The rear left-hand side crew door shall include a window that is 27.00 inches in width X 26.00 inches in height. The window shall be a powered type and shall be controlled by a switch on the inner door panel and the driver's control panel.

## GLASS TINT REAR DOOR LEFT HAND

The window located in the left-hand side rear door shall include a ceramic dark gray automotive tint which shall allow forty-five percent (20%) light transmittance. The dark tint shall aid in-cab cooling and help protect passengers from radiant solar energy.

## GLASS SIDE MID RH

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

## GLASS TINT SIDE MID RIGHT HAND

The window located on the right-hand side of the cab between the front and rear doors shall include a dark gray automotive tint which shall allow forty-five percent (20%) light transmittance. The dark tint shall aid in-cab cooling and help protect passengers from radiant solar energy.

## GLASS SIDE MID LH

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

## GLASS TINT SIDE MID LEFT HAND

The window located on the left-hand side of the cab between the front and rear doors shall include a dark gray automotive tint which shall allow forty-five percent (20%) light transmittance. The dark tint shall aid in-cab cooling and help protect passengers from radiant solar energy.

## CLIMATE CONTROL

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

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

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

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

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

The air conditioning system plumbing shall be a mixture of custom bent zinc-coated steel fittings and Aero-quip GH134 flexible hose with Aeroquip EZ-Clip fittings.
The overhead heater/defroster plumbing shall include an electronic flow control valve that re-directs hot coolant away from the evaporator, via a bypass loop, as the temperature control is moved toward the cold position.

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

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

**CLIMATE CONTROL DRAIN**

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

**CLIMATE CONTROL ACTIVATION**

The heating, defrosting and air conditioning controls shall be located on the center dash panel on the lower left-hand side, in a position that is easily accessible to the driver. The climate control shall be activated by a rotary switch.

**HVAC OVERHEAD COVER PAINT**

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

## A/C CONDENSER LOCATION

A roof-mounted A/C condenser shall be installed centered on the cab forward of the raised roof against the slope rise.

## A/C COMPRESSOR

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

## UNDER CAB INSULATION

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

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

The engine tunnel insulation shall measure approximately 0.75 inches thick including a vertically lapped polyester fiber layer, a 1.0 lb/ft² PVC barrier layer, an open-cell foam layer, and moisture and heat-reflective foil facing reinforced with a woven fiberglass layer. The foil surface acts as protection against moisture and other contaminants. The insulation shall meet or exceed FMVSS 302 flammability test.
The insulation shall be cut precisely to fit each section and sealed for additional heat and sound deflection. The insulation shall be held in place by 3 mils of acrylic pressure-sensitive adhesive and aluminum pins with a hard hat, hold in place fastening heads.

## INTERIOR TRIM FLOOR

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

The floor shall have an overlay of 3003-H22 aluminum embossed tread plate. The tread plate shall be held down with screws and aluminum trim molding.

## INTERIOR TRIM

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

## REAR WALL INTERIOR TRIM

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

## HEADER TRIM

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

## TRIM CENTER DASH

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

## TRIM LH DASH

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

## TRIM RH DASH

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

## ENGINE TUNNEL TRIM

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

## POWERPOINT DASH MOUNT

The cab shall include One (1) 12-volt cigarette lighter type receptacle in the cab dash to provide a power source for 12-volt electrical equipment. The receptacles shall be wired battery direct. The cab shall also include two (2) Dual universal serial bus (USB) charging receptacles in the cab dash rocker switch cutout to provide a power source for USB chargeable electrical equipment. Each USB receptacle shall include one (1) USB port capable of a 5 Volt-1 amp output and one (1) USB port capable of a 5 Volt-2.1-amp output. The receptacles shall be wired battery direct and include a backlit legend.

## ENGINE TUNNEL MOUNTING PLATE

One 1/2” poly plate covering the top of the engine tunnel for mounting equipment shall be supplied.

## STEP TRIM

Each cab entry door shall include a three-step entry. The first step closest to the ground shall be constructed of polished 5032 H32 aluminum Grip Strut® grating with angled outer corners. The step shall feature a splash guard to reduce water and debris from splashing into the step. The splash guard shall have an opening on the outer edge to allow debris and water to flow through rather than becoming trapped within the stepping surface. The lower step shall be mounted to a frame that is integral to the construction of the cab for rigidity and strength. The middle step shall be integral to the cab construction and shall be trimmed with a Flex-Tred® adhesive grit surface material.

## UNDER CAB ACCESS DOOR

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

## INTERIOR DOOR TRIM

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

## DOOR TRIM CUSTOMER NAMEPLATE

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

## CAB DOOR TRIM REFLECTIVE

The interior of each door shall include high visibility reflective tape. A white reflective tape shall be provided vertically along the outer rear edge of the door. The lowest portion of each door skin shall include a reflective tape chevron with red and white stripes. The chevron tape shall measure 6.00 inches in height.

## INTERIOR GRAB HANDLE "A" PILLAR

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

## INTERIOR GRAB HANDLE FRONT DOOR

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

## INTERIOR GRAB HANDLE REAR DOOR

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

## INTERIOR SOFT TRIM COLOR

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

## INTERIOR TRIM SUNVISOR

The header shall include two (2) sun visors, one each side forward of the driver and officer seating positions above the windshield. Each sun visor shall be constructed of Masonite and covered with padded vinyl trim.

## INTERIOR ABS TRIM COLOR

The cab interior vacuum-formed ABS composite trim surfaces shall be gray in color.

## INTERIOR FLOOR MAT COLOR

The cab interior floor mat shall be gray in color.

## CAB PAINT INTERIOR

The inner door panel surfaces shall feature a medium gray Spar-Liner spray-on bed liner coating.

## HEADER TRIM INTERIOR PAINT

The metal surfaces in the header area shall feature a medium gray Spar-Liner spray-on bed liner coating.

## DASH PANEL GROUP

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

## SWITCHES CENTER PANEL

The center dash panel shall include three (3) rocker switch positions in a single row configuration in the upper left portion of the panel.
A rocker switch with a blank legend installed directly above shall be provided for any position without a switch and legend designated by a specific option. The non-specified switches shall be two-position, black switches with green indicator lights. Each blank switch legend can be custom engraved by the body manufacturer. All switch legends shall have backlighting provided and must be able to be read at any time day or night.

## SWITCHES LEFT PANEL

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

## SWITCHES RIGHT PANEL

The right dash panel shall include three (3) rocker switch positions in the upper right-hand portion of the panel.

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

## SEAT BELT WARNING

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

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

## SEAT MATERIAL

Seat coverings shall not be fabric and shall allow for easy decontamination.

## SEAT COLOR

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

## SEAT DRIVER

The driver's seat shall be an H.O. Bostrom 400 Series Firefighter Sierra model seat with air suspension. The seat shall feature eight-way electric positioning. The eight positions shall include up and down, fore and aft with 8.00 inches of travel, back angle adjustment, and seat rake adjustment. The seat shall feature integral springs to isolate shock. Seat controls must be easily reachable when belted in the seat.

The seat shall feature an all-belts-to-seat (ABTS) style of safety restraint. The ABTS feature shall include a three-point shoulder harness with the lap belt, automatic retractor, and buckle as an integral part of the seat assembly.

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

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

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

## SEAT BACK DRIVER

The driver’s seat shall include a standard seat back incorporating all belts to seat features (ABTS). The seat back shall feature a contoured headrest. The driver’s seat shall feature a two (2) way adjustable lumbar support and offer an infinite fully reclining adjustable titling seat back. The seat back shall also feature a contoured headrest.

## SEAT MOUNTING DRIVER

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

## OCCUPANT PROTECTION DRIVER

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

The driver’s seating area APS shall include:

• Advanced seat belt system - retractor pre-tensioner tightens the seat belt around the driver, securing the occupant in the seat and the load limiter plays out some of the seat belt webbings to reduce seat belt to chest and torso force upon impact as well as mitigate head and neck injuries.

• Large side curtain airbag - protects the driver's head, neck, and upper body from dangerous cab side surfaces and contact points with intrusive surfaces as a result of a collision as well as provides ejection mitigation protection to the driver in a qualifying event by covering the window and the upper portion of the door.

• Dual knee airbags (patent pending) with energy management mounting (patent pending) - protects the driver's lower body from dangerous surface contact injuries, acceleration injuries, and intrusion as well as locks the lower body in place so the upper body shall be slowed by the load limiting seat belt.

Steering wheel airbag - protects the driver's head, neck, and upper torso from contact injuries, acceleration injuries, and contact points with intrusive surfaces as a result of a collision.
The manufacturer shall provide the department with a link to the software to diagnose and repair any and all SRS system faults at no charge.

**SEAT OFFICER**

The officer's seat shall be an H.O. Bostrom 400 Series Firefighter model seat with air suspension. The seat shall feature eight-way electric positioning. The eight (8) positions shall include up and down, forward, and aft, and front and rear tilt. The seat shall also feature integral springs to isolate shock. Seat controls must be easily reachable when belted in the seat.

The seat shall feature an all-belts-to-seat (ABTS) style of safety restraint. The ABTS feature shall include a three-point shoulder harness with the lap belt, automatic retractor, and buckle as an integral part of the seat assembly.

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

This model of the seat shall have successfully completed the static load tests by FMVSS 207, 209, 210, and 302 in effect at the time of manufacture. This testing shall include a simultaneous forward load of 3000 pounds each on the lap and shoulder belts and twenty (20) times the weight through the center of gravity. The model of seats shall also have successfully completed the flammability of materials used in the occupant compartments of motor vehicles as outlined in FMVSS 302, which decides the burning rate of materials in the occupant compartments of motor vehicles.

**SEAT BACK OFFICER**

The officer's seat back shall include an IMMI brand SmartDock® Gen 2 hands-free self-contained breathing apparatus (SCBA) holder. The hands-free holder shall meet NFPA 1901-03 9G dynamic

requirements for cylinder restraint systems for use in crew compartments of emergency response vehicles. The bracket shall accommodate and secure most types of self-contained breathing apparatus cylinders.

The hands-free holder shall consist of a back plate, bottom cradle, non-marring top claws, and claw height adjustment knob. The height adjustment knob shall allow for easy adjustment of the claws to the SCBA. The hands-free holder's claws shall lock from inertial forces to prevent the SCBA from becoming a projectile in the event of a crash to meet the NFPA 1901-03 standard for SCBA retention. The SCBA holder shall offer single-motion insertion into the claws and hands-free release when the SCBA fitted seat occupant rises.

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

**SEAT MOUNTING OFFICER**

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

**OCCUPANT PROTECTION OFFICER**

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

The officer’s seating area APS shall include:

• Advanced seat belt system - retractor pre-tensioner tightens the seat belt around the officer, securing the occupant in the seat and the load limiter plays out some of the seat belt webbing to reduce seat belt to chest and torso force upon impact as well as mitigate head and neck injuries.

• Large side curtain airbag - protects the officer’s head, neck, and upper body from dangerous cab side surfaces and contact points with intrusive surfaces as a result of a collision as well as provides ejection mitigation protection to the officer in a qualifying event by covering the window and the upper portion of the door.

Knee airbags - protect the officer's lower body from dangerous surface contact injuries, acceleration injuries, and contact points with intrusive surfaces as a result of a collision as well as lock the lower body in place so the upper body shall be slowed by the load limiting seat belt.

**POWER SEAT WIRING**

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

**SEAT BELT ORIENTATION CREW**

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

**SEAT REAR-FACING OUTER LOCATION**

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

**SEAT CREW REAR-FACING OUTER**

The crew area shall include a seat in the rear-facing outboard position which shall be an H.O. Bostrom 400 Series Firefighter model seat. The seat shall feature a tapered and padded seat, and cushion.

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

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

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

**SEAT BACK REAR-FACING OUTER**

The crew area seat backs shall include an IMMI brand SmartDock® Gen 2 hands-free self-contained breathing apparatus (SCBA) holder. The hands-free holder shall meet NFPA 1901-03 9G dynamic requirements for cylinder restraint systems for use in crew compartments of emergency response vehicles. The bracket shall accommodate and secure most types of self-contained breathing apparatus cylinders.

The hands-free holder shall consist of a back plate, bottom cradle, non-marring top claws, and claw height adjustment knob. The height adjustment knob shall allow for easy adjustment of the

claws to the SCBA. The hands-free holder's claws shall lock from inertial forces to prevent the SCBA from becoming a projectile in the event of a crash to meet the NFPA 1901-03 standard for SCBA retention. The SCBA holder shall offer single-motion insertion into the claws and hands-free release when the SCBA fitted seat occupant rises.

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

**SEAT MOUNTING REAR-FACING OUTER**

The rear-facing outer seat shall be mounted facing the rear of the cab.

**OCCUPANT PROTECTION RFO**

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

Each rear-facing outer seating position APS shall include:

• APS advanced seat belt system - retractor pre-tensioners tighten the seat belts around each occupant, securing the occupants in seats and load limiters play out some of the seat belt webbing to reduce seat belt to chest and torso force upon impact as well as mitigate head and neck injuries.

Side curtain airbag - protects each occupant's head, neck, and upper body from dangerous cab side surfaces and contact points with intrusive surfaces as a result of a collision as well as provides ejection mitigation protection to each occupant in a qualifying event by covering the windows and walls adjacent to each seating position with an airbag custom-designed for each cab configuration.

**SEAT FORWARD FACING CENTER LOCATION**

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

**SEAT CREW FORWARD-FACING CENTER**

The crew area shall include a seat in the forward-facing center position which shall be an H.O. Bostrom 400 Series Firefighter model seat. The seat shall feature a tapered and padded seat, and cushion. The seat and cushion shall be hinged and compact in design for additional room and shall remain in the stored position until occupied.

The seat shall feature an all-belts-to-seat (ABTS) style of safety restraint. The ABTS feature shall include a three-point shoulder harness with the lap belt and automatic retractor as an

integral part of the seat assembly. The buckle portion of the seat belt shall extend from the seat base towards the driver position within easy reach of the occupant.

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

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

**SEAT BACK FORWARD-FACING CENTER**

The crew area seat backs shall include an IMMI brand SmartDock® Gen 2 hands-free self-contained breathing apparatus (SCBA) holder. The hands-free holder shall meet NFPA 1901-03 9G dynamic requirements for cylinder restraint systems for use in crew compartments of emergency response vehicles. The bracket shall accommodate and secure most types of self-contained breathing apparatus cylinders.

The hands-free holder shall consist of a back plate, bottom cradle, non-marring top claws, and claw height adjustment knob. The height adjustment knob shall allow for easy adjustment of the claws to the SCBA. The hands-free holder's claws shall lock from inertial forces to prevent the SCBA from becoming a projectile in the event of a crash to meet the NFPA 1901-03 standard for SCBA retention. The SCBA holder shall offer single-motion insertion into the claws and hands-free release when the SCBA fitted seat occupant rises.

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

**SEAT FRAME FORWARD-FACING STORAGE ACCESS**

There shall be one (1) access point to the storage area centered on the front of the seat frame. This access point shall be covered by a webbing- to allow access for storage in the seat box. Decide if we want the base storage area open or closed?

**SEAT MOUNTING FORWARD-FACING CENTER**

The forward-facing center seats shall offer a special mounting. The seats shall be installed 18.00 inches apart offering additional room for each occupant.

## SEAT FRAME EXTERIOR REAR COMPARTMENT ACCESS

The seat frame shall be open to the exterior rear compartment on both the right-hand side and the left-hand side. This shall allow interior access to the left and right exterior rear compartments.

## CAB FRONT UNDER-SEAT STORAGE ACCESS

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

## SEAT COMPARTMENT DOOR FINISH

All under-seat storage compartment access doors shall feature a medium gray Spar-Liner spray-on bed liner coating.

## WINDSHIELD WIPER SYSTEM

The cab shall include a dual-arm wiper system which shall clear the windshield of water, ice, and debris. There shall be two (2) windshield wipers which shall be affixed to a radial wet arm. The system shall include a single motor which shall initiate the arm in which both the left-hand and right-hand windshield wipers are attached, initiating a back and forth motion for each wiper. The wiper motor shall be activated by an intermittent wiper control located within easy reach of the driver's position.

## ELECTRONIC WINDSHIELD FLUID LEVEL INDICATOR

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

## CAB DOOR HARDWARE

The cab entry doors shall be equipped with exterior pull handles, suitable for use while wearing firefighter gloves. The handles shall be made of aluminum with a chrome-plated finish.
The interior exit door handles shall be flush paddle type with a black finish, which are incorporated into the upper door panel.

All cab entry doors shall include locks that are keyed alike. The door locks shall be designed to prevent an accidental lockout.
The exterior pull handles shall include a scuff plate behind the handle constructed of polished stainless steel to help protect the cab finish.

## DOOR LOCKS

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

## DOOR LOCK LH REAR CAB COMPARTMENT

The left-hand side rear compartment shall feature a manual door lock.

## DOOR LOCK RH REAR CAB COMPARTMENT

The right-hand side rear compartment shall feature a manual door lock.

## GRAB HANDLES

The cab shall include one (1) 18.00-inch three-piece knurled stainless steel, anti-slip exterior assist handle, installed behind each cab entry door. The grab handle shall be made of stainless steel with a knurled finish to enable non-slip assistance with a gloved hand. Each end of the grab handle will include one (1) chrome plated stanchion that shall allow the grab handle to be fastened to the cab exterior. Each grab handle shall include a stainless-steel scuff plate to help protect the cab paint from damage.

