

HOUSTON FIRE DEPARTMENT AIR TRUCK

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SECTION A – BOILER PLATE INFORMATION

A – 1000: SCOPE AND GENERAL INFORMATION

It is the intent of the HOUSTON FIRE DEPARTMENT to secure an emergency apparatus to withstand the continuous use encountered in the emergency service. The apparatus shall be of the latest type, symmetrically proportioned and constructed with due consideration of the load to be sustained.

All parts not specifically mentioned herein, but which are necessary in order to furnish a complete emergency apparatus, shall be furnished and shall conform to the best practices known to the emergency industry.

The apparatus and all major components shall be manufactured in North America. Where the following detailed specifications require specific brand names, model number, dimension or capacities of components such as: axles, brakes, spring suspension, frame, steering gear, drive line, universal joints, engine transmission, alternator, batteries, air brake system, they have been specified for the service because of their reliability/availability of replacement parts on a local basis.

All specifications herein contained are considered as minimum. No exceptions to these minimum standards shall be allowed relating to gauge, alloy and type of metal, size of compartments, and overall design.

The delivered apparatus shall have a certified G.V.W.R. weight sticker applied to vehicle on delivery to assure the apparatus meets all laws pertaining to the weight carrying capacity of the vehicle.

A – 1010: GENERAL CONSTRUCTION AND DESIGN

The design of the equipment shall be in accordance with the best engineering practices. The equipment design and accessory installation shall permit accessibility for use, maintenance and service. All components and assemblies shall be free of hazardous protrusions, sharp edges, cracks or other elements which might cause injury to personnel or equipment. All components shall be designed and protected so that heavy rains or other adverse weather conditions will not interfere with normal servicing or operation.

All oil, hydraulic and air tubing lines, and electrical wiring shall be located in protective positions properly attached to the frame or body structure and shall have protective loom or grommets at each point where they pass through structural members, except where a through frame connector is necessary.

The apparatus shall be designed and the equipment mounted with due consideration to distribution of load between the front and rear axles, so that all specified equipment including personnel will be carried without injury to the apparatus. All dimensions are approximate and subject to a plus or minus 1/4" tolerance.

The following specifications describe minimum requirements for an emergency services vehicle designed for severe duty applications.

The materials specified are considered absolute minimum. Subletting any part of the fabrication, painting, or finishing of the apparatus will not be acceptable.

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A – 1020: ACCESSIBILITY

Parts and components shall be located or positioned for rapid and simple inspection and recognition of excessive wear or potential failure. Whenever functional layout of operating components determines that physical or visual interference between items cannot be avoided, the item predicted to require the most maintenance shall be located for best accessibility.

Cover plates which must be removed for component adjustment or part removal should be equipped with quick disconnect fasteners or hinged panels.

Drains, filler plugs, grease fittings, hydraulic lines, bleeders, and check points for all components should be located so that they are readily accessible and do not require special tools for proper servicing. Design practices should minimize the number of tools required for maintenance.

A – 1030: MATERIALS

The materials specifications are considered absolute minimum. Exceptions will not be accepted or permitted since all raw materials of specified type are available to all manufacturers. Since all manufacturers have the ability to shear, break and weld as these specifications require, all basic design requirements shall be complied with.

Materials shall conform to the specifications listed herein. When not specifically listed, materials shall be of the best quality for purpose of commercial practice. Materials shall be free of all defects and imperfections that might affect the serviceability of finished product.

A – 1040: QUALITY AND WORKMANSHIP

The manufacturing process, including quality control, shall be consistent with present industry standards. All equipment, material, and articles required under these specifications are to be new or fabricated from new materials produced from recovered materials. The term "Recovered Materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this document. The term "Heavy Duty", as used to describe an item, shall mean in excess of the standard, quantity, quality, or capacity and represents the best, most durable, strongest, etc., part, component, HOUSTON FIRE DEPARTMENT system, etc., that is available. The HOUSTON FIRE DEPARTMENT or their designate shall be the sole judge of quality, construction and stability of the apparatus and equipment being offered.

Welding shall not be employed in the assembly of the apparatus in a manner that will prevent the ready removal of any component part for service or repair. All steel and stainless steel welding shall be done to American Welding Society D1.1-83 recommendations for structural steel welding. All aluminum welding shall be done to American Welding Society and ANSI D1.2-83 requirements for structural welding of aluminum.

Defective components shall not be furnished. Parts, equipment, and assemblies, which have been repaired or modified to overcome deficiencies, shall not be furnished without the approval of the HOUSTON FIRE DEPARTMENT. Welded, bolted, and riveted construction utilized shall be in accordance with the highest standards of the industry. Component parts and units shall be manufactured to definite standard dimensions with proper fits, clearances, and uniformity. General appearance of the vehicle shall not show any evidence of poor quality of work.