## REARVIEW MIRRORS

Retrac Aerodynamic style single vision mirror heads model 613275 shall be provided and installed on the front cab doors.

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

The mirrors shall measure 8.00 inches wide X 19.00 inches high and s hall include an 8.00-inch convex mirror with stainless steel back, model 980-4, installed below the flat glass to provide a wider field of vision. The flat mirrors shall be motorized with remote horizontal and vertical adjustment. The control switches shall be mounted within easy reach of the driver. The convex mirrors shall be manually adjustable.

The mirrors shall be constructed of a vacuum-formed chrome plated ABS plastic housing that is corrosion resistant and shall include the finest quality non-glare glass.
Retrac motorized dual-vision heated aerodynamic mirrors, model 613423. The flat mirrors shall be motorized with remote horizontal and vertical adjustment and heated for cold weather. The control switches shall be mounted within easy reach of the driver. The convex mirrors shall be manually adjustable.

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

**CAB FENDER**

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

**MUD FLAPS FRONT**

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

**IGNITION**

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

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

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

**BATTERY**

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

**BATTERY TRAY**

The batteries shall be installed within two (2) stainless steel battery housings with integrated slide-out trays located on the left side and right side of the chassis, securely bolted to the frame rails. The battery trays shall be natural finish stainless steel.

The battery trays shall include draining holes in the bottom for sufficient drainage of water. A durable, non-conducting, interlocking mat made by Dri-Dek shall be installed on the bottom of the trays to allow for airflow and help prevent moisture build-up. The batteries shall be held in place by non-conducting phenolic resin hold-down boards. The design for the slide-out feature shall include remote terminal studs for the battery cables to improve ease of maintenance.

## BATTERY BOX COVER

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

## BATTERY CABLE

The starting system shall include cables which shall be protected by 275 degrees F. minimum high-temperature flame retardant loom, sealed at the ends with heat shrink and sealant.
The battery terminals shall not be utilized for auxiliary connections. The only acceptable auxiliary connections shall be for the cross-over link from the left bank to the right bank, power for jumper studs, and starter cables. All other auxiliary connections will use remote studs mounted in the battery box area. There shall be four (4) remote studs labeled as Common Power, Common Ground, Clean Power, and Clean Ground.

## BATTERY JUMPER STUD

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

## ALTERNATOR

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

## STARTER MOTOR

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

## BATTERY CONDITIONER

A Kussmaul 1200 battery conditioner shall be supplied. The battery conditioner shall be mounted in the cab in the LH rear-facing outer seating position.

## BATTERY CONDITIONER DISPLAY

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

## ELECTRICAL INLET

A Kussmaul 20 amp super auto-eject electrical receptacle shall be supplied. It shall automatically eject the plug when the starter button is depressed.
A single item or addition of multiple items must not exceed the rating of the electric inlet that it’s connected to.

**ELECTRICAL INLET LOCATION**

An electrical inlet shall be installed on the left-hand side of the cab behind the driver side rear door on the cab.

**ELECTRICAL INLET CONNECTION**

The electrical inlet shall be connected to the battery conditioner.

**ELECTRICAL INLET COLOR**

The electrical inlet connection shall include a red cover.

**HEADLIGHTS**

The cab front shall include four (4) rectangular LED headlamps with separate high and low beams mounted in bright chrome bezels.

Whelen Lights shall be used for all light applications when possible.

**FRONT TURN SIGNALS**

The front fascia shall include two (2) Whelen model 600 4.00-inch X 6.00-inch programmable amber LED turn signals shall be installed in a chrome bezel outboard of the front warning and above the headlamps installed in the outboard position.

**HEADLIGHT LOCATION**

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

**SIDE TURN/MARKER LIGHTS**

The sides of the cab shall include two (2) LED round side marker lights which shall be provided just behind the front cab radius corners.

**MARKER AND ICC LIGHTS**

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

**HEADLIGHT AND MARKER LIGHT ACTIVATION**

The headlights and marker lights shall be controlled via a virtual button on the Vista display. There shall be a virtual dimmer control on the Vista display to adjust the brightness of the dash

lights. The headlamps and markers lamps shall illuminate to 100% brilliance when the master power switch is in the "On" position.

**CORNERING LIGHTS**

The cab side shall include two (2) Whelen 400 LED steady-on cornering lights with clear lenses, one (1) on each side. The lights shall be mounted rearward from the front cab corner radius ahead of the cab doors. Each light head shall illuminate when the respective side turn signal is activated.

**GROUND LIGHTS**

Each door shall include an NFPA-compliant LED ground light mounted to the underside of the cab step below each door. The lights shall include a polycarbonate lens, housing that is vibration welded, and LEDs which shall be shock-mounted for extended life. The ground lighting shall be activated when the parking brake is set and through a virtual button on the Vista display and control screen.

**LOWER CAB STEP LIGHTS**

The middle step located at each door shall include a recess-mounted 4.00 inch round LED light which shall activate with the opening of the respective door.

**INTERMEDIATE STEP LIGHTS**

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

**ENGINE COMPARTMENT LIGHT**

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

**LIGHTBAR PROVISION**

There shall be one Whelen (1) light bar installed on the cab roof. The light bar shall be provided and installed by the Chassis builder. The light bar installation shall include mounting and wiring to a control switch on the cab dash.

**CAB FRONT LIGHTBAR**

The Lightbar provision shall be one (1) The lightbar shall be 85.00 inches in length.

**LIGHTBAR SWITCH**

The light bar shall be controlled by a rocker switch located on the switch panel. There shall be an additional rocker switch to control the amber lights only. The amber light switch shall be able to be activated at all times. The switches shall be clearly labeled for identification.

**FRONT SCENE LIGHTS**

The front scene lights shall be the firetec lightbar placed below the Whelen light bar extending the full width off the cab.

**FRONT SCENE LIGHTS ACTIVATION**

The front scene lighting shall be activated by a rocker switch.

**SIDE SCENE LIGHTS**

The side of the cab shall include two (2) Whelen 900 series 9SC0ENZR model scene lights, one (1) on each side which shall be surface mounted with a chrome bezel. The Whelen lights shall offer LED lighting at a gradient 32-degree angle.

**SIDE SCENE LIGHT LOCATION**

The scene lighting located on the left and right sides of the cab shall be mounted rearward of the cab “B” pillar in the 10.00-inch raised roof portion of the cab between the front and rear crew doors.

**SIDE SCENE ACTIVATION**

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

**INTERIOR OVERHEAD LIGHTS**

The cab shall include a two-section, red and clear Weldon LED dome lamp located over each door. The dome lamps shall be rectangular in shape and shall measure approximately 7.00 inches in length X 3.00 inches in width with a black colored bezel. The clear portion of each lamp shall be activated by opening the respective door and via the multiplex display and both the red and clear portion can be activated by individual push lenses on each lamp.

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

**DO NOT MOVE THE APPARATUS LIGHT**

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

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

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

**MASTER WARNING SWITCH**

A master switch shall be included in the main rocker switch panel. The switch shall be a rocker type, red in color and labeled “Master” for identification. The switch shall feature control over all devices wired through it. Any warning device switch left in the “ON” position shall automatically power up when the master switch is activated.

**HEADLIGHT FLASHER SWITCH**

**INBOARD FRONT WARNING LIGHTS**

The cab front fascia shall include two (2) Whelen LED front warning lights in the left and right inboard positions. The lights shall be mounted to the front fascia of the cab within a chrome bezel.

**INBOARD FRONT WARNING LIGHTS COLOR**

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

**FRONT WARNING SWITCH**

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

**INTERSECTION WARNING LIGHTS**

The chassis shall include two (2) Whelen LED intersection warning lights, one (1) on each side.

**INTERSECTION WARNING LIGHTS COLOR**

The intersection lights shall be red. with a clear lens.

**INTERSECTION WARNING LIGHT’S LOCATION**

The intersection warning lights shall be centered on each of the flat surfaces of the steel channel bumper's angled front right and left corners.

**SIDE WARNING LIGHTS**

The cab sides shall include two (2) Whelen LED warning lights, one (1) on each side. The lights shall be mounted to the sides of the cab within a chrome bezel.

**SIDE WARNING LIGHTS COLOR**

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

**SIDE WARNING LIGHTS LOCATION**

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

**SIDE AND INTERSECTION WARNING SWITCH**

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

**INTERIOR DOOR OPEN WARNING LIGHTS**

The interior of each door shall include one (1) red 4.00-inch diameter Truck-Lite LED warning light located on the door panel. Each light shall activate with a flashing pattern when the door is in the open position to serve as a warning to oncoming traffic.

**SIREN CONTROL HEAD**

A Whelen 295HFS2 electronic siren control head with remote amplifier shall be provided and flush-mounted in the switch panel with a location-specific to the customer’s needs. The siren shall feature 200-watt output, hands-free mode, and shall be in “standby” mode awaiting instruction. The siren shall offer radio broadcast, public address, wail, yelp, or piercer tones,

**AIR HORN ACTIVATION**

The air horn activation shall be accomplished by two (2) lanyard cables, one (1) on the left-hand side accessible to the driver and one (1) on the right hand side accessible to the officer. An air horn activation circuit shall be provided to the chassis harness pump panel harness connector.

**MECHANICAL SIREN ACTIVATION**

The mechanical siren shall be actuated by a Linemaster model SP491-S81 foot switch mounted in the front section of the cab for use by the driver and a rocker switch in the panel on the

officer's side dash. A red momentary siren brake rocker switch shall be provided in the switch panel on the dash.

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

**BACK-UP ALARM**

A Preco-Matic model 1059 dual function backup alarm shall be installed at the rear of the chassis with an output level of 107 dB. The alarm shall automatically activate when the transmission is placed in reverse.

**INSTRUMENTATION**

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

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

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

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

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

indicate when the system voltage has dropped below 11.8 volts for more than 120 seconds in accordance with the requirements of NFPA 1901. The scale on the transmission temperature gauge shall read from 100 to 300 degrees °F with a red line zone indicating critical temperatures. A red indicator light in the gauge and an audible alarm shall indicate a high transmission temperature.

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

**RED INDICATORS**

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

**AMBER INDICATORS**

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

**GREEN INDICATORS**

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

Pump Engaged - indicates the pump transmission is currently in pump gear
Auxiliary Brake - indicates secondary braking device is active

**BLUE INDICATORS**

High Beam indicator

**AUDIBLE ALARMS**

- Air Filter Restriction
- Cab Tilt Lock
- Check Engine
- Check Transmission
- Open Door/Compartment
- High Coolant Temperature
- High or Low System Voltage
- High Transmission Temperature
- Low Air Pressure
- Low Coolant Level
- Low DEF Level
- Low Engine Oil Pressure
- Low Fuel
- Seatbelt Indicator
- Stop Engine
- Water in Fuel
- Extended Left/Right Turn Signal On
- ABS System Fault

**BACKLIGHTING COLOR**

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

**AUXILIARY SPEEDOMETER**

The dash or overhead area shall include an auxiliary speedometer which shall feature a digital readout and be located within the officer's area. To be determined by Durham fire.

**RADIO**

A Jensen radio with weather band, AM/FM stereo receiver, and four (4) speakers shall be installed in the cab. This radio shall be satellite radio capability and blue tooth compatible.

## CAMERA

An Audiovox Voyager heavy-duty rearview camera system shall be supplied. One (1) box-shaped camera shall be shipped loose for OEM installation in the body to afford a clear view of the rear of the vehicle and two (2) cameras with teardrop-shaped chrome-plated housings shall be mounted on the left and right sides of the cab below the windshield ahead of the front door at approximately the same level as the cab door handle. The side cameras shall afford a clear view of the area on each side of the vehicle.

The cameras shall be wired to a Weldon Vista display which shall be located on the left side of the dash. The rear camera shall activate when the transmission is placed in reverse and the side cameras shall activate with the respective side turn signal. Each camera shall also be activated by a button on the Vista display.

## AM/FM ANTENNA

A small antenna shall be located on the right-hand side of the cab roof for AM/FM and weather band reception. Location shall not interfere with the whelen light bar function.

## COMMUNICATION ANTENNA

An antenna base, for use with an NMO type antenna, shall be mounted on the right-hand front corner of the cab roof so not to interfere with light bars or other roof mounted equipment installed by Spartan Chassis. The antenna base shall be an Antenex model MABVT8 made for either a 0.38 inch or 0.75 inch receiving hole in the antenna and shall include 17.00 foot of RG58 A/U cable with no connector at the radio end of the cable. The antenna base design provides the most corrosion resistance and best power transfer available from a high temper all brass construction and gold-plated contact design. The antenna base shall be provided by the manufacturer. Location shall not interfere with the whelen light bar function.

## CAB EXTERIOR PROTECTION

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

## FIRE EXTINGUISHER

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

## ROAD SAFETY KIT

The cab and chassis shall include . Ten (10) quick deploy 28" spring cones that meet NFPA and MUTCD highway traffic cone requirements shall be provided. The cones are made of durable, bright orange, flexible mesh material. Each cone shall weigh 3 lbs. and be easily stored in the wire mesh tote storage system.

## DOOR KEYS

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

## DIAGNOSTIC SOFTWARE OCCUPANT PROTECTION

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

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

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

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

## WARRANTY

Summary of Warranty Terms:

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

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

## CHASSIS OPERATION MANUAL

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

## ENGINE AND TRANSMISSION OPERATION MANUALS

The following manuals specific to the engine and transmission models ordered will be included with the chassis in the ship loose items:
(1) Hard copy of the Engine Operation and Maintenance Manual with CD

(1) Digital copy of the Transmission Operator's manual
(1) Digital copy of the Engine Owner's manual

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

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

**PAINT CONFIRMATION**

There shall be a paint confirmation letter sent to the body manufacturer with paint spray outs to confirm the cab primary paint color or primary and secondary paint color as specified by the paint options.

**DASH PANEL GROUP**

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

**SWITCHES CENTER PANEL**

The center dash panel shall include twelve (12) rocker switch positions in a six (6) over six (6) switch configuration in the left portion of the panel.

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

**SWITCHES LEFT PANEL**

The left dash panel shall include thirteen (13) switches. There shall be six (6) switches across the top of the panel and seven (7) across the bottom of the panel. Six (6) of the top row of switches shall be rocker type. Four (4) of the lower row of switches shall be rocker type and the left three (3) shall be the windshield wiper/washer control switch, instrument lamp dimmer switch, and headlight switch. Switch layout to match currant engine configuration.

A rocker switch with a blank legend installed directly above shall be provided for any position not designated by a specific option. The non-designated switches shall be two-position, black switches with a green indicator light. Each blank switch legend can be custom engraved by the body manufacturer. All switch legends shall have backlighting provided.

**SWITCHES RIGHT PANEL**

The right dash panel shall include rocker switches and legends to match current engine configuration.

## DRIVELINE LAYOUT CONFIRMATION

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

F. Axle Weight: 16,212, R. Axle Weight: 4,761

## CAB TO AXLE DIMENSION

Cab to axle will be 148”.

## CHASSIS MODIFICATIONS

## LUBRICATION AND TIRE DATA PLATE

A permanent label in the driving compartment shall specify the quantity and type of the following fluids used in the vehicle and tire information:
• Engine oil
• Engine coolant
• Chassis transmission fluid
• Drive axle(s) lubrication fluid
• Air conditioning refrigerant. . (if applicable)
• Air conditioning lubrication oil. . (if applicable)
• Power steering fluid
• Cab tilt mechanism fluid. . (if applicable)
• Transfer case fluid. . (if applicable)
• Equipment rack fluid (if applicable)
• CAFS air compressor system lubricant. . (if applicable)
• Generator system lubricant. . (if applicable)
• Front tire cold pressure
• Rear tire cold pressure
• Maximum tire speed ratings

## VEHICLE DATA PLATE

A permanent label in the driving compartment indicates the following:
• Filter part numbers for the;
− Engine
− Transmission
− Air
− Fuel
• Serial numbers for the;
− Engine
− Transmission

• Delivered Weights of the Front and Rear Axles
• Paint Brand and Code(s)
• Sales Order Number

**OVERALL HEIGHT, LENGTH DATA PLATE (US)**

The fire apparatus manufacturer shall permanently affix a high-visibility label in a location visible to the driver while seated.

The label shall show the height of the completed fire apparatus in feet and inches, the length of the completed fire apparatus in feet and inches, and the GVWR in pounds.

Wording on the label shall indicate that the information shown was current when the apparatus was manufactured and that, if the overall height changes while the vehicle is in service, the fire department must revise that dimension on the plate.

**PERSONNEL CAPACITY**

A label that states the number of personnel the vehicle is designed to carry shall be located in an area visible to the driver.

**SEAT BELT WARNING - FAMA06/07**

A safety sign FAMA06 shall be visible from each seat that is not equipped with occupant restraint and therefore not intended to be occupied while the vehicle is in motion.

A safety sign FAMA07, which warns of the importance of seat belt use, shall be visible from each seat that is intended to be occupied while the vehicle is in motion.

**EQUIPMENT MOUNTING FAMA10**

A safety sign FAMA10, which warns of the need to secure items in the cab, shall be visible inside the cab.

**FIRE SERVICE TIRES - FAMA12**

A safety sign FAMA12, which warns of the special requirements for fire service–rated tires, shall be visible to the driver entering the cab of any apparatus so equipped.

**HELMET WARNING - FAMA15**

A safety sign FAMA15, which warns not to wear helmets while the vehicle is in motion, shall be visible from each seat that is intended to be occupied while the vehicle is in motion.

## CLIMBING METHOD - FAMA23

A safety sign FAMA23, which warns of the proper climbing method, shall be visible to personnel entering the cab and at each designated climbing location on the body.

## REAR STEP CROSSWALK WARNING - FAMA24

A safety sign FAMA24, which warns personnel not to ride on the vehicle, shall be located at the rear step areas and at any cross walkways.

## FINAL STAGE MANUFACTURER VEHICLE CERTIFICATION

A final stage manufacturer vehicle certification label shall be provided and installed in the driver cab door jamb area.

## FRONT BUMPER

The front bumper shall be as provided by the cab/chassis manufacturer. No other alterations or modifications are required to the extension length.

## FRONT TOW PROVISIONS

The front tow provisions shall be supplied and installed by the cab/chassis manufacturer.

## AIR INTAKE SYSTEM

An air filter shall be provided in the engine's air intake system by the customer cab/chassis manufacturer.
Air inlet restrictions shall not exceed the engine manufacturer's recommendations.
The air inlet shall be equipped with a means of separating water and burning embers from the air intake system.

## CHASSIS EXHAUST

The chassis exhaust shall be extended just past the body side away from the pump operator. A stainless-steel exhaust deflector shall be located just above the exhaust pipe and below the body to prevent discoloration of the body side panels. The exhaust shall terminate with an exhaust tip to accommodate the plymovent system.

## RADIO/ANTENNA INSTALLATION

There shall be one (1) dealer supplied and installed radio installed in the cab within easy reach of the driver. The location of the radio shall be determined by a Durham Fire Department representative.

Durham Fire Department to supply a 30-foot cable for the remote radio head for installation.

There shall be a Durham Fire Department supplied Sharkee Antenna installed on the cab roof behind the lightbar, officer side. Antenna cabling shall be routed to behind officer seat floor location for Durham Fire Department provided Rocket Router.

**TIC & KEY BOX MOUNTING**

Mounting shall be provided on engine enclosure between driver and officer for Durham Fire Department supplied thermal imaging camera. Final location to be determined by correspondence after chassis arrival at bidders' location.

Knox Box shall be installed by the Durham Fire Department after delivery preferably in the low center area of the center dash panel. Power and grounding shall be provided behind the panel.

**PORTABLE RADIO BRACKETS**

There shall be two (2) mounting clips/brackets near each seating position, for Durham Fire Department portable radios. The bracket shall be one holder and one charger. Location to be determined by Durham Fire.

**SEAT BELT COLOR**

Section 14.1.3.3 of the NFPA 1901 Standards, requires all seat belt webbing in the cab to be bright red or bright orange in color, and the buckle portion of the seat belt shall be mounted on a rigid or semi-rigid stalk such that the buckle remains positioned in an accessible location.

**SEAT BELT WEB LENGTH - CUSTOM CAB**

Sections 14.1.3.2 and 14.1.3.3 of the NFPA 1901 standards, require the effective seat belt web length for a Type 1 lap belt for pelvic restraint to be a minimum of 60", and a Type 2 pelvic and upper torso restraint-style seat belt assembly to be a minimum of 110".

The chassis seat belt web length as supplied by the custom chassis manufacturer shall be compliant with NFPA Standards 14.1.3.2 and 14.1.3.3.

**SEAT BELT / VDR SYSTEM - CUSTOM CAB**

The seat belt warning and vehicle data recorder systems shall be provided by the cab/chassis manufacturer.

**HELMET STORAGE**

No helmet storage is required in the cab driving area.

## HELMET STORAGE, CREW AREA

Three (3) OnScene Solutions Talon model helmet storage bracket(s) shall be provided and installed in the rear crew area. The helmet mounting will comply with the 9G NFPA requirements. If the cab is specified with airbags, the helmet bracket(s) will be mounted clear of the deployment area.
• Three (3) helmet bracket(s) shall be mounted on the rear wall area adjacent to seating. Mounting shall not interfere with airbag systems if specified.
Location to be determined by Durham Fire.

## CAB CRASH TEST CERTIFICATION

A cab crash test certification from the fire apparatus manufacturer shall be provided with the equipment. A copy of this certification shall be included with the bid.

NOTE: There shall be no exception to any portion of the cab integrity certification requirements. Nonconformance shall lead to immediate rejection of the bid.

The certification shall state that the cab does meet or exceed the requirements below:

1) European Occupant Protection Standard ECE Regulation No. 29.
2) SAE J2422 Cab Roof Strength Evaluation - Quasi-Static Loading Heavy Trucks.

## CAB MIRRORS, DRIVER-ADJUSTABLE

Section 14.3.5 of the NFPA 1901 Standards, 2009 edition, requires all primary rear view mirrors used by the driver to be adjustable from the driver's position.

## MUDFLAPS

There shall be 1/4" rubber mudflaps provided and installed behind each set of tires to prevent throwing road debris and lower road spray.

## AIR BRAKE SYSTEM QUICK BUILD-UP

The air brake quick build-up system shall be supplied from the cab/chassis manufacturer.
The quick buildup system shall provide sufficient air pressure so that the apparatus has no brake drag and is able to stop under the intended operating conditions following the 60-second buildup time.

## ROAD EMERGENCY SAFETY KIT

The DOT required collapsible cones, warning flares, and fire extinguishers shall be provided by the cab and chassis supplier.

## CAB INTERIOR CABINET - OVERHEAD

There shall be two (2) overhead cabinet(s) provided on the interior. Each cabinet shall be constructed of 1/8" smooth finish aluminum and painted with a dark gray hammer tone powder coat paint finish for a hard durable surface. Each cabinet shall be approximately 14" high x 14" deep x 40" wide. If the cab is specified with airbags, the interior cabinet(s) will be mounted clear of the deployment area.
The above cabinet(s) shall have a sliding clear Lexan door(s) with extruded door pull edge and friction type latch mounted in an extruded aluminum top and bottom track.

## INTERIOR STORAGE CABINET

There shall be an interior storage cabinet provided behind the engine tunnel. The cabinet shall be constructed of 1/8" smooth finish aluminum and painted with a hammer tone powder coat paint finish for a hard-durable surface. Paint color shall be gray. Cabinet shall be approximately 42” wide x 32” high x 21” deep. (Follow the angle of the engine tunnel with a base depth of 16")

There shall be one (1) OnScene Solutions 27" Night Axe LED light(s) mounted inside the cabinet.

• Cabinet shall be provided with vertically mounted shallow aluminum Shelf-Trac for specified component installation.

• Cargo netting of 2" nylon webbing shall be provided over cabinet opening with easy release automotive style latches at the top and/or sides.

• There shall be one (1) vertically adjustable shelf in each of the above cabinets. It shall have a 1.25" lip to contain items while minimizing space used.

## CAB MISCELLANEOUS EQUIPMENT

The following items shall be provided in the cab as follows;

## INTERIOR UNDER CABINET LED LIGHTS

One (1) OnScene Solution model #70152, 10” x 6” x 7/8”, 10-30 VDC, surface mount dual red and white LED light(s) with clear lens shall be provided in the rear crew area of the cab. Each light shall be individually switched with a high/low-intensity setting. In addition, light(s) will be capable of a five (5) second delay after switching off.

## ADDITIONAL GLOVE BOXES

There shall be two ( 2)  glove box holders installed in the crew cab area.

## FUEL FILL

There shall be one (1) fuel fill door located in the streetside exterior wheel well panel, behind the rear axle. The filling door shall be fabricated from brushed stainless steel. There shall be a permanent label with the text "DIESEL FUEL ONLY" located adjacent to the fuel fill access.

## BODY DESIGN

The importance of public safety associated with emergency vehicles requires that the construction of this vehicle meet the following specifications. These specifications are written to establish the minimum level of quality and design. All Bidders shall be required to meet these minimum requirements.

It is the intent of these specifications to fully describe the requirements for a custom-built emergency-type vehicle. In order to extend the expected service life of this vehicle, the body module shall be removable from the chassis frame and be capable of being installed on a new chassis.

Therefore, pop rivets shall NOT be used in the construction of the structural portions of the body. This includes side body sheets, inner panels of compartment doors, and any other structural portions of the body.

## EXTERIOR ALUMINUM BODY

The fabrication of the body shall be constructed from an aluminum 3003H-14 alloy smooth plate. This shall include compartment front panel, vertical side sheets, side upper rollover panels, rear panels, and compartment door frames.

The body compartment floors, and exterior panels shall be constructed with not less than 3/16" (.187) aluminum 3003H-14 smooth plate. Interior compartment dividing walls shall be constructed with not less than 1/8" (.125) aluminum 3003H-14 smooth plate. Lighter gauge sheet metal will not be acceptable in these areas, with No Exceptions.

## DRIP RAILS

The body shall have drip rails over the side full height compartments.

## WALKWAY/ROOF COMPARTMENT SUPPORT

The upper body floor structure shall be integral with the body sheet metal construction and shall be an all-welded assembly. Bolted or glued assemblies shall not be accepted.

All seams in roof material shall be fully and continuously welded to prevent the entry of moisture.

**BODY MOUNTS - NYLON**

There shall be 75,000-90,000 PSI yield high strength .625" bolts to attach the body brackets to the chassis frame, mounted so as to prevent any movement of the body.

Full length nylon sills shall be located between the chassis frame rails and the body.

**10" REAR STEP BUMPER**

The full-width rear bumper shall be constructed from a 2" x 2" x 1/4" aluminum tubing frame and covered with a 3/16" NFPA compliant aluminum tread plate. The bumper shall extend from the rear vertical body panel 10" and provide a rear step with a minimum of 1/2" space at the body for water drainage.

**REAR TOW EYES**

There shall be two (2) heavy-duty rear-mounted tow eyes securely attached to the body subframe, below the body. The tow eyes shall be fabricated from a 3/4" thick steel plate with a 3" diameter opening. Tow eyes shall have a black powder coat finish.

**GROUND LIGHTS**

There shall be two (2) OnScene 8" Access LED lights installed below the bumper capable of providing illumination at a minimum level of 2 fc (20 lx) on ground areas within 30 in. (800 mm) of the edge of the vehicle in areas designed for personnel to climb onto or descend from the vehicle to the ground level.

Lighting shall be switchable but activated automatically when the vehicle park brake is set.

**WHEEL WELL EXTERIOR PANEL**

The exterior panel of the body wheel well enclosure shall be constructed from 3/16" smooth aluminum panels.

**STAINLESS STEEL BODY FENDERS**

The body wheel well openings shall be provided with round radius, polished stainless steel fenderettes. The fenderettes shall be bolted and easily replaceable if damaged. The fenderettes shall be installed using a rubber gasket to reduce the buildup of moisture and/or debris.

**SCBA CYLINDER COMPARTMENTS**

There shall be three (3) SCBA cylinder storage compartments located, two (2) on the curbside, and one (1) on the streetside of the rear wheel well area. Each compartment shall be capable of storing two (2) SCBA (60 min.) cylinders. Each compartment shall have a vertical hinged stainless steel aluminum door with a positive catch latch and painted primary lower body color.

Each compartment shall allow the storage of an SCBA cylinder or a fire extinguisher up to 7-3/4" in diameter x 24" deep. The door shall activate the "Hazard Warning Light" in the cab when not in the closed position.

**BODY PAINT SPECIFICATIONS**

**BODY PAINT PREPARATION**

After the body and components have been fabricated, they shall be disassembled so when the vehicle is complete there shall be finish paint beneath the removable components. The body shall be removed from the chassis during the painting process to ensure proper paint coverage. The body and components shall be metal finished as follows to provide a superior substrate for painting.

The exterior (and interior, if painted) body shall undergo a thorough cleaning process starting with a biodegradable phosphoric acid solution to begin the etching process followed by a complete clear water rinse. The next step shall consist of a chemical conversion coating applied to seal the metal substrate and become part of the metal surface for greater film adhesion.

All bright metal fittings, if unavailable in stainless steel or polished aluminum, shall be chrome plated. Iron fittings shall be copper under plated before chrome plating.

**PAINT PROCESS**

The painting process shall follow the strict standards set forth by PPG Industries guidelines.

**PAINT - ENVIRONMENTAL IMPACT**

The contractor shall meet or exceed all current State (his) regulations concerning paint operations. Pollution control shall include measures to protect the atmosphere, water, and soil. PPG Delfleet® Evolution paint shall be free of all heavy metal (lead & chromate) components. Paint emissions from sanding and painting shall be filtered and collected. All paint wastes shall be disposed of in an environmentally safe manner. Solvents used in cleanup operations shall be collected, sent off-site for distillation, and returned for reuse.

**FASTENERS**

Prior to the assembly and reinstallation of exterior components; i.e. warning and DOT lights, handrails, steps, door hardware, and miscellaneous items, a Mylar isolation tape, or gasket shall be used to prevent damage to the finished painted surface. These components shall be fastened to the body using either a plastic insert into body metal with stainless steel screws or zinc-coated nut-surts into the body surface using stainless steel bolts to prevent corrosion from dissimilar metals. All bolts shall be coated with ECK when installed.

## ELECTROLYSIS CORROSION CONTROL

The vehicle shall be assembled using ECK brand or a similar corrosion control compound on all high corrosion potential areas.

ECK protects aluminum and stainless steel against electrolytic reaction, isolates dissimilar metals, and gives bedding protection for hardware and fasteners. ECK contains an anti-seizing lubricant for threads. ECK is dielectric and perfect for use with electrical connectors.

## PAINT FINISH - SINGLE COLOR

The body shall be painted with a single color of PPG Delfleet® Evolution per Durham Fire Department approved paint spray out provided.
A small touch-up bottle of paint shall be provided with the completed vehicle.
• Paint Color: Match cab/chassis supplied paint color.

## BODY UNDERCOATING

The entire underside of the body shall be sprayed with black automotive undercoating. Undercoating shall cover all areas underside of the body and wheel well area to help prevent corrosion under the vehicle.

## UNDERCOAT WARRANTY

The body undercoating shall have a warranty provided by the manufacturer for the lifetime of the vehicle or twenty (20) years, whichever occurs first. The warranty shall be transferable between vehicle owners. Should the undercoating material applied to the underside of the body and wheel wells of the vehicle ever flake off, peel, chip or crack due to drying out, the damaged area shall be re-sprayed without charge to the vehicle owner.

## PAINT WARRANTY

The vehicle shall be provided with a ten (10) year non-prorated warranty to the original owner. Warranty is provided by PPG Inc. A warranty sheet with all conditions and maintenance procedures shall be provided with the delivered vehicle.

**Pro-rated warranties will not be acceptable.**

## COMPARTMENT INTERIOR FINISH

The interior of all exterior body compartments shall be a "Maintenance Free" smooth unpainted finish. All body seams shall be finished with a caulk sealant for both appearance and moisture protection.

## MATEFLEX GRATING

Black Mateflex grating shall be installed where specified. Where appropriate the grating shall have a beveled edge facing the front of the compartment to prevent snagging while loading equipment.

Provide Mateflex on all compartment floors, shelves, and Trays

## REFLECTIVE STRIPE REQUIREMENTS

Material

All retroreflective materials shall conform to the requirements of ASTM D 4956, *Standard Specification for Retroreflective Sheeting for Traffic Control*, Section 6.1.1 for Type I Sheeting.

All retroreflective materials used that are colors not listed in ASTM D 4956, Section 6.1.1, shall have a minimum coefficient of retro-reflection of 10 with an observation angle of 0.2 degrees and an entrance angle of -4 degrees.

Any printed or processed retroreflective film construction used shall conform to the standards required of an integral-colored film as specified in ASTM D 4956, Section 6.1.1.

Minimum Requirements

A retroreflective stripe(s) shall be affixed to at least 50 percent of the cab and body length on each side, excluding the pump panel areas, and at least 25 percent of the width of the front of the apparatus.
The stripe or combination of stripes shall be a minimum of 4 in. (100 mm) in total width.

The 4 in. (100 mm) wide stripe or combination of stripes shall be permitted to be interrupted by objects (i.e., receptacles, cracks between slats in roll-up doors) provided the full stripe is seen as conspicuous when approaching the apparatus.

## GRAPHICS PROOF

A color graphics proof of the reflective striping layout shall be provided for approval by Durham Fire Department prior to installation. The graphics proof shall be submitted to Durham Fire Department on 8.5" x 11" sheets with front, sides, rear and plan views, each on one (1) sheet. In addition, if there is any special artwork an additional sheet shall be provided showing all details.

## REFLECTIVE STRIPE - CAB SIDE

The reflective stripe material shall be 6" wide, 3M Scotchcal 680 series.
• This reflective stripe shall be white in color.

**REFLECTIVE STRIPE - CAB FRONT**

The reflective stripe material shall be 6" wide, 3M Scotchcal 680 series.
• This reflective stripe shall be white in color.