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A – 1050: LIABILITY INSURANCE

The Body Manufacturer shall furnish with the proposal 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 of \$2,000,000.00 including Products Completed / Operations Aggregate.

Personal Injury of \$1,000,000.00, Fire damage of \$50,000.00 and Medical expense of \$10,000.00. 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 \$2,000,000.00 each occurrence, Aggregate of \$2,000,000.00.

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.

A – 1060: INTERNET IN-PROCESS SITE

The Body Manufacturer shall post and maintain a website where the HOUSTON FIRE DEPARTMENT will be able to view digital images of their apparatus as its being manufactured. 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 final completion of the apparatus.

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A – 1070: VEHICLE STABILITY

A – 1080: ROLLOVER STABILITY

The apparatus shall meet the criteria defined below, or it shall be equipped with a stability control system defined below.

The apparatus shall meet the criteria defined in either of the following:

- 1) The apparatus shall remain stable to 26.5 degrees in both directions when tested on a tilt table in accordance with SAE J2180, *A Tilt Table Procedure for Measuring the Static Rollover Threshold for Heavy Trucks*.
- 2) The calculated or measured center of gravity (CG) shall be no higher than 80 percent of the rear axle track width.

Compliance shall be certified by testing, calculating, or measuring the apparatus or by comparing the apparatus to a compliant, substantially similar example apparatus and the certification shall be delivered with the fire apparatus.

The example apparatus shall be considered substantially similar if it includes a chassis with the same or higher CG height, the same or narrower rear axle track width, the same or greater water tank size and CG height, the same type of front and rear suspension and the same type and size of aerial device.

The apparatus shall be loaded with fuel, fire-fighting agents, hose, ladders, a weight of 250 lb in each seating position and weight equivalent to the Miscellaneous Equipment Allowance as defined in NFPA 1901, 2009 Edition, Table 12.1.2.

If the apparatus is designed to meet a specified higher equipment loading or larger hose bed capacity or to carry additional ground ladders, these greater loads shall be included in the testing, calculating or measuring.

The weight added to the fire apparatus for the purpose of test, calculation or measurement shall be distributed to approximate typical in-service use of the fire apparatus while not exceeding the manufacturer's published individual compartment weight ratings.

If the apparatus is 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.

A – 1090: ROADABILITY

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) From a standing start, the apparatus shall be able to attain a speed of 35 mph (55 km/hr) within 25 seconds on a level road.
- 2) The apparatus shall be able to attain a minimum top speed of 50 mph (80 km/hr) on a level road.
- 3) The apparatus shall be able to maintain 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 (105 km/hr) or the manufacturer's maximum fire service speed rating for the tires installed on the apparatus, whichever is lower.

If the combined water tank and foam agent tank capacities on the fire apparatus exceed 1250 gal (4732 L), or the GVWR of the vehicle is over 50,000 lb (22,680 kg), the maximum top speed of the apparatus shall not exceed either 60 mph (85 km/hr) or the manufacturer's maximum fire service speed rating for the tires installed on the apparatus, whichever is lower.

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A – 1100: 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 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.

A – 1110: CONSTRUCTION DOCUMENTATION

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

The manufacturers record of apparatus construction details, including the following information:

- 1) Owner's name and address
- 2) Apparatus manufacturer, model, and serial number
- 3) Chassis make, model, and serial number
 - a) GAWR of front and rear axles and GVWR
 - b) Front tire size and total rated capacity in pounds (kilograms)
 - c) Rear tire size and total rated capacity in pounds (kilograms)
 - d) Chassis weight distribution in pounds (kilograms) with water and manufacturer-mounted equipment (front and rear)
 - e) 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
 - f) Type of fuel and fuel tank capacity
 - g) Electrical system voltage and alternator output in amps
 - h) Battery make, model, and capacity in cold cranking amps (CCA)
 - i) Chassis transmission make, model, and serial number; and if so equipped, chassis transmission PTO(s) make, model, and gear ratio
- 4) Pump make, model, rated capacity in gallons per minute (liters per minute where applicable), and serial number
- 5) Pump transmission make, model, serial number, and gear ratio
- 6) Auxiliary pump make, model, rated capacity in gallons per minute (liters per minute where applicable), and serial number
- 7) Water and Foam tank certified capacity in gallons or liters
- 8) Paint manufacturer and paint number(s)
- 9) Company name and signature of responsible company representative
- 10) If the apparatus is a mobile foam fire apparatus, the certification of foam tank capacity
- 11) Certification of compliance of the optical warning system
- 12) Siren manufacturer's certification of the siren
- 13) Written load analysis and results of the electrical system performance tests
- 14) Certification of slip resistance of all stepping, standing, and walking surfaces
- 15) If the apparatus has a fire pump, the pump manufacturer's certification of suction capability
- 16) If the apparatus is equipped with a fire pump and special conditions are specified by the purchaser, the pump manufacturer's certification of suction capacity under the special conditions
- 17) If the apparatus has a fire pump, a copy of the apparatus manufacturer's approval for stationary pumping applications
- 18) If the apparatus has a fire pump, the engine manufacturer's certified brake horsepower curve for the engine furnished, showing the maximum governed speed
- 19) If the apparatus has a fire pump, the pump manufacturer's certification of the hydrostatic test
- 20) If the apparatus has a fire pump, the certification of inspection and test for the fire pump
- 21) If the apparatus is equipped with an auxiliary pump, the apparatus manufacturer's certification of the hydrostatic test
- 22) When the apparatus is equipped with a water tank, the certification of water tank capacity