**CHEVRON STRIPE - CAB BUMPER**

A reflective stripe shall be affixed to the front of the cab. The stripe or combination of stripes shall be a minimum of 4 in. (100 mm) in total width.

The approximate 10" wide Chevron retroreflective stripe shall be affixed to at least 25 percent of the width of the front of the apparatus with retroreflective striping in a chevron pattern sloping downward and away from the centerline of the vehicle at an angle of 45 degrees. Each stripe shall be 6" in width. Chevron panels shall have a 3M UV over laminate to protect from UV rays, scene damage, and everyday use. Chevron panels shall have a minimum 10-year warranty for material failure, and colorfastness.

• The stripe material shall be 3M Scotchlite Diamond Grade.

All retroreflective materials required shall conform to the requirements of ASTM D 4956, *Standard Specification for Retroreflective Sheeting for Traffic Control*, Section 6.1.1 for Type I Sheeting.

This reflective chevron stripe shall alternate red and fluorescent yellow-green in color.

**REFLECTIVE STRIPE - BODY SIDES**

The reflective stripe material shall be 6" wide, 3M Scotchcal 680 series.
• This reflective stripe shall be white in color.

The stripe shall remain in a straight line from the front of the cab to the rear body.

**CHEVRON REFLECTIVE STRIPE - REAR SIDES PANELS**

At least 50 percent of the rear-facing vertical surfaces, visible from the rear of the apparatus, excluding any pump panel areas not covered by a door, shall be equipped with retroreflective striping in a chevron pattern sloping downward and away from the centerline of the vehicle at an angle of 45 degrees. Each stripe shall be 6" in width.

The rear side panels of the body on each side of a rear stairway or compartment shall have a chevron-style reflective stripe, extending from a bumper height up to side compartment drip rail height. Each chevron panel shall be a full sheet and shall have a 3M UV over laminate to protect from UV rays, scene damage, and everyday use. Chevron panel shall have a minimum 10-year warranty for material failure, and colorfastness.

The stripe material shall be Scotchlite Diamond Grade Reflective.

This reflective chevron stripe shall alternate red and fluorescent yellow green in color in a V pattern.

**LETTERING**

**GOLD LEAF LETTERING**

Genuine gold leaf lettering shall be furnished on the apparatus. The lettering shall be genuine 23 carat gold leaf and have a burnished (engine turned) finish. Letters to be outlined and drop shaded with black enamel paint. The lettering shall also be protected by a coat of clear enamel. up to sixty (60) 3" letters shall be provided. Lettering layout shall be as follows:

**GRAPHICS PROOF**

A color graphics proof of the lettering layout shall be provided for approval by Durham Fire Department before installation. The graphics proof shall be submitted to Durham Fire Department on 8.5" x 11" sheets with front, sides, rear and plan views, each on one (1) sheet. In addition, if there is any special artwork an additional sheet shall be provided showing all details.

The following lettering shall be provided and installed on the completed unit as follows.

**SIDE CAB DOOR LETTERING**

Genuine gold leaf lettering shall be furnished on the apparatus. The lettering shall be genuine 23 carat gold leaf and have a burnished (engine turned) finish. Letters to be outlined and drop shaded with black enamel paint. The lettering shall also be protected by a coat of clear enamel. up to sixty (60) 3" letters shall be provided. Lettering layout shall be as follows:

The final design and layout shall be determined before construction.

**UPPER BODY SIDE LETTERING**

There shall be sixteen (16) 8" high 22K gold letters provided and installed on the vehicle.
Lettering shall have a clear 3M UV protective overlaminate applied before installation.
The final design and layout shall be determined before construction.
There shall be six (6) 9" high reflective letters furnished and installed on the vehicle.
• This reflective lettering shall be white in color.

**REAR BODY LETTERING**

**FRONT OF CAB LETTERING**

There shall be eight (8) 3" high 22K gold letters provided and installed on the vehicle. Lettering shall have a clear 3M UV protective overlaminate applied before installation.
The final design and layout shall be determined before construction.

**CUSTOM DECAL LOGO - 12" -18"**

Two (2) custom-designed 12" - 18" Scotchcal type retroreflective logo shall be provided and located on the completed vehicle. The exact design and/or artwork shall be provided by the Durham Fire Department before construction.

One (1) copy of the above custom logo shall be provided and located on the completed vehicle as directed by Durham Fire Department.

**EXTERIOR COMPARTMENT DOORS**

**ROLL-UP COMPARTMENT DOOR**

The rear compartment shall be equipped with ROM brand roll-up door.

The door shall be constructed of double wall slats that provide a smooth surface on the interior of the door to prevent interference with compartment contents. The slats shall have recessed bulb type slat seals which provide a weatherproof compartment and reduce the effects of vehicle

vibration. The aluminum extrusions shall be equipped with nylon universal end shoes with positive snap-in securement's that slide in the track and side frame section. The top frame section shall include a gutter, non-marring top seal and bumper to cushion the bottom rail.

The latching mechanism shall be a lift bar arrangement, which utilizes a door-wide spring-loaded bar and two (2) cam-surfaced latch points. Any roll door that exceeds a 63" high door opening from the rub-rail or above 30" if over a wheel well shall include a pull-down strap to make for easy closing.

**DOOR FINISH**

The body side compartment roll up doors shall be painted by the door manufacturer with a WET paint type coating. The Body Manufacturer shall supply the paint to ensure proper color match. The drip rail and outside tracks shall be left in natural anodized finish.

**DRIP PANS**

The exterior compartment doors shall have a drip pan provided under the shutter to protect the door and to eliminate water from the doors entering the compartment when rolled up. The pans shall have tubes to run the water in between the compartment walls and exit underneath the apparatus. The pans shall be spring loaded for easy removal in the event the door must be serviced.

**PAINT**

The complete apparatus body and any applicable doors shall be painted. All exposed metal surfaces which are not chrome plated or polished shall be thoroughly cleaned and prepared.

To prevent corrosion and to ensure bonding of primer, the body shall be cleaned and degreased with the paint manufacturer’s recommended wax and grease remover. All irregularities in primed

surfaces shall be sanded down before application of the finished coats. All removable items such as compartment doors shall be removed and painted separately.

To prevent electrolysis around fasteners, special attention must be given to how components are fastened to the exterior of body. All vendor-supplied screws shall be discarded and the manufacturer shall replace them with their own stainless steel screws. In addition, every screw hole possible that protrudes into the body shall be punched with a square hole and then a plastic insert will be installed to isolate the dissimilar metals. Where an insert cannot be used, a zinc-rich type coating will be applied to each screw before they are installed. **(NO EXCEPTION TO THIS REQUIREMENT)**

PPG polyurethane "Delfleet® Evolution" lead free paint shall be used on the body. Consistent with this requirement and to ensure optimum adhesion of final paint and long service of paint, all related materials shall be those specified by the paint manufacturer for use with their finish. These related products shall include, but not be limited to the following: PPG Epoxy primer, catalysts, thinners, and hardeners.

**SEVEN (7) UPPER BODY COMPARTMENTS (OPEN)**

The forward transverse compartment shall be 90.0" long x 31.0" wide x 28.5" deep. There shall be six (6) compartments parallel to the sides of the body, three (3) on each side. The streetside compartments shall be approximately 70.0" long x 28.0" wide x 28.5" deep. The Curbside compartments from front to rear shall be approximately 70.0" long x 28.0" wide x 28.5" deep, 60.0" long x 28.0" wide x 28.5" deep, 66.0" long x 28.0" wide x 28.5" deep.

The side compartments shall be open under each door sill to allow for long equipment. Each compartment shall be integral to the body construction and will not be bolted or add-on modules. The outside walls of each compartment will be double-walled to prevent equipment from denting the outside painted surface.

Each compartment shall have a lift-up type compartment door hinged on the outboard side. Each door shall be fabricated from a 3/16" aluminum tread plate. Each door shall have two (2) pneumatic type cylinders, one (1) at each end, attached to cast aluminum brackets mounted to the interior surface of the door to hold the door in both the opened and closed positions. Each door shall be mounted using multiple 16" long, equally spaced, 14-gauge stainless steel hinges, with a 1/4" stainless steel pin. A polyester barrier film gasket shall be placed between the stainless-steel hinge and the body mounting surface as necessary to prevent corrosion caused by dissimilar metals.

Each compartment door shall overlap a 2" vertical lip on the body roof to prevent the entry of moisture and sealed with automotive-type rubber molding to provide a weather-resistant seal. Each roof compartment door shall have a chrome 7" handle bolted to the center of each door. Each compartment shall have a 13/16" drain hole located on the floor of the compartment with a 1" flexible drain tube that terminates below the body.

Each compartment shall have a horizontally mounted OnScene Solutions LED light on the underside of the door. The light and NFPA door ajar system shall be automatically activated by an individual switch per compartment.

**TRANSVERSE ROOF COMPARTMENT - SHELF TRAC**

The front transverse roof compartment shall be provided with four (4) rows; two (2) rows each side of horizontally mounted aluminum Shelf-Trac welded to the walls for vertical partition installation and adjustability.

**SIDE ROOF COMPARTMENT - SHELF TRAC**

There shall be four rows; two (2) rows on each side of horizontally mounted aluminum Shelf-Trac welded to the walls of the side upper body compartments for vertical partition installation and adjustability.

**ROOF COMPARTMENT - VERTICAL PARTITION**

There shall be four (4) vertical partition(s) provided in the roof compartment(s). The partition(s) shall be used to retain or hold equipment in place during travel. Each partition shall be fabricated from 3/16" smooth aluminum and bolted to a specified Shelf-Trac for ease of adjustment.

**UPPER BODY WALKWAY**

A 34" wide, upper body walkway shall be provided at the center of the body and recessed into the roof structure. The walkway shall be fabricated from NFPA compliant 3/16" aluminum tread plate with continuously welded cross seams to prevent moisture penetration into apparatus body, No Exceptions. The walkway shall be supported with 2" x 2" tubing on 14" - 22" centers. 13/16" drains shall be installed in front of the walkway with a screen to prevent piping from getting clogged and connected to 1" flexible drain tubes that will terminate below the body.

**WALKWAY/STEP LIGHTS**

There shall be three (3) Whelen Blue LED lights provided to illuminate the walkway or step area. The lights shall be activated when the parking brake is set.

Each light shall be mounted in an extruded aluminum housing to protect against damage from personnel or equipment.

Lighting shall provide illumination at a minimum level of 2 fc (20 lx) on all work surfaces, steps, and walkways. Lighting shall be switchable but activated automatically when the vehicle park brake is set.

## WALKWAY STEP COMPARTMENT WITH POWER LIFT-UP DOOR - FULL HEIGHT

The rear of the body shall be provided with a minimum 34" wide roof access stairway recessed into the side rear compartments. Stairs treads shall be 9 1/2" minimum depth and formed from 3/16" NFPA compliant aluminum tread plate with uniformed riser height design. Stair treads will be continuously welded into side walls. Bolt-in tread design will not be acceptable.

Access to the rear compartment shall be through a powered lift-up door that serves a dual purpose. The door shall have a stair tread/riser design to provide access to the upper walkway and access to the upper body compartment storage area, and a lift-up to provide access to compartment storage behind this door.

The five (5) treads and risers from rear bumper height to below the roof access stairway shall be a one-piece lift-up door and be horizontally hinged at top of the stairway. Two (2) 12 VDC linear actuators shall be provided to power the door open, and to hold the door in the open position. The door shall be controlled from a water-proof rocker switch located on the rear body panel. Access panels shall be provided in each upper side rear compartment to actuators for service or emergency raise or lower.

The door shall seal on the angled plane of stairway surfaces with a 1" vertical lip to prevent dirt, road debris, and moisture from entering the compartment.

The upper compartment area shall be approximately 33" wide x 35" high x depth to the front wall of the rear transverse compartment, or as required. The lower compartment shall be approximately 29" wide x 21" high x 18" deep at the base, or as depth allows with the specified fuel tank.

The door opening shall be approximately 29 1/2" wide x 56" high vertically (35" above frame, and 21" below frame).

The compartment shall have two (2) OnScene 9" LED lights that shall be automatically activated when the door is opened and wired to the NFPA-required hazard warning light provided in the cab.

Roll-out ladder design requiring set-up time and 8 plus feet behind apparatus or vertical ladders that do not allow the firefighter to safely ascend or descend with equipment will not be acceptable.

## STAIRWAY HANDRAILS

There shall be two (2) full-length handrails on the lift-up door, one (1) on each side providing three points of contact at all times for safer access to roof compartments. The handrails shall be angled for optimum use during ingress or egress of the upper walkway area.

Handrails shall be NFPA compliant 1-1/4" knurled 304 stainless steel with welded end stanchions.

**STAIRWAY COMPARTMENT LAYOUT**

• There shall be vertically mounted aluminum Shelf-Trac for specified component installation. Shelf-Trac extrusion shall have side extruded channels for use in mounting or securing special ancillary items, without the need for drilling into the body.

• There shall be one (1) adjustable shelf/shelves approximately 34"d x 34"w. The shelf shall be fabricated from a 3/16" 3003 aluminum sheet with a 2" vertical flange along the front and rear edges.

- Shelf located at the rear wall of compartment for customer supplied HPU.
- The above component(s) shall have a smooth unpainted finish.

• There shall be one (1) module fabricated from 3/16” (.188) 3003H-14 aluminum alloy smooth sheet. The module will be designed for the following long tools and equipment:

- The list of items to be stored in the transverse module shall be determined at the pre-construction meeting.
-

• The specified portable winch shall be mounted in a compartment using a heavy-duty "U" shaped channel. Winch receiver tube and mounting pin shall be utilized to hold in place during travel.

- The mounting is located at the base of the compartment.

• One (1) OnScene Access LED, full-height compartment light, vertically mounted.

**WALKWAY/STEP LIGHTS**

There shall be two (2) Whelen Blue LED lights provided to illuminate the walkway or step area. The lights shall be activated when the parking brake is set.

Each light shall be mounted in an extruded aluminum housing to protect against damage from personnel or equipment.

Lighting shall provide illumination at a minimum level of 2 fc (20 lx) on all work surfaces, steps, and walkways. Lighting shall be switchable but activated automatically when the vehicle park brake is set.

**FOLD-DOWN STEP**

There shall be one (1) fold-down step located at the bottom of the roof access stairway mounted on top of the bumper to reduce the distance from the ground to the first step. The step surface

shall be NFPA compliant aluminum treadplate and shall manually fold up into the stairway with an over-center gas shock to hold the step in position during travel. The step shall activate the "Hazard Warning Light" in the cab when not in the stowed position.

**REAR BODY HANDRAILS**

There shall be two (2) 24" vertical handrails on the rear of the body. Handrails shall be NFPA compliant 1-1/4" knurled 304 stainless steel with welded end stanchions.

**BODY WIDTH DIMENSIONS**

The body shall be 100.0" wide, and 102.0" wide at drip rails. Interior compartment depth dimensions shall be approximate:
Area Description Dimension
Transverse above subframe 95.0"
Compartment depth below subframe 24.5"

**STREETSIDE COMPARTMENT - FRONT (S1)**

The interior useable compartment width shall be approximately 56.0" wide.
The compartment door opening shall be approximately 49.0" wide.
This compartment shall have a R•O•M series IV roll-up door.
• The roll-up door shall have painted finish on the door slats and the door trim components.
• The door shall be equipped with a CPI harsh environment mechanical type door ajar switch located inside compartment interior lower door track.
• A keyed cylinder lock shall be provided on the bottom rail of the roll-up door.
• A compartment threshold protection plate shall be installed on the bottom edge of the compartment door opening. The threshold protection shall be fabricated from an aluminum extrusion with an anodized exterior finish.

**COMPARTMENT LAYOUT**

• There shall be vertically mounted aluminum Shelf-Trac for specified component installation. Shelf-Trac extrusion shall have side extruded channels for use in mounting or securing special ancillary items, without the need for drilling into the body.

• There shall be one (1) OnScene Solutions 81 series aluminum tray base with 100% extension, and a rating of 1,000 lbs. Slide-out tray(s) base shall be approximately 46" deep and as wide as the compartment layout or door opening permits located above the level of the chassis frame rails. Each slide base shall have a cable-operated, spring-loaded latch complemented by a large hand opening and red pull handle (Pull to Release) which will lock the tray in the closed and full extension positions. Each tray shall be fabricated from a 3/16" 3003 aluminum sheet and shall have welded corners to form a box-type tray surface with an internal depth of approximately 3 ½".

- Vertical partition(s) shall be provided on the slide-out tray base dividing the tray into left and right sides. Each vertical partition shall be horizontally adjustable; mounted on an aluminum

Shelf Trac on the tray floor. The vertical partition(s) shall be 3/16" (.188) 3003H-14 alloy smooth aluminum sheet.

− The above component(s) shall have a smooth unpainted finish.

• There shall be one (1) transverse module fabricated from 3/16” (.188) 3003H-14 aluminum alloy smooth sheet. The module will be designed for the following long tools and equipment:

Vertical on the front wall.
− The list of items to be stored in the transverse module shall be determined at the pre-construction meeting.

− One (1) Durham Fire Department supplied stokes basket(s). Manufacturer, model number, and dimensions of the stokes basket(s) shall be provided during the pre-construction meeting.