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- 23) If the apparatus has an aerial device, the certification of inspection and test for the aerial device
- 24) If the apparatus has an aerial device, all the technical information required for inspections to comply with NFPA 1911, Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus
- 25) If the apparatus has a foam proportioning system, the foam proportioning system manufacturer's certification of accuracy and the final installer's certification the foam proportioning system meets this standard
- 26) If the system has a CAFS, the documentation of the manufacturer's pre delivery tests
- 27) If the apparatus has a line voltage power source, the certification of the test for the power source
- 28) If the apparatus is equipped with an air system, air tank certificates, the SCBA fill station certification, and the results of the testing of the air system installation
- 29) Any other required manufacturer test data or reports.

A – 1120: OPERATIONS AND SERVICE DOCUMENTATION

The Contractor shall deliver with the fire apparatus at least two (2) sets of complete operation and service documentation covering the completed apparatus as delivered and accepted.

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

The Contractor shall also 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:
 - j) Pictorial representations of circuit logic for all electrical components and wiring
 - k) Circuit identification
 - l) Connector pin identification
 - m) Zone location of electrical components
 - n) Safety interlocks
 - o) Alternator–battery power distribution circuits
 - p) 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

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.

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A – 1130: NFPA REQUIRED DOCUMENTATION FORMAT - CD-ROM

The vehicle construction details and the operations and service documentation as required per NFPA 1901 latest edition shall be provided on a CD-ROM. These manuals shall be divided into sections for ease of reference. There shall be two (2) copies of the CD-ROM provided with the completed vehicle.

A – 1140: STATEMENT OF EXCEPTIONS

The Contractor shall deliver with the fire apparatus either a certification that the apparatus fully complies with all requirements of this standard or alternatively, 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 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

Prior to or at the time of delivery of the apparatus, the Statement of Exceptions shall be signed by an authorized agent of the entity responsible for 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.

An apparatus that is delivered subject to a Statement of Exceptions other than a certification of full compliance shall not be placed in emergency service until the apparatus has been modified as necessary to accomplish full compliance with this standard.

A – 1150: 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 Body 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) Full water and other agent tanks
- 4) *250 lb (114 kg) in each seating position
- 5) Fixed equipment such as pumps, aerial devices, generators, reels and air systems as installed
- 6) Ground ladders, suction hose, designed hose load in their hose beds and on their reels
- 7) An allowance for miscellaneous equipment that is the greatest of the values for type of vehicle per NFPA 1901, a Purchaser provided list of equipment to be carried with weights or a Purchaser specified miscellaneous equipment allowance.

The Body Manufacturer shall engineer and design the vehicle such that the completed unit, when loaded to its estimated in-service weight, with all movable weights distributed as close as is practical to their intended in-service configuration, does not exceed the GVWR. A final Body 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.

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Apparatus Type	Equip. Storage Area	Apparatus Size	Equipment Allowance	
			lb.	kg.
Special Service Fire Apparatus	Minimum of 120 cu ft (3.4 cu mt) of enclosed compartmentation.	10,000 lb to 15,000 lb (4,500 kg to 7,000 kg) GVWR	2,000	910
		15,001 lb to 20,000 lb (7,001 kg to 9,000 kg) GVWR	2,500	1,135
		20,001 lb to 30,000 lb (9,001 kg to 14,000 kg) GVWR	3,000	1,350
		30,001 lb to 40,000 lb (14,001 kg to 18,000 kg) GVWR	4,000	1,800
		40,001 lb to 50,000 lb (18,001 kg to 23,000 kg) GVWR	6,000	2,700
		50,001 lb to 60,000 lb (23,001 kg to 27,000 kg) GVWR	8,000	3,600
		60,001 lb and up (27,001 kg) GVWR	10,000	4,500

A – 1160: TESTING

A – 1170: ROAD TEST

Road test shall be conducted in accordance with 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 in excess of 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 minimum top speed of 50 mph (80 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, dry surface road that is free of loose material, oil or grease.

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A – 1180: LOW VOLTAGE - ELECTRICAL SYSTEM PERFORMANCE TEST

The vehicles 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).

A – 1190: 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.

A – 1200: 1. RESERVE CAPACITY TEST

The engine shall be started and kept running until the engine and engine compartment temperatures are stabilized at normal operating temperatures and the battery system is fully charged. The engine shall be shut off and the minimum continuous electrical load shall be activated for ten (10) minutes.

All electrical loads shall be turned off prior to attempting to restart the engine. The battery system shall then be capable of restarting the engine. Failure to restart the engine shall be considered a test failure of the battery system.

A – 1210: 2. ALTERNATOR PERFORMANCE TEST

A – 1220: TEST AT IDLE

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

A – 1230: 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.

A – 1240: 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.

HOUSTON FIRE DEPARTMENT AIR TRUCK

A – 1250: LOW VOLTAGE - ELECTRICAL SYSTEM PERFORMANCE TEST

A – 1260: 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 individual intermittent electrical load

A – 1270: UL 120/240 VAC CERTIFICATION

The 120/240 volt electrical system shall be tested and certified by Underwriters Laboratories, 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 continuous 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 continuous 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 continuous 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.

Voltage shall be maintained within $\pm 10\%$ 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.

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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.

If the apparatus is equipped with a fire pump, the 2-hour certification test of the power source shall be completed with the fire pump pumping at 100% capacity at 150 psi (1000 kPa) net pump pressure. The test shall be permitted to be run concurrently with the pump certification test.

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.

A – 1280: DIELECTRIC VOLTAGE WITHSTAND TEST

The line voltage wiring and permanently connected devices and equipment shall be subjected to a dielectric voltage withstand test of 900 volts for one (1) minute. The testing shall be performed after all body work 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 in accordance with 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 fire fighters 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.

Fees: Texas Franchise Tax

A – 1290: WARRANTY

A full statement shall be provided of the warranties for the vehicle(s) being proposed. 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 of time 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 manufacturer or purchased from an outside source, and will deal directly with the HOUSTON FIRE DEPARTMENT on all warranty work.

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A – 1300: GENERAL LIMITED WARRANTY - ONE (1) YEAR

The vehicle shall be free of defects in material and workmanship for a period of one (1) year or 24,000 miles (or 38,624 kilometers), whichever occurs first starting thirty (30) days after the original invoice date.

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

A – 1310: LOW VOLTAGE ELECTRICAL WARRANTY - FIVE (5) YEARS

The vehicle 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 – 1320: STRUCTURAL WARRANTY - TEN (10) YEARS

The body shall be free of structural or design failure or workmanship 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.

A – 1330: 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.

A – 1340: CONSTRUCTION PERIOD

The completed vehicle shall be delivered within three hundred (300) days after receipt of a purchase order or contract.

Contractor shall not be held liable for delays of chassis delivery due to accidents, strikes, floods or other events not subject to their control. Contractor shall provide immediate written notice to HOUSTON FIRE DEPARTMENT as to delays and to what extent these delays have in completing vehicle within the stated construction time period.

A – 1350: OVERALL HEIGHT

The overall height (OAH) of the vehicle shall be approximately 105" (8' - 9") from the ground. This measurement shall be taken on flat ground with the tires properly inflated, in the unloaded condition, at that highest point of the vehicle.

A – 1360: OVERALL LENGTH

The overall length (OAL) of the vehicle shall be approximately 280" (23' - 4").

HOUSTON FIRE DEPARTMENT AIR TRUCK

A – 1370: FINAL INSPECTION CONFERENCE

A final inspection conference shall be required, at the contractor's factory for two (2) personnel from the HOUSTON FIRE DEPARTMENT to inspect the vehicle and construction details prior to shipment of the completed vehicle. This inspection shall take place after any specified striping and lettering is 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.

A – 1380: DELIVERY AND DEMONSTRATION

The contractor shall be responsible for the delivery of the completed unit to the HOUSTON 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 HOUSTON FIRE DEPARTMENT regarding the operation, care, and maintenance of the apparatus and equipment supplied at HOUSTON FIRE DEPARTMENT location.