Stokes Basket: Junkin JSA-200 84.5" l x 25  w x 9" h
− There shall be one (1) OnScene Solutions cargo strap provided to secure the stored equipment.

• The floor of the compartment above the frame rails shall be extended to the interior edge of the door. The floor shall have a 2" vertical lip and a 1" return to increase strength.

• One (1) Hannay ECR1618-17-18 electric cable reel(s) capable of storing 200' of 10/3 electric cable. Reel(s) shall be designed to hold 110% of the capacity of cord length, with fully enclosed 45 amp, three (3) conductor collector rings. Reel(s) shall be mounted to a channel structure that allows for side-to-side adjustment of reel position.

− Power rewind control(s) shall be in a position where the operator can observe the rewinding operation and not be more than 72 in. (1830 mm) above the operator’s standing position and shall be marked with a label indicating its function.

− A label shall be provided in a visible location adjacent to the reel with the following information: Current rating, Current type, Phase, Voltage, and Total cord length.

− The cable reel shall be equipped with 100' of 10/3 SEOW yellow cable, a molded plastic ball clamp, and a single heavy-duty L5-30 twist-lock female plug at the end.

• One (1) Akron model EJBX series, cast aluminum electrical power distribution box with gray powder coat painted finish shall be provided. The power distribution box shall meet all requirements described in NFPA 1901. The power distribution box shall include the following outlets mounted on a backlit face plate;

− A 12" pigtail that terminates in an L5-30 configuration to match the cable on the cord reel. The outlet configuration shall include:

− One (1) 120 VAC, L5-15 duplex straight-blade receptacle

− One (1) 120 VAC, L5-15  duplex straight-blade receptacle

− One (1) 120 VAC, 5-15 duplex straight-blade receptacle.

− One (1) 120 VAC, 5-15 duplex straight-blade receptacle.

• One (1) Akron Brass model EJB-VMT aluminum treadplate vertical mounting bracket for specified power distribution box shall be provided and mounted in the compartment per Durham Fire Department.

• The reel shall be supplied with OnScene Solutions fairlead extension with a 6" - 10" extension (depending on compartment depth). The fair lead extension shall allow hoses or cords to be extended out and away from compartment door edges, slide trays, or shelving that may result in wear damage.

• One (1) Hannay EF1520-17-18 low-pressure air hose reel(s) shall be provided in this compartment. The reel shall be designed to hold 110% of the capacity needed.

− Power rewind control(s) shall be in a position where the operator can observe the rewinding operation and shall be marked with a label indicating its function and shall be guarded to prevent accidental operation.

− A label shall be provided in a visible location adjacent to the reel with the following information: (1) Utility air or breathing air, (2) Operating pressure, (3) Total hose length, (4) Hose Size (ID).

− The hose reel shall be equipped with 100' of 3/8" Parker Series 7092 GST II low pressure air hose rated for 300 PSI maximum pressure. A molded plastic ball clamp shall be provided on the hose to stop it at the 4-way roller. The hose shall be Red in color.

− A reel shut-off valve, 0 - 125 psi adjustable low-pressure regulator, and 0 - 300 psi gauge shall be provided on an aluminum control panel with a flow diagram graphic overlay near the air reel location, not exceeding 72" from the ground.

− Utility air compressor on/off switch with PTO time delay interlock shall be located on the panel.

• The reel shall be supplied with OnScene Solutions fairlead extension with a 6" - 10" extension (depending on compartment depth). The fair lead extension shall allow hoses or cords to be extended out and away from compartment door edges, slide trays, or shelving that may result in wear damage.

• Two (2) OnScene Access LED, full-height compartment lights, vertically mounted.

• The 12-volt electrical distribution panel shall be located in the front lower compartment.

## STREETSIDE COMPARTMENT - AHEAD OF REAR WHEELS (S2)

The interior useable compartment width shall be approximately 56.0" wide.
The compartment door opening shall be approximately 49.0" wide.
This compartment shall have a R•O•M series IV roll-up door.

The body side compartment roll up doors shall be painted by the door manufacturer with a WET paint type coating. The Body Manufacturer shall supply the paint to ensure proper color match. The drip rail and outside tracks shall be left in natural anodized finish.

## COMPARTMENT LAYOUT

• There shall be vertically mounted aluminum Shelf-Trac for specified component installation. Shelf-Trac extrusion shall have side extruded channels for use in mounting or securing special ancillary items, without the need for drilling into the body.

• There shall be one (1) 400 lbs. slide-out tray(s) approximately 24" deep and as wide as the compartment layout or door opening permits. The tray top shall be fabricated from a 3/16" 3003 aluminum sheet with a 3" vertical lip and welded corners to form a box-type tray surface. The sliding tracks shall extend 100% of the slide length. The tray assembly shall utilize a pneumatic cylinder mounted on the underside to hold the tray in both the extended and closed positions.

− The above component(s) shall have a smooth unpainted finish.

• There shall be one (1) OnScene Solutions 81 series aluminum tray base with 100% extension, and a rating of 1,000 lbs. Slide-out tray(s) base shall be approximately 70" deep and as wide as the compartment layout or door opening permits located above the body subframe and shall be vertically adjustable in height. Each slide shall have a cable-operated, spring-loaded latch complemented by a large hand opening and red pull handle (Pull to Release) which will lock the tray in the closed and full extension positions. Each tray shall be fabricated from a 3/16" 3003 aluminum sheet and shall have welded corners to form a box-type tray surface with an internal depth of approximately 3 ½".

− The above component(s) shall have a smooth unpainted finish.

• One (1) fully enclosed 1/8" aluminum fuel storage cabinet(s) shall be provided in the compartment. Cabinet shall be approximately 12-1/2" wide x 22-3/4" high x 23-1/2" deep. The cabinet shall have vertically hinged doors and interior vertical shelf-Trac and one (1) adjustable shelf. The entire cabinet interior and exterior shall be powder coat painted bright yellow in color.

Vent under the truck.

• Two (2) OnScene Access LED, full-height compartment lights, vertically mounted.

• Two (2) 3-1/2" x 3-1/2" black plastic louvered vents shall be provided in the lower compartment.

## STREETSIDE COMPARTMENT - ABOVE REAR WHEELS (S3)

The interior useable compartment width shall be approximately 59.0" wide.
The compartment door opening shall be approximately 52.0" wide.
This compartment shall have a R•O•M series IV roll-up door.
The body side compartment roll up doors shall be painted by the door manufacturer with a WET paint type coating. The Body Manufacturer shall supply the paint to ensure proper color match. The drip rail and outside tracks shall be left in natural anodized finish.

## COMPARTMENT LAYOUT

• There shall be vertically mounted aluminum Shelf-Trac for specified component installation. Shelf-Trac extrusion shall have side extruded channels for use in mounting or securing special ancillary items, without the need for drilling into the body.

• There shall be one (1) swing-out style smooth aluminum tool board approximately 50" wide x 30" high mounted centered in the depth of the compartment. Tool board vertical exterior edge shall have a double 90-degree formed edge to provide an easy-grip handle. The tool board shall pivot on the right-hand side and be rated for a maximum 200 lb. evenly distributed load. The tool board shall utilize a pneumatic cylinder to hold the tool board in both the opened and closed positions.

Both Full widths hinged opposite sides, inboard 6" outboard 16"
− The vertical tool board material shall be a 3/16" (.188) 3003H-14 aluminum alloy sheet.

− The above component(s) shall have a smooth unpainted finish.

• Two (2) OnScene Access LED, full-height compartment lights, vertically mounted.

## STREETSIDE COMPARTMENT - REAR (S4)

The interior useable compartment width shall be approximately 64.0" wide.
The compartment door opening shall be approximately 57.0" wide.
This compartment shall have a R•O•M series IV roll-up door.

The body side compartment roll up doors shall be painted by the door manufacturer with a WET paint type coating. The Body Manufacturer shall supply the paint to ensure proper color match. The drip rail and outside tracks shall be left in natural anodized finish.

## COMPARTMENT LAYOUT

• There shall be vertically mounted aluminum Shelf-Trac for specified component installation. Shelf-Trac extrusion shall have side extruded channels for use in mounting or securing special ancillary items, without the need for drilling into the body.

• There shall be one (1) OnScene Solutions 81 series aluminum tray base with 100% extension, and a rating of 1,000 lbs. Slide-out tray(s) base shall be approximately 30" deep and as wide as the compartment layout or door opening permits located above the level of the chassis frame rails. Each slide base shall have a cable-operated, spring-loaded latch complemented by a large hand opening and red pull handle (Pull to Release) which will lock the tray in the closed and full extension positions. Each tray shall be fabricated from a 3/16" 3003 aluminum sheet and shall have welded corners to form a box-type tray surface with an internal depth of approximately 3 ½".

− The above component(s) shall have a smooth unpainted finish.

• There shall be four (4) slide-out smooth aluminum vertical tool board(s) approximately 24" deep. Each tool board(s) vertical exterior edge shall have a double 90-degree formed edge to provide an easy-grip handle. The top and bottom of tool board(s) shall be provided with Accuride 9300 series slide tracks. Each board shall be rated for a maximum 200 lbs. evenly distributed load. Each tool board shall utilize a pneumatic cylinder to hold the tool board in both the opened and closed positions.

− The vertical tool board material shall be a 3/16" (.188) 3003H-14 aluminum alloy sheet.

− The above component(s) shall have a smooth unpainted finish.

− Each tool board will be bolted to the compartment floor.

• There shall be one (1) bolt-in vertical compartment partition(s) provided dividing the compartment into left and right sides. The vertical partition(s) shall be 3/16" (.188) 3003H-14 alloy smooth aluminum sheet.

SHOP NOTES; located 16" from the hopper. Area for scoop shovel and push broom.
− The above component(s) shall have a smooth unpainted finish.

• A clay absorbent (or similar weight material) storage hopper shall be provided in this compartment for approximately 150 pounds of material. The storage hopper shall be filled from an upper-body compartment and funneled to a manual 3" PVC 1/4-turn ball valve with a flexible hose provided on the bottom of hopper storage. The bottom of the absorbent hopper and valve shall be spaced on the floor to allow for a 5-gallon pail to be stored under the valve.

NOTES; exit through the compartment floor.

• The floor of the compartment above the frame rails shall cover the area directly above the frame rails ONLY (non-extended floor).

• Two (2) OnScene Access LED, full-height compartment lights, vertically mounted.

• Two (2) 3-1/2" x 3-1/2" black plastic louvered vents shall be provided in the lower compartment.

## CURBSIDE COMPARTMENT - FRONT (C1)

The interior useable compartment width shall be approximately 56.0" wide.
The compartment door opening shall be approximately 49.0" wide.
This compartment shall have a R•O•M series IV roll-up door.

The body side compartment roll-up doors shall be painted by the door manufacturer with a WET paint type coating. The Body Manufacturer shall supply the paint to ensure a proper color match. The drip rail and outside tracks shall be left in a natural anodized finish.

## COMPARTMENT LAYOUT

• There shall be vertically mounted aluminum Shelf-Trac for specified component installation. Shelf-Trac extrusion shall have side extruded channels for use in mounting or securing special ancillary items, without the need for drilling into the body.

• There shall be one (1) OnScene Solutions 81 series aluminum tray base with 100% extension, and a rating of 1,000 lbs. Slide-out tray(s) base shall be approximately 46" deep and as wide as the compartment layout or door opening permits located above the level of the chassis frame rails. Each slide base shall have a cable-operated, spring-loaded latch complemented by a large hand opening and red pull handle (Pull to Release) which will lock the tray in the closed and full extension positions. Each tray shall be fabricated from a 3/16" 3003 aluminum sheet and shall have welded corners to form a box-type tray surface with an internal depth of approximately 3 ½".

NOTES; Change to Tool Boards w/pans if necessary.

− Vertical partition(s) shall be provided on the slide-out tray base dividing the tray into left and right sides. Each vertical partition shall be horizontally adjustable; mounted on an aluminum Shelf Trac on the tray floor. The vertical partition(s) shall be 23" tall using 7040 series double-sided Pac Track.

− The above component(s) shall have a smooth unpainted finish.

• There shall be a transverse storage module that extends from the opposite side of the body (specified in the opposite side compartment).

− There shall be one (1) OnScene Solutions cargo strap provided to secure the stored equipment.

• One (1) Lista toolbox, model HS-0450-04LM-NB-RG-LG-IDL shall be provided in the compartment. The Lista cabinet shall be x 40-1/4" wide x 21.6" high x 22-1/2" deep. Cabinet shall have four (4) individual locking drawers as follows; one (1) 2", one (1) 3", one (1) 4", and one (1) 5". The cabinet shall be Light Gray in color.

Located (rear-facing) on a specified slide-out tray.
• The floor of the compartment above the frame rails shall be extended to the interior edge of the door. The floor shall have a 2" vertical lip and a 1" return to increase strength.

## CURBSIDE COMPARTMENT - AHEAD OF REAR-WHEEL (C2)

The interior useable compartment width shall be approximately 56.0" wide.
The compartment door opening shall be approximately 49.0" wide.
This compartment shall have a R•O•M series IV roll-up door.
• The door shall be equipped with a CPI harsh environment mechanical type door ajar switch located inside compartment interior lower door track.
• A keyed cylinder lock shall be provided on the bottom rail of the roll-up door.
The body side compartment roll up doors shall be painted by the door manufacturer with a WET paint type coating. The Body Manufacturer shall supply the paint to ensure proper color match. The drip rail and outside tracks shall be left in natural anodized finish.

## COMPARTMENT LAYOUT

• There shall be vertically mounted aluminum Shelf-Trac for specified component installation. Shelf-Trac extrusion shall have side extruded channels for use in mounting or securing special ancillary items, without the need for drilling into the body.

• There shall be one (1) adjustable shelf/shelves approximately 24" deep. Each shelf shall be fabricated from a 3/16" 3003 aluminum sheet with a 2" vertical flange along the front and rear edge.

• Cargo netting of 2" nylon webbing shall be provided for retaining cribbing with easy release automotive style latches at the top and/or sides.

− The above component(s) shall have a smooth unpainted finish.

• The floor of the compartment above the frame rails shall be extended to the interior edge of the door. The floor shall have a 2" vertical lip up.

• Two (2) OnScene Access LED, full-height compartment lights, vertically mounted.

• Two (2) 3-1/2" x 3-1/2" black plastic louvered vents shall be provided in the lower compartment.

## CURBSIDE COMPARTMENT - ABOVE REAR WHEEL (C3)

The interior useable compartment width shall be approximately 59.0" wide.
The compartment door opening shall be approximately 52.0" wide.
This compartment shall have a R•O•M series IV roll-up door.

The body side compartment roll up doors shall be painted by the door manufacturer with a WET paint type coating. The Body Manufacturer shall supply the paint to ensure proper color match. The drip rail and outside tracks shall be left in natural anodized finish.

## COMPARTMENT LAYOUT

• There shall be vertically mounted aluminum Shelf-Trac for specified component installation. Shelf-Trac extrusion shall have side extruded channels for use in mounting or securing special ancillary items, without the need for drilling into the body.

• There shall be one (1) 1,000 lbs. slide-out tray(s) with a Slide Master structural steel base approximately 68" deep and as wide as the compartment layout or door opening permits located above the level of the chassis frame rails. Each tray shall be fabricated from a 3/16" 3003 aluminum sheet and shall have welded corners to form a box-type tray surface with an internal depth of approximately 3 ½".

− The slide master tray base shall be wet painted silver in color.

− The slide master tray base shall have a gravity-type latch mechanism that requires manual rotation to unlock and lock.

− The above component(s) shall have a smooth unpainted finish.

• Two (2) OnScene Access LED, full-height compartment lights, vertically mounted.

• There shall be one (1) airbag storage module(s). The module shall be fabricated from 1/8" (.125) 3003H-14 aluminum alloy sheet. Circular notches shall be provided along the front edge to ease access to the airbags. Each bay shall be sized to hold the airbag The make, model, qty, and exact dimensions of the airbags shall be provided by the department before or during the pre-construction meeting.

30"t x 2"w x 68"d
− There shall be four (4) OnScene Solutions Velcro cargo straps provided to secure the stored equipment.

## CURBSIDE COMPARTMENT - REAR (C4)

The interior useable compartment width shall be approximately 64.0" wide.
The compartment door opening shall be approximately 57.0" wide.
This compartment shall have a R•O•M series IV roll-up door.

The body side compartment roll up doors shall be painted by the door manufacturer with a WET paint type coating. The Body Manufacturer shall supply the paint to ensure proper color match. The drip rail and outside tracks shall be left in natural anodized finish.

## COMPARTMENT VENTS

Vents shall be provided in each compartment and so located that water cannot normally enter the compartment through the openings. Vents shall be fabricated integrally into the wall of the compartment. Each compartment shall have sufficient vents to provide good air circulation to dry out compartment interiors and equipment.

## COMPARTMENT LAYOUT

• There shall be vertically mounted aluminum Shelf-Trac for specified component installation. Shelf-Trac extrusion shall have side extruded channels for use in mounting or securing special ancillary items, without the need for drilling into the body.

• There shall be one (1) OnScene Solutions 81 series aluminum tray base with 100% extension, and a rating of 1,000 lbs. Slide-out tray(s) base shall be approximately 24" deep and as wide as the compartment layout or door opening permits located below the level of the chassis frame rails. Each slide base shall have a cable-operated, spring-loaded latch complemented by a large hand opening and red pull handle (Pull to Release) which will lock the tray in the closed and full extension positions. Each tray shall be fabricated from a 3/16" 3003 aluminum sheet and shall have welded corners to form a box-type tray surface with an internal depth of approximately 3 ½".

− The above component(s) shall have a smooth unpainted finish.

• There shall be one (1) storage module(s). The module shall be fabricated from 1/8" (.125) 3003H-14 aluminum alloy sheet. There will be a total of seven compartments.

− Cargo netting of 2" nylon webbing shall be provided over cabinet opening with easy release automotive style latches at the top and/or sides.

• The floor of the compartment above the frame rails shall cover the area directly above the frame rails ONLY (non-extended floor).

• Two (2) OnScene Access LED, full-height compartment lights, vertically mounted.

• There shall be three (3) 120 VAC outlet(s) located in the module compartment on the top of the full-length compartment.

− The outlet receptacle(s) shall be 20 amp, straight-blade (NEMA 5-20R).

− Outlet(s) shall be powered through the onboard generator system.

• Two (2) 3-1/2" x 3-1/2" black plastic louvered vents shall be provided in the lower compartment.

## ROOF ACCESS STAIRWAY

The rear of the body shall be provided with a recessed center stairway with a minimum of 34" width. Stairs treads shall be 9.5" minimum depth and formed from a 3/16" NFPA compliant aluminum tread plate with a uniformed maximum riser height of 12". Roll-out ladder design requiring set-up time and 8 plus feet behind apparatus or vertical ladders that do not allow the firefighter to safely ascend or descend with equipment will not be acceptable.

**ROPE ANCHOR OR PORTABLE WINCH RECEIVERS**

The completed unit shall have an integrated receiver or anchor system for use with a removable rope anchor point and/or a portable electric winch when specified.
Receivers or anchors installed at any location on the apparatus for use as removable winch anchors shall be designed and affixed to provide at least a 2.0 to 1 straight line pull no-yield safety factor over the load rating of the removable winch.

Receivers or anchors installed at any location on the apparatus for use with rope operations shall be designed and affixed to the apparatus to provide at least a 9,000 lbf (40,000 N) no-yield condition with a straight line pull.

A safety sign FAMA28 shall be located on or near each receiver or anchor stating the maximum straight-line pull rating.

| Side receiver(s) (if specified) shall have the following load rating: | | SAFETY FACTOR |
|---|---|---|
| STRAIGHT PULL | | |
| Rope Tie Off: | 600 Lbs. | 15:1 |
| Winch: | 5,000 Lbs. | 2:1 |

| Front and/or rear receiver(s) (if specified) shall have the following load rating: STRAIGHT PULL | | SAFETY FACTOR |
|---|---|---|
| Rope Tie Off: | 600 Lbs. | 15:1 |
| Winch: | Winch Load Rating (9,000 Lbs. Max) | 2:1 |

The following items shall be provided to accomplish rope rescue and/or portable winch operation.

The receiver(s) shall be manufactured using a 2" x 2" x 1/4" wall steel trailer style receiver tube and 1/2" steel plate and bolted to body structure. The receiver assembly shall have a black hammer tone powder coat paint finish. Each receiver location shall have a stainless steel scuff plate to protect the paint on the upper body. Reinforcements to the body shall be added as necessary to increase the structural integrity and to provide a working weight rating of 600 lbs., with a 9,000 lbs. maximum load based upon using a 15:1 safety factor to match typical 1/2" rescue rope ratings.

NOTES; New Style To Accept Rope Accessory Tube
• Two (2) removable rope anchor(s) shall be provided with the completed vehicle. Each rope anchor shall be fabricated from 3/4" steel, 2" high x 11.5" long with a 3" OD/2" ID eyelet. Eyelet end shall have a radiused edge to prevent damage to rope or carabineer. Each rope anchor shall have a black hammer tone powder coat paint finish. A steel 5/8" x 3" hitch pin shall lock the rope anchor into the receiver tube.

• Two (2) removable rope anchor(s) shall be provided with the completed vehicle. Each rope anchor shall be fabricated from 3/4" steel, 2" high x 11.5" long with a 3" OD/2" ID eyelet. Eyelet

end shall have a radiused edge to prevent damage to rope or carabineer. Each rope anchor shall have a black hammer tone powder coat paint finish and a steel 5/8" hitch pin to lock it in place. An aluminum mounting bracket shall be provided to store rope anchor(s) inside a body compartment as close to the receiver location as possible.

• One (1) Warn model XD9000i, 9,000 lb. 12-volt electric winch shall be furnished with the completed unit. It shall be capable of being stored in a compartment and mounted to the apparatus by inserting the mounting point into a properly rated receiver. 80' of 3/8" synthetic rope with pinned utility hook and hawse fairlead shall be installed. A 12' remote control shall be provided with the assembly that permits the operator to stand at a safe operating distance from the cable and winch.

• There shall be one (1) 2" x 2" x 1/4" wall steel receiver tube(s) with a black hammer tone powder coat paint finish located at the front bumper for use with a removable rope anchor point and/or a portable electric winch (if specified).

− There shall be one (1) 12 VDC plug(s) with quick-connect provided to power a Warn portable winch. All 12 VDC cables are to be sized according to Warn and installed for the intended use.

− The receiver(s) shall have one (1) rubber cover(s) provided.

• There shall be one (1) 2" x 2" x 1/4" wall steel receiver tube(s) with black hammer tone powder coat paint finish located on the streetside of the body in the rearward wheel well panel area for use with removable rope anchor and/or a portable electric winch (when specified).

− There shall be one (1) 12 VDC plug(s) with quick-connect provided to power a Warn portable winch. All 12 VDC cables are to be sized according to Warn and installed for the intended use.

− One (1) 12" x 2" M x 2" F winch mounting adapter(s) shall be provided. Winch adapter will extend the specified portable winch 6" from the receiver. An aluminum mounting bracket shall be provided to store winch adapter(s) inside a body compartment as close to the receiver location as possible.

− The receiver(s) shall have one (1) rubber cover(s) provided.

• There shall be one (1) 2" x 2" x 1/4" wall steel receiver tube(s) with black hammer tone powder coat paint finish located on the curbside of the body in the rearward portion of the wheel well panel for use with removable rope anchor and/or a portable electric winch (when specified).

− There shall be one (1) 12 VDC plug(s) with quick-connect provided to power a Warn portable winch. All 12 VDC cables are to be sized according to Warn and installed for the intended use.

− One (1) 12" x 2" M x 2" F winch mounting adapter(s) shall be provided. Winch adapter will extend the specified portable winch 6" from the receiver. An aluminum mounting bracket shall be provided to store winch adapter(s) inside a body compartment as close to the receiver location as possible.

− The receiver(s) shall have one (1) rubber cover(s) provided.

• There shall be one (1) 2" x 2" x 1/4" wall steel receiver tube(s) with black hammer tone powder coat paint finish located at the rear bumper for use with a removable rope anchor point and/or a portable electric winch (when specified).

− There shall be one (1) 12 VDC plug(s) with quick-connect provided to power a Warn portable winch. All 12 VDC cables are to be sized according to Warn and installed for the intended use.

− The receiver(s) shall have one (1) rubber cover(s) provided.

**LOW VOLTAGE ELECTRICAL SYSTEM- 12 VDC**

General

Any low voltage electrical systems or warning devices installed on the fire apparatus shall be appropriate for the mounting location and intended electrical load.
Where wire passes through sheet metal, grommets shall be used to protect wire and wire looms.
Electrical connections shall be with double crimp water-tight heat shrink connectors.
All 12 VDC wiring running from front to back of the vehicle body shall be run in a full-length electrical wiring raceway down each side of the body.

Wiring

All electrical circuit feeder wiring supplied and installed by the fire apparatus manufacturer shall meet the requirements of NFPA Chapter 13.
The circuit feeder wire shall be stranded copper or copper alloy conductors of a gauge rated to carry 125% of the maximum current for which the circuit is protected. Voltage drops in all wiring from the power source to the using device shall not exceed 10%. The use of star washers for circuit ground connections shall not be permitted.
All circuits shall otherwise be wired in conformance with SAE J1292, *Automobile, Truck, Truck-Tractor, Trailer, and Motor Coach Wiring.*

Wiring and Wire Harness Construction

All insulated wire and cable shall conform to SAE J1127, *Low Voltage Battery Cable,* or SAE J1128, *Low Voltage Primary Cable,* type SXL, GXL, or TXL.

All conductors shall be constructed in accordance with SAE J1127 or SAE J1128, except where good engineering practice dictates special strand construction. Conductor materials and stranding, other than copper, shall be permitted if all applicable requirements for physical, electrical, and environmental conditions are met as dictated by the end application. Physical and dimensional values of conductor insulation shall be in conformance with the requirements of SAE J1127 or SAE J1128, except where good engineering practice dictates special conductor insulation. The overall covering of conductors shall be a moisture-resistant loom or braid that has

a minimum continuous rating of 194°F (90°C) except where good engineering practice dictates special consideration for loom installations exposed to higher temperatures. The overall covering of jacketed cables shall be moisture resistant and have a minimum continuous temperature rating of 194°F (90°C), except where good engineering practice dictates special consideration for cable installations exposed to higher temperatures.

All wiring connections and terminations shall use a method that provides a positive mechanical and electrical connection. The wiring connections and terminations shall be installed in accordance with the device manufacturer's instructions. All ungrounded electrical terminals shall have protective covers or be in enclosures. Wire nut, insulation displacement, and insulation piercing connections shall not be used.
Wiring shall be restrained to prevent damage caused by chafing or ice buildup and protected against heat, liquid contaminants, or other environmental factors.

Wiring shall be uniquely identified at least every 2 ft (0.6 m) by color-coding or permanent marking with a circuit function code. The identification shall reference a wiring diagram.
Circuits shall be provided with properly rated low voltage over-current protective devices. Such devices shall be readily accessible and protected against heat more than the over-current device's design range, mechanical damage, and water spray. Circuit protection shall be accomplished by utilizing fuses, circuit breakers, fusible links, or solid-state equivalent devices.
If a mechanical-type device is used, it shall conform to one of the following SAE standards:

1) SAE J156, *Fusible Links*
2) SAE J553, *Circuit Breakers*
3) SAE J554, *Electric Fuses (Cartridge Type)*
4) SAE J1888, *High Current Time Lag Electric Fuses*
5) SAE J2077, *Miniature Blade Type Electrical Fuses*

Switches, relays, terminals, and connectors shall have a direct current (dc) rating of 125% of the maximum current for which the circuit is protected.

Power Supply

A 12 V or greater electrical alternator shall be provided. The alternator shall have a minimum output at idle to meet the minimum continuous electrical load of the vehicle, at 200°F (93°C) ambient temperature within the engine compartment and shall be provided with full automatic regulation.

Minimum Continuous Electrical Load

The minimum continuous electrical load shall consist of the total amperage required to simultaneously operate the following in a stationary mode during emergency operations:

1) The propulsion engine and transmission
2) All legally required clearance and marker lights, headlights, and other electrical devices except windshield wipers and four-way hazard flashers

3) The radio(s) at a duty cycle of 10 percent transmit and 90 % receive (for calculation and testing purposes, a default value of 5 A continuous)
4) The lighting necessary to produce 2 fc (20 lx) of illumination on all walking surfaces on the apparatus and on the ground at all egress points onto and off the apparatus, 5 fc (50 lx) of illumination on all control and instrument panels, and 50 percent of the total compartment lighting loads
5) The minimum optical warning system, where the apparatus is blocking the right-of-way
6) The continuous electrical current required to simultaneously operate any fire pumps, aerial devices, and hydraulic pumps
7) Other warning devices and electrical loads defined by the purchaser as critical to the mission of the apparatus

If the apparatus is equipped to tow a trailer, an additional 45 A shall be added to the minimum continuous electrical load to provide electrical power for the federally required clearance and marker lighting and the optical warning devices mounted on the trailer.

The condition of the low voltage electrical system shall be monitored by a warning system that provides both an audible and a visual signal to persons on, in, or near the apparatus of an impending electrical system failure caused by the excessive discharge of the battery set.
The charge status of the battery shall be determined either by direct measurement of the battery charge or indirectly by monitoring the electrical system voltage.

If electrical system voltage is monitored, the alarm shall sound if the system voltage at the battery or at the master load disconnect switch drops below 11.8 V for 12 V nominal systems, 23.6 V for 24 V nominal systems, or 35.4 V for 42 V nominal systems for more than 120 seconds.

A voltmeter shall be mounted on the driver's instrument panel to allow direct observation of the system voltage.

Electromagnetic Interference

Electromagnetic interference suppression shall be provided, as required, to satisfy the radiation limits specified in SAE J551/1, *Performance Levels and Methods of Measurement of Electromagnetic Compatibility of Vehicles, Boats (up to 15 m), and Machines (16.6 Hz to 18 GHz)*.

Wiring Diagram

A complete electrical wiring schematic of the actual system shall be provided with the finished apparatus. Similar or generic type electrical schematics shall NOT BE ACCEPTABLE.
Low Voltage Electrical System Performance Test

A low voltage electrical system test certification shall be provided with the delivered apparatus.

## 12 VOLT MULTIPLEX CONTROL CENTER

The apparatus shall be equipped with a Weldon V-MUX multiplexed 12-volt electrical system that will provide complete diagnostic capability. The system shall have the capability of delivering multiple signals via a CAN bus, utilizing specifications set forth by SAE J1939. The system shall be node based to maximize stability so that the failure of one node does not affect the operation of the other nodes. The system shall use shielded twisted-pair wire for transmission of system function signals. The shielded wire shall provide protection against EMI and RFI noise interruptions.

The multiplex system shall be responsible for providing power management functions as well as load shedding. The warning light system shall be controlled by the multiplex system. The system shall be capable of displaying text and/or graphic messages on a display module. The system shall be based on solid-state technology and shall include self-contained diagnostic indicators.

## WELDON CERTIFICATION

A letter shall be provided with bid submittal that the Contractor has successfully completed the Weldon training requirements for Level 1 of the V-MUX Certified Supplier Program and is authorized to design, build, and service V-MUX electrical systems.

The apparatus shall be equipped with a Weldon V-MUX multiplexed 12-volt electrical system that will provide the complete diagnostic capability, No Exception. The system shall have the capability of delivering multiple signals via a CAN bus, utilizing specifications set forth by SAE J1939. The system shall be node based to maximize stability so that the failure of one node does not affect the operation of the other nodes. The system shall use shielded twisted-pair wire for transmission of system function signals. The shielded wire shall provide protection against EMI and RFI noise interruptions.

The multiplex system shall be responsible for providing power management functions as well as load shedding. The warning light system shall be controlled by the multiplex system. The system shall be capable of displaying text and/or graphic messages on a display module. The system shall be based on solid-state technology and shall include self-contained diagnostic indicators.

## MULTIPLEX SYSTEM INTERFACE DISPLAY

The Weldon V-MUX Vista IV multiplex system interface display(s) shall be provided by the cab/chassis manufacturer. The full-color Vista interface display allows the user to control warning and scene lighting, HVAC controls (when specified), and view on-board diagnostics including service information. This display has a wide operating temperature range, automatic screen switching in response to current conditions, and a sleep mode option to eliminate night glare. The following features shall be included;

- 800 x 480 resolution
- Four video ports
- Flash updates with USB memory stick

• Display inside and outside temperature (when specified)
• Automatic climate control (when specified)
• 100% Configurable (OEM Level)
• Field re-programmable
• Peer to peer network
• On-board diagnostics / service information
• Colors change to indicate button status
• Video Ready for: Backup camera, Thermal camera, DVD, GPS...

**BATTERY SYSTEM**

The battery connectors shall be the heavy-duty type with cables terminating in a heat shrink loom. Heavy-duty battery cables shall provide maximum power to the electrical system. Where required, the cables shall be shielded from exhaust tubing and the muffler. Large rubber grommets shall be provided where cables enter the battery compartment.

Batteries shall be of the high-cycle type. With the engine off, the battery system shall be able to provide the minimum continuous electrical load for 10 minutes without discharging more than 50 percent of the reserve capacity and then restart the engine. The battery system cold-cranking amps (CCA) rating shall meet or exceed the minimum CCA recommendations of the engine manufacturer. The batteries shall be mounted to prevent movement during fire apparatus operation and shall be protected against accumulations of road spray, snow, and road debris. The batteries shall be readily accessible for examination, testing, and maintenance.
A means shall be provided for jump-starting the engine if the batteries are not accessible without lifting the cab of a tilt-cab apparatus.

Where an enclosed battery compartment is provided, it shall be ventilated to the exterior to prevent the buildup of heat and explosive fumes. The batteries shall be protected against vibration and temperatures that exceed the battery manufacturer's recommendation.
An onboard battery conditioner or charger or a polarized inlet shall be provided for charging all batteries. Where an onboard conditioner or charger is supplied, the associated line voltage electrical power system shall be installed in accordance with Chapter 22.
One of the following master disconnect switches shall be provided:

1) A master body disconnect switch that disconnects all electrical loads not provided by the chassis manufacturer
2) A master load disconnect switch that disconnects all electrical loads on the apparatus except the starter

Electronic control systems and similar devices shall be permitted to be otherwise connected if so specified by their manufacturer.

The alternator shall be wired directly to the batteries through the ammeter shunt(s) if one is provided, and not through the master load disconnect switch.

A green “battery disconnect on” indicator light that is visible from the driver’s position shall be provided.

Rechargeable hand lights, radios, and other similar devices shall be permitted to be connected to the electrical system ahead of the master disconnect switch.

A sequential switching device shall be permitted to energize the optical warning devices and other high current devices required in minimum continuous electrical load, provided the switching device shall first energize the electrical devices required in minimum continuous electrical load within 5 seconds.

**BATTERY SWITCH**

One (1) "battery disconnect on" switch in a cab located within easy reach of Driver with an indicator light that is visible from the driver’s position shall be provided. The switch and indicator light shall be supplied and installed by the cab/chassis manufacturer.

**BATTERY SOLENOID**

The battery switch shall consist of a minimum 200 ampere, constant duty solenoid to feed from the positive side of the battery.

**BATTERY CONDITIONER**

The battery conditioner shall be supplied and installed by the cab chassis manufacturer.

**ENGINE COMPARTMENT LIGHT**

Engine compartment light(s) shall be supplied and installed by the cab chassis manufacturer.

**INTERIOR CAB LIGHT, LED**

One (1) OnScene Solution model #70152, 10” x 6” x 7/8”, 10-30 VDC, surface mount dual red and white LED light(s) with clear lens shall be provided on the cab ceiling. Each light shall be individually switched with a high/low-intensity setting. In addition, light(s) will be capable of a 5-second delay after switching off.

**CAB HAZARD WARNING LIGHT**

A red flashing or rotating light is located in the driving compartment. The light shall be furnished by the cab/chassis manufacturer. The light shall be illuminated automatically whenever the vehicles parking brake is not fully engaged and any of the following conditions exist:

- Any passenger or equipment compartment door is not closed.
- Any ladder or equipment rack is not in the stowed position.
- Stabilizer system is not in its stowed position.

• Powered light tower is not stowed.
• Any other device permanently attached to the apparatus is open, extended, or deployed in a manner that is likely to cause damage to the apparatus if the apparatus is moved.

Compartments and equipment meet all of the following conditions shall be permitted to be exempt from being wired to the hazard light:

• The volume is less than or equal to 4 ft3 (0.1 m3).
• The compartment has an opening less than or equal to 144 in.2 (92,900 mm2).
• The open door does not extend sideways beyond the mirrors or up above the top of the fire apparatus.
• All equipment in the compartment is restrained so that nothing can fall out if the door is open while the apparatus is moving.
• Manually raised pole lights with an extension of fewer than 5 ft (1.5 m).

The hazard light shall be labeled "DO NOT MOVE APPARATUS WHEN LIGHT IS ON".

**BACK-UP ALARM**

An electronic backup alarm shall be supplied and installed by the cab/chassis manufacturer. The backup alarm shall actuate automatically when the transmission gear selector is placed in reverse.

**REAR VIEW CAMERA**

The cab chassis-provided rear view camera shall be installed on the rear of the body.

**TAIL LIGHTS**

Rear body taillights shall be vertically mounted and located per Federal Motor Vehicle Safety Standards, FMVSS. The following lights shall be furnished.

• Two (2) Whelen amber LED 600 Series 60A00TAR turn signal lights
• Two (2) Whelen red LED 600 Series 60BTT stop/taillights
• Two (2) Whelen LED 600 Series 60C00WCR maximum intensity backup lights with clear lens

Each of the lights above shall be mounted in a 6EFLANGE, chrome finish bezel.

**MIDSHIP MARKER/TURN SIGNAL**

Two (2) Whelen model T0A00MAR 2" round amber LED midship body clearance marker/turn signal lights shall be provided and installed, one (1) light on each side of the body, in the forward wheel well of the rear axle. Midship marker/turn lights shall be wired to the headlight circuit of the chassis.

**MARKER LIGHTS**

The body shall be equipped with all necessary clearance lights and reflectors in accordance with Federal Motor Vehicle Safety Standards (FMVSS) and Canadian Motor Vehicle Safety Standards (CMVSS) regulations. All body clearance lights shall be Truck-Lite Model 18 LED to reduce the need for maintenance and lower the amp draw. Clearance lights shall be wired to the headlight circuit of the chassis.

**CAB STEP LIGHTS / GROUND LIGHTS**

The step lights and/or ground lights shall be supplied and installed by the cab/chassis manufacturer. Light(s) shall be capable of providing illumination at a minimum level of 2 fc (20 lx) on ground areas within 30 in. (800 mm) of the edge of the vehicle in areas designed for personnel to climb onto or descend from the vehicle to the ground level.
Lighting designed to provide illumination on areas under the driver and crew riding area exits shall be switchable but activated automatically when the exit doors are opened.

**LICENSE PLATE LIGHT**

One (1) Arrow #437 chrome-plated LED license plate light shall be installed on the rear of the body. The license plate light shall be wired to the headlight circuit of the chassis. A fastener system shall be provided for license plate installation.

**ELECTRONIC SIREN**

The siren control head shall be supplied and installed by the cab/chassis manufacturer. Siren power shall be wired through the master warning light switch.

**SIREN SPEAKER**

The siren speaker shall be supplied and installed by the cab/chassis manufacturer.

**SCENE LIGHTS OPTI-SCENELIGHT SERIES 900 SUPER LED**

Six (6) scene lights shall be provided in the location specified and shall be switched in the cab. The lights shall be Whelen 900 Series Super LED, high intensity 90o gradient Opti-Scene lights™ with 24 diodes and chrome plated flange.

Locate 2 on each side of the upper body, one toward the front and one toward the rear

Locate 2 on the upper rear of the body

**REAR LED SCENE LIGHTS**

Two (2) Whelen 900 Series Super-LED® model 9SC0ENZR, 9" x 7" surface mounted scene lights shall be provided on the upper rear body to light the work area immediately behind the

vehicle. The 900 configurations shall consist of 24 clear Super-LEDs and a clear gradient optic polycarbonate lens with a chrome flange. The 900 series light shall have 6,500 usable lumens each. The scene light is covered by a five-year factory warranty.

The above scene lights shall light to a level of at least 3 fc (30 lx), measured at 25 equally spaced points on a 2.5 ft (750 mm) grid within a 10 ft x 10 ft (3 m x 3m) square to the rear of the vehicle.

The lights shall be controlled at the multiplex display(s) in the cab.

The rear scene lights shall also be activated when the apparatus is in reverse.

**DAVID CLARK INTERCOM SYSTEM**

The following David Clark intercom system shall be provided and installed to improve the safety of firefighters and rescue professionals through enhanced communication and hearing protection. System shall have the following major components as a minimum.

One (1) U3800 Master Station
One (1) U3805 Radio Junction Module
One (1) U3806 Dual Headset Intercom Module
One (1) U3815 Radio Interface Headset Station
One (1) U3811 Radio Interface Headset Module
One (1) H3441 Behind The Head Single Ear (slotted dome) Headset.
Five (5) H3442 Over The Head Dual Ear Headset.

Necessary cables and power cords.

**INTERCOM SYSTEM INSTALLATION**

A six (6) position intercom system shall be provided in the cab. The driver and officer positions shall be interfaced with the specified radio, and remote push to talk. There shall be mounting clips/brackets for each headset near each seated position.
The above-listed intercom system shall be installed in the cab locations as follows;

**FRONT OF CAB**

- Driver's – Mounted above the right shoulder position on the ceiling.
- Officer's – Mounted above the left shoulder position on the ceiling.

**REAR CREW AREA**

- Driver's side rear-facing – Above the left shoulder on the wall or ceiling.
- Officer's side rear-facing – Above the left shoulder on the wall or ceiling.
- Driver's side forward-facing center – Above the left shoulder on the rear wall or ceiling.

• Officer's side forward-facing center – Above the right shoulder on the rear wall or ceiling.

**WARNING LIGHT PACKAGE**

Each apparatus shall have a system of Whelen Core Tech warning devices that meets or exceeds the requirements of this section.

The optical warning system shall consist of an upper and a lower warning level. The requirements for each level shall be met by the warning devices in that particular level without consideration of the warning devices in the other level.

For the purposes of defining and measuring the required optical performance, the upper and lower warning levels shall be divided into four (4) warning zones. The four zones shall be determined by lines drawn through the geometric center of the apparatus at 45 degrees to a line drawn lengthwise through the geometric center of the apparatus. The four (4) zones shall be designated A, B, C, and D in a clockwise direction, with zone A to the front of the apparatus. Each optical warning device shall be installed on the apparatus and connected to the apparatus's electrical system in accordance with the requirements of this standard and the requirements of the manufacturer of the device.

A master optical warning system switch that energizes all the optical warning devices shall be provided.

The optical warning system on the fire apparatus shall be capable of two (2) separate signaling modes during emergency operations. One (1) mode shall signal to drivers and pedestrians that the apparatus is responding to an emergency and is calling for the right-of-way. One (1) mode shall signal that the apparatus is stopped and is blocking the right-of-way. The use of some or all of the same warning lights shall be permitted for both modes provided the other requirements of this chapter are met.

A switching system shall be provided that senses the position of the parking brake or the park position of an automatic transmission. When the master optical warning system switch is closed and the parking brake is released or the automatic transmission is not in the park, the warning devices signaling the call for the right-of-way shall be energized. When the master optical warning system switch is closed and the parking brake is on or the automatic transmission is in park, the warning devices signaling the blockage of the right-of-way shall be energized. The system shall be permitted to have a method of modifying the two (2) signaling modes.
The optical warning devices shall be constructed or arranged so as to avoid the projection of light, either directly or through mirrors, into any driving or crew compartment(s). The front optical warning devices shall be placed so as to maintain the maximum possible separation from the headlights.

Steadily burning, non flashing optical sources shall be permitted to be used.

## UPPER LEVEL WHELEN  WARNING DEVICES

The upper-level Whelen Core Techwarning devices shall be mounted as high and as close to the corner points of the apparatus as is practical to define the clearance lines of the apparatus. The upper-level optical warning devices shall not be mounted above the maximum height, specified by the device manufacturer.

ZONE A - FRONT WARNING LIGHTS
The light bar shall be supplied and installed by the cab/chassis manufacturer. Light bar shall have a Inferred Traffic Pre-emption emitter.
ZONES B AND D - SIDE WARNING LIGHTS
UPPER REAR CORNER WARNING LIGHTS

There shall be two (2)  Whelen Red surface-mounted corner lights provided, one (1) on each side. Each light shall have a red light with a clear lens and chrome flange.
The lights shall be controlled at the multiplex display(s) in the cab.

UPPER FORWARD CORNER WARNING LIGHTS

There shall be two (2) Whelen series Red surface-mounted corner lights provided, one (1) on each side. Each light shall have a red light with a clear lens and chrome flange.
The lights shall be controlled at the multiplex display(s) in the cab.

ZONE C - REAR WARNING LIGHTS

There shall be two (2)  Whelen Red surface-mounted corner lights provided, one (1) on each side. Each light shall have a red light with a clear lens and chrome flange.
The lights shall be controlled at the multiplex display(s) in the cab.

## LOWER LEVEL WHELEN Core WARNING DEVICES

To define the clearance lines of the apparatus, the optical center of the lower-level optical warning devices in the front of the vehicle shall be mounted on or forward of the front axle centerline and as close to the front corner points of the apparatus as is practical.

The optical center of the lower-level optical warning devices at the rear of the vehicle shall be mounted on or behind the rear axle centerline and as close to the rear corners of the apparatus as is practical. The optical center of any lower-level device shall be between 18 in. and 62 in. (460 mm and 1600 mm) above level ground for large apparatus, and 18 in. and 48 in. (460 mm and 1600 mm) above level ground.
A midship optical warning device shall be mounted right and the left sides of the apparatus if the distance between the front and rear lower-level optical devices exceeds 25 ft (7.6 m) at the optical center. Additional midship optical warning devices shall be required, where necessary, to maintain a horizontal distance between the centers of adjacent lower-level optical warning devices of 25 ft (7.6 m) or less. The optical center of any midship mounted optical warning device shall be between 18 in. and 62 in. (460 mm and 1600 mm) above level ground.

ZONE A - FRONT WARNING LIGHTS

The warning lights shall be supplied and installed by the cab/chassis manufacturer. They shall be Whelen lights to complete an NFPA-compliant lower-level warning light system. This system shall be CORE technology manufactured by Whelen.

ZONES B AND D - CAB INTERSECTOR LIGHT (CAB FRONT CORNERS)

The warning lights shall be supplied and installed by the cab/chassis manufacturer. They shall be Whelen lights to complete an NFPA-compliant lower-level warning light system.

ZONES B AND D - BODY LIGHT (BODY WHEELWELL AREA)

There shall be two (2) Whelen LED lights provided, one (1) on each side. Each light shall have a red lens.

The lights shall be controlled at the multiplex display(s) in the cab.

ZONES B, D & C - BODY INTERSECTOR LIGHT (BODY REAR CORNERS)

There shall be two (2) Whelen LED lights provided, one (1) on each side of rear body panels. Each light shall have a red lens and chrome flange.
The lights shall be controlled at the multiplex display(s) in the cab.

**LINE VOLTAGE ELECTRICAL SYSTEM**
**ONAN PTO GENERATOR**

The vehicle shall be equipped with an Onan Protec PTO generator system with a capacity of 20,000 watts at 120/240 VAC, 166/83 amps, single phase. The current frequency shall be stable at 60 hertz.

The transmission's PTO port and PTO, or the split shaft PTO, and all associated drive shaft components shall be rated to support the continuous duty torque requirements of the generator's continuous duty rating as stated on the power source nameplate.

Where the generator is driven by the chassis engine and transmission through a split shaft PTO, the driving compartment speedometer shall register when the generator drive system is engaged. Where the generator is driven by the chassis engine and transmission through a split shaft PTO and a chassis transmission retarder is furnished, it shall be automatically disengaged for generator operations.
The direct-drive generator shall be mounted so that it does not change the ramp break-over angle, angle of departure, or angle of approach as defined by other components, and it shall not extend into the ground clearance area.

The direct-drive generator shall be mounted away from exhaust and muffler areas or provided with a heat shield to reduce operating temperatures in the generator area.

## GENERATOR BONDING

A minimum of four (4) 16" x 2 gauge copper ground straps shall be bolted to the body sub-frame and chassis sub-frame for proper bonding of the high voltage system. The conductor shall have a minimum amperage rating, as defined in 310.15, “Ampacities for Conductors Rated 0–2000 Volts,” of *NFPA 70*, of 115 percent of the rated amperage on the power source specification label.

## GENERATOR ENGAGEMENT

A “Generator Engaged” indicator shall be provided in the driving compartment to indicate that the generator shift has been successfully completed.

An “OK to Operate Generator” indicator shall be provided in the driving compartment to indicate that the generator is engaged (if not always engaged), the transmission is in the proper gear (if required, automatic transmissions only), and the parking brake is engaged (if applicable). An interlock system shall be provided to prevent the advancement of the engine speed in the driving compartment or at any operator’s panel unless the parking brake is engaged, the transmission is in neutral or the output of the transmission is correctly connected to a pump or generator instead of the drive wheels.

## WARRANTY PERIOD

Provided such goods are operated and maintained in accordance with Onan's written instructions, Onan warrants that the Protec YDCR series PTO generators shall be free from defects in material and workmanship for a period of five (5) years or one thousand (1,000) hours, whichever comes first, from the date of delivery to the first purchaser.

## GENERATOR SPLASH GUARD

A powder coat painted splash cover shall be installed to reduce the amount of road spray on the frame-mounted PTO generator. A V-ring seal shall also be installed in the cover to provide additional protection against contaminants reaching the generator front seals.
The generator shall be engaged at the driver's multiplex display in the cab.

## GENERATOR MOUNTING

The generator shall be mounted between the chassis frame rails. The generator mounting brackets shall be fabricated using heavy-duty steel tubing, or a structural channel. The generator mounting shall be bolted and removable so that the generator can be lowered from under apparatus for service, if necessary. The generator case shall not extend below the bottom edge of the apparatus body.

## MANUALS AND SCHEMATICS

Two (2) complete manuals on parts list, maintenance, wiring schematics, hydraulic schematics, circuit boards, voltage regulator board, and other components shall be provided on delivery.

## POWER-TAKE-OFF GENERATOR DRIVE

There shall be a "Hot Shift" power-take-off (PTO) installed on the transmission PTO opening of the chassis. The "Hot Shift" PTO is provided to allow the engagement of the PTO at higher engine RPM speeds. The PTO output shall be connected to the generator through hollow tube type driveline with heavy-duty universals.

The engagement of the PTO shall be in the chassis cab with a rocker switch and red pilot light to note the engagement of the PTO or via the V-Mux screen if so equipped.

The power supply to the PTO engagement control shall be wired to the parking brake and a neutral position transmission switch to prevent engagement unless the vehicle is stopped and transmission has been placed in neutral.

The installation of the engine, transmission, and driven accessories (power takeoffs (PTO), etc.) shall meet the engine and transmission manufacturers' installation recommendations for the service intended.

The model part number shall be Chelsea 280 series.
Double-check the model number and ratio with engineering before ordering the PTO on the chassis.

## 425 Amp Hour Battery Idle Reduction System.

There shall be a Harrison Idle reduction system installed in the upper storage area of the body.

## ENGINE SPEED CONTROL

An engine speed auxiliary control device (high idle switch or throttle) shall be installed to maintain a stable cycle output from the generator when the apparatus is parked.
An interlock shall prevent the operation of the engine speed auxiliary control device unless the parking brake is engaged and the transmission is in neutral or park, or the parking brake is engaged and the engine is disengaged from the drive wheels.

The engine shall be prevented from regulating its own engine speed during times when engine rpm control is critical for consistent apparatus functions such as generator, water pump, or aerial operation.

## LOADCENTER

The load center shall be an Eaton BR Series specifically designed for protection and distribution of AC line voltage such as lighting and small motor branch circuits. The load center enclosure is made of 16 gauge galvanized sheet steel with a galvanized coating provided for corrosion protection. All trims used on BR load centers are chromate sealed and finished with an electro-disposition epoxy paint (ANSI-61) which exceeds requirements for outdoor and indoor applications. A combination surface/flush cover with integral door is supplied with indoor load centers rated from 100 through 400 amperes. All plug-in load centers are CSA listed to file LL98266. CSA Certified to C22.2 No.29, to load center type and CSA listing.

## GENERATOR MONITORING PANEL

A Crompton Instruments Integra Ci3 digital meter package shall be provided to properly monitor the generator performance and load demand during operation. The electrical parameters can be viewed on a backlit LCD screen. The 15 screens are accessible via four buttons on the front panel allowing the user to scroll between various screens. The following shall be displayed full-time;

- Generator frequency in hertz
- Line 1 current in amperes
- Line 2 current in amperes
- Generator voltage in volts

In addition, an elapsed generator hours gauge shall be provided near the digital meter.

## SHORE POWER INLET - BATTERY CHARGER

The above-mentioned shore power inlet and battery conditioner shall be specified in the 12-volt section.

## LINE VOLTAGE ELECTRICAL SYSTEM

## GENERAL REQUIREMENTS

Stability

Any fixed line voltage power source producing alternating current (ac) shall produce electric power at 60 Hz, ±3 Hz when producing power at all levels between no load and full rated power. Any fixed line voltage power source shall produce electric power at the rated voltage ±10 percent when producing power at all levels between no load and full rated power.
The maximum voltage supplied to portable equipment shall not exceed 275 volts to the ground. Higher voltage shall be permitted only when used to operate fixed wired, permanently mounted equipment on the apparatus.

Conformance with National Electrical Code

All components, equipment, and installation procedures shall conform to *NFPA 70*, *National Electrical Code*, except where superseded by the requirements of this chapter. Where the requirements of this chapter differ from those in *NFPA 70*, the requirements in this chapter shall apply.

Where available, line voltage electrical system equipment and materials included on the apparatus shall be listed and used only in the manner for which they have been listed. All equipment and materials shall be installed in accordance with the manufacturer's instructions.

Location Ratings

Any equipment used in a dry location shall be listed for dry locations. Any equipment used in a wet location shall be listed for wet locations.

Any equipment, except a PTO-driven generator, used in an underbody or under chassis location that is subject to road spray shall be either listed as Type 4 or mounted in an enclosure that is listed as Type 4.

If a PTO-driven generator is located in an underbody or under chassis location, the installation shall include a shield to prevent road spray from splashing directly on the generator.

Grounding

Grounding shall be in accordance with 250.34(A) and 250.34(B) of *NFPA 70*. Ungrounded systems shall not be used.

Only stranded or braided copper conductors shall be used for grounding and bonding.
The grounded current-carrying conductor (neutral) shall be insulated from the equipment-grounding conductors and from the equipment enclosures and other grounded parts.
The neutral conductor shall be colored white or gray in accordance with 200.6, "Means of Identifying Grounded Conductors," of *NFPA 70*.

Any bonding screws, straps, or buses in the distribution panel board or in other system components between the neutral and equipment-grounding conductor shall be removed and discarded.

Bonding

The neutral conductor of the power source shall be bonded to the vehicle frame. The neutral bonding connection shall occur only at the power source. In addition to the bonding required for the low voltage return current, each body and each driving or crew compartment enclosure shall be bonded to the vehicle frame by a copper conductor.
The conductor shall have a minimum amperage rating, as defined in 310.15, "Ampacities for Conductors Rated 0–2000 Volts," of *NFPA 70*, of 115 percent of the rated amperage on the power source specification label.

A single conductor that is sized to meet the low voltage and line voltage requirements shall be permitted to be used.

Ground Fault Circuit Interrupters

In special service vehicles incorporating a lavatory, sink, toilet, shower, or tub, 120 V, 15, or 20 A receptacles within 6 ft (1.8 m) of these fixtures shall have ground fault circuit interrupter (GFCI) protection. GFCIs integrated into outlets or circuit breakers or as stand-alone devices shall be permitted to be used in situations.

Power Source General Requirements

All power source system mechanical and electrical components shall be sized to support the continuous duty nameplate rating of the power source.

The power source shall be shielded from contamination that would prevent the power source from operating within its design specifications.

Power Source Rating

For power sources of 8 kW or larger, the power source manufacturer shall declare the continuous duty rating that the power source can provide when installed on fire apparatus according to the manufacturer's instructions and run at 120°F (49°C) air intake temperature at 2000 ft (600 m) above sea level.

The rating on the power source specification label shall not exceed the declared rating from the power source manufacturer.

Access shall be provided to permit both routine maintenance and removal of the power source for major servicing. The power source shall be located such that neither it nor its mounting brackets interfere with the routine maintenance of the fire apparatus.
Instrumentation

If the power source is rated at less than 3 kW, a "Power On" indicator shall be provided. If the power source is rated at 3 kW or more but less than 8 kW, a voltmeter shall be provided.
If the power source is rated at 8 kW or more, the following instrumentation shall be provided at an operator's panel:

1) Voltmeter
2) Current meters for each ungrounded leg
3) Frequency (Hz) meter
4) Power source hour meter

The instrumentation shall be permanently mounted at an operator's panel. The instruments shall be located in a plane facing the operator. Gauges, switches, or other instruments on this panel shall each have a label to indicate their function.

The instruments and other line voltage equipment and controls shall be protected from mechanical damage and not obstructed by tool mounting or equipment storage.

An instruction plate(s) that provides the operator with the essential power source operating instructions, including the power-up and power-down sequence, shall be permanently attached to the apparatus at any point where such operations can take place.

Operation

Provisions shall be made for placing the generator drive system in operation using controls and switches that are identified and within convenient reach of the operator.

Where the generator is driven by the chassis engine and engine compression brakes or engine exhaust brakes are furnished, they shall be automatically disengaged for generator operations. Any control device used in the generator system power train between the engine and the generator shall be equipped with a means to prevent unintentional movement of the control device from its set position in the power generation mode.

If there is permanent wiring on the apparatus that is designed to be connected to the power source, a power source specification label that is permanently attached to the apparatus at the operator's control station shall provide the operator with the information required.

The power source, at any load, shall not produce a noise level that exceeds 90 dBA in any driving compartment, crew compartment, or onboard command area with windows and doors closed or at any operator's station on the apparatus.

Power Supply Assembly

The conductors used in the power supply assembly between the output terminals of the power source and the main over current protection device shall not exceed 12 ft (4 m) in length. All power supply assembly conductors, including neutral and grounding conductors, shall have an equivalent amperage rating and shall be sized to carry not less than 115 percent of the amperage of the nameplate current rating of the power source.

If the power supply assembly connects to the vibrating part of a generator (not a connection on the base), the conductors shall be flexible cords or other fine-stranded conductors enclosed in metallic or nonmetallic liquid-tight flexible conduit rated for wet locations and temperatures not less than 194°F (90°C).

Over-current Protection

Manually resettable overcurrent devices shall be installed to protect the line voltage electrical system components.

Power Source Protection

A main overcurrent protection device shall be provided that is either incorporated in the power source or connected to the power source by a power supply assembly.

The size of the main over the current protection device shall not exceed 100 percent of the rated amperage stated on the power source specification label or the rating of the next larger available size over the current protection device, where so recommended by the power source manufacturer.

If the main over current protection device is subject to road spray, the unit shall be housed in Type 4–rated enclosure.

Branch Circuit Over-current Protection

Over-current protection devices shall be provided for each individual circuit and shall be sized at no less than 15 amps in accordance with 240.4, “Protection of Conductors,” of *NFPA 70*.
Any panel board shall have a main breaker where the panel has six or more individual branch circuits or the power source is rated 8 kW or larger.

Each over-current protection device shall be marked with a label to identify the function of the circuit it protects.

Dedicated circuits shall be provided for any large appliance or device (air conditioning units, large motors, etc.) that requires 60 percent or more of the rated capacity of the circuit to which it is connected, and that circuit shall serve no other purpose.

Panelboards

All fixed power sources shall be hardwired to a permanently mounted panel board unless one of the following conditions exists:
1) All line voltage power connections are made through receptacles on the power source and the receptacles are protected by integrated over-current devices.
2) Only one circuit is hardwired to the power source, which is protected by an integrated over current device.

The panel shall be visible and located so that there is unimpeded access to the panel board controls. All panel boards shall be designed for use in their intended location. The panel(s) shall be protected from mechanical damage, tool mounting, and equipment storage.
Where the power source is 120/240 V and 120 V loads are connected, the apparatus manufacturer or line voltage system installer shall consider load balancing to the extent that it is possible.

Wiring Methods

Fixed wiring systems shall be limited to the following:

1) Metallic or nonmetallic liquid-tight flexible conduit rated at temperatures not less than 194°F (90°C) with stranded copper wire rated for wet locations and temperatures not less than 194°F (90°C)
2) Type SOW, SOOW, SEOW, or SEOOW flexible cord rated at 600 V and at temperatures not less than 194°F (90°C)

Electrical cord or conduit shall not be attached to chassis suspension components, water or fuel lines, air or air brake lines, fire pump piping, hydraulic lines, exhaust system components, or low voltage wiring and shall be arranged as follows:

1) Separated by a minimum distance of 12 in. (300 mm) from exhaust piping or shielded from such piping
2) Separated from fuel lines by a minimum distance of 6 in. (150 mm)

A means shall be provided to allow "flexing" between the driving and crew compartment, the body, and other areas or equipment whose movement would stress the wiring.
Electrical cord or conduit shall be supported within 6 in. (150 mm) of any junction box and at a minimum of every 24 in. (600 mm) of the run.

Supports shall be made of nonmetallic materials or of corrosion-resistant or corrosion-protected metal. All supports shall be of a design that does not cut or abrade the conduit or cord and shall be mechanically fastened to the apparatus.

Only fittings and components listed for the type of cord or conduit being installed shall be used. Splices shall be made only in a listed junction box.

Additional Requirements for Flexible Cord Installations
Where flexible cord is used in any location where it could be damaged, it shall be protected by installation in conduit, enclosures, or guards.

Where a flexible cord penetrates a metal surface, rubber or plastic grommets or bushings shall be installed.

Wiring Identification

Each line voltage circuit originating from the main panel board shall be identified.
The wire or circuit identification either shall reference a wiring diagram or wire list or shall indicate the final termination point of the circuit.

Where pre-wiring for future power sources or devices exists, the un-terminated ends shall be marked with a label showing their wire size and intended function.
Wiring System Components
Only stranded copper conductors with insulation rated for temperatures of at least 194°F (90°C) and wet locations shall be used. Conductors in flexible cord shall be sized in accordance with Table 400.5(A) of *NFPA 70*. Conductors used in conduit shall be sized in accordance with

310.15, “Ampacities for Conductors Rated 0–2000 Volts,” of *NFPA 70*. Aluminum or copper-clad aluminum conductors shall not be used.

All boxes shall conform to and be mounted in accordance with Article 314, “Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; Fittings; and Manholes,” of *NFPA 70*. All boxes shall be accessible using ordinary hand tools. Boxes shall not be permitted behind welded or pop-riveted panels.

The maximum number of conductors permitted in any box shall be in accordance with 314.16, “Number of Conductors in Outlet, Device, and Junction Boxes, and Conduit Bodies,” of *NFPA 70*.

All wiring connections and terminations shall provide a positive mechanical and electrical connection. Connectors shall be installed in accordance with the manufacturer’s instructions. Wire nuts or insulation displacement and insulation piercing connectors shall not be used. Each switch shall indicate the position of its contact points (i.e., open or closed) and shall be rated for the continuous operation of the load being controlled. All switches shall be marked with a label indicating the function of the switch. Circuit breakers used as switches shall be “switch rated” (SWD) or better. Switches shall simultaneously open all associated line voltage conductors. Switching of the neutral conductor alone shall not be permitted.

Line voltage circuits controlled by low voltage circuits shall be wired through properly rated relays in listed enclosures that control all non-grounded current-carrying conductors.

Receptacles and Inlet Devices
Two (2)110 volt outlets and two (2) 12 volt outlets shall be located in two of the rear compartments for charging equipment. Location to be determined by Durham Fire Department in the Wet and Dry Locations

All wet location receptacle outlets and inlet devices, including those on hardwired, remote power distribution boxes, shall be of the grounding type, provided with a wet location cover, and installed in accordance with Section 406.8, “Receptacles in Damp or Wet Locations,” of *NFPA 70*.

All receptacles located in a wet location shall be not less than 24 in. (600 mm) from the ground. Receptacles on off-road fire apparatus shall be a minimum of 30 in. (750 mm) from the ground. All receptacles located in a dry location shall be of the grounding-type and shall be at least 12 in. (300 mm) above the interior floor height. No receptacle shall be installed in a face-up position. The face of any wet location receptacle shall be installed in a plane from vertical to not more than 45 degrees off vertical.

**RECEPTACLE LABEL**

Each receptacle shall be marked with a label indicating the nominal line voltage (120 volts or 240 volts) and the current rating in amps of the circuit. If the receptacle is DC or other than single-phase, that information shall also be marked on the label.

All receptacles and electrical inlet devices shall be listed to UL 498, *Standard for Safety Attachment Plugs and Receptacles*, or other recognized performance standards. Receptacles used for DC voltages shall be rated for DC service.

Wiring Schematics

An "As-Built" Wiring diagram for line voltage systems shall be provided to include the following information;

(a) Pictorial representations of circuit logic for all electrical components and wiring
(b) Circuit identification
(c) Connector pin identification
(d) Zone location of electrical components
(e) Safety interlocks
(f) Alternator–battery power distribution circuits
(g) Input/output assignment sheets or equivalent circuit logic implemented in multiplexing systems

**LIGHT TOWER**

There shall be one (1) Will-Burt Nightscan Model #NS 6-20 RCP 600 WH telescoping vertical mast(s) installed as specified. The lights to be wired directly to the generator system circuit breaker panel with conduit and standard copper wire.

The pneumatic telescopic light tower shall be piped to the vehicle air system. The lights shall telescope at 20 feet above the mounting surface and rotate 360 degrees.

The light mast shall be internally wired and equipped with four (4) Whelen "Pioneer" ED floodlights, 12 volt, mounted on Will-Burt's RCP dual tilt Remote Control Positioner lighting system.

Instruction and warning labels shall be provided near the operating position of the light tower. A label shall also be provided that states the extended tower height from the ground and bulb replacement data. The light tower shall be equipped with a proximity switch. The switch will be wired into the "do not move apparatus when light is on" indicator light in cab and a light located in the area of the light tower controls. The lights will be activated when the light tower is not fully nested.

A 12-volt observation light will be installed on light tower. The light will be activated as soon as the up position switch is activated. The light is positioned so it will shine up in the air to help check for any overhead obstacles.

## EQUIPMENT PAYLOAD WEIGHT ALLOWANCE

In compliance with NFPA 1901 standards, the special service vehicle shall be designed for an equipment loading allowance of 6,000 lbs. of Durham Fire Department-provided equipment based on a 40,001 - 50,000 pound gross vehicle weight rating.

## EQUIPMENT

The following equipment shall be furnished with the completed special service vehicle;

• One (1) container of assorted stainless steel nuts, bolts, screws, and washers used in the construction of the apparatus shall be provided with the completed apparatus.

− The wheel chock(s) shall be mounted in front of the rear axle, below the body on streetside.

• Two (2) Stream light Fire Vulcan C4 LED flashlight(s) with shoulder strap shall be provided with 80,000 candelas and a 3-hour run time. Each flashlight shall be orange in color and have a 12-volt DC charger and vehicle mount kit. Each flashlight shall have LED spotlight-style bulbs and reflectors. The flashlight(s) shall be wired to the battery direct unless otherwise specified by the Durham Fire Department.

Complete set of Polytech mounts for the Partech struts, Airbags, and misc. hand tools or equivalent.

Need Swivel for Extrication Tools.

− The flashlight(s) shall be mounted on the completed unit in the lower area of compartment S1.

## REMAINING NFPA MINOR EQUIPMENT BY THE PURCHASER

All other minor equipment not specified above, but required by NFPA 1901 for special service vehicles, section 10.9.3 shall be supplied and mounted by Durham Fire Department before the unit is placed in emergency service.