The delivery engineer shall set delivery and instruction schedule with the person appointed by HOUSTON FIRE DEPARTMENT.

After delivery of the apparatus, the HOUSTON 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.

HOUSTON FIRE DEPARTMENT AIR TRUCK

SECTION B: CHASSIS MODIFICATIONS

B – 1000: 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
- Pump transmission lubrication fluid . . (if applicable)
- Pump priming system fluid, if applicable . . (if applicable)
- 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

B – 1010: VEHICLE DATA PLATE

A permanent label in the driving compartment which 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

B – 1020: 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.

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B – 1030: ACCIDENT PREVENTION

There shall be a placard in the cab seating area which reads, "ALL OCCUPANTS MUST BE SEATED AND BELTED WHEN THE APPARATUS IS IN MOTION".

B – 1040: 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.

B – 1050: ACCIDENT PREVENTION

If the rear bumper is 8" deep or more, there shall be a placard on the rear face of the body, in clear sight from the ground, which reads, "WARNING - DO NOT RIDE ON STEPS OR DECK AREAS WHILE THE APPARATUS IS IN MOTION. DEATH OR SERIOUS INJURY MAY RESULT".

B – 1060: WEARING HELMET WARNING

A label stating "DO NOT WEAR HELMET WHILE SEATED" shall be visible from each seating location.

B – 1070: FRONT BUMPER

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

B – 1080: RANCH HAND PUSH BUMPER GUARD



There shall be a Ranch Hand Push Bumper Model # PBF061BL1 assembly provided and installed on the front of the chassis cab grille area. The "Push Bumper" shall be black in color.

B – 1090: FRONT TOW PROVISIONS



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

B – 1100: EXHAUST

The existing exhaust tailpipe shall be modified from the stock location by cutting the pipe and adding a connector and band clamp.

The exhaust piping and discharge outlet shall be located or shielded so as not to expose any portion of the apparatus or equipment to excessive heating.

Exhaust pipe discharge shall be directed away from any operator's position.


Where parts of the exhaust system are exposed so that they are likely to cause injury to operating personnel, protective guards shall be provided.

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B – 1110: RADIO/ANTENNA INSTALLATION

There shall be one (1) HOUSTON FIRE DEPARTMENT supplied Motorola APX dual band remote head radio(s) with dual antenna connections installed in the cab within easy reach of driver. The location of radio shall be determined by the HOUSTON FIRE DEPARTMENT at the pre-construction meeting. The radio microphone will be mounted at the final inspection

Radio shall be installed per Manufacturer's requirements and wired for proper 12 volt power and ground.

The radio will be ran to the 5 position antenna rail located on the body roof, there shall be at least three (3) feet of spacing between the 800MHZ antenna and the UHF antenna. 

B – 1120: SEAT BELT COLOR AND MOUNTING

Section 14.1.3.4 of the NFPA 1901 Standards, 2009 edition, requires all seat belt webbing in 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.

Per HOUSTON FIRE DEPARTMENT specification for a commercial chassis, this emergency vehicle may not have the required seat belt webbing colors or buckle in an accessible location. These belts may not provide visibility to driver that seat belts are on or buckle is easily accessible. This specifications for an emergency fire apparatus for these seat belts shall be non-compliant to NFPA 1901 standards, effective at the time of the bid opening.

B – 1130: SEAT BELT WEB LENGTH - COMMERCIAL CAB

Sections 14.1.3.2 and 14.1.3.3 of the NFPA 1901 standards, 2009 edition, 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 commercial chassis manufacturer shall be compliant to NFPA Standards 14.1.3.2 and 14.1.3.3.

Per HOUSTON FIRE DEPARTMENT specification for a commercial chassis, this emergency vehicle may not have seat belts of this required length. These belts may not provide sufficient length for large firefighters in bunker gear. This specification for an emergency fire apparatus for these seat belts shall be non-compliant to NFPA 1901 standards, effective at the time of the bid opening.

B – 1140: SEAT BELT MONITORING SYSTEM - COMMERCIAL CAB

Section 14.1.3.10 of the NFPA 1901 Standards, 2009 edition, requires that a seat belt warning system be provided. The seat belt warning device is intended to assist the driver or officer in determining whether all occupants are seated and belted before the vehicle is driven.

Per HOUSTON FIRE DEPARTMENT specification for a commercial chassis, this emergency vehicle may not have a seat belt monitoring system. Without this device, the driver must manually determine that all occupants are seated and belted before the apparatus is placed in motion. This specification for an emergency fire apparatus for the seat belt monitoring system shall be non-compliant to NFPA 1901 standards, effective at the time of the bid opening.

B – 1150: IGNITION KEY

If the vehicle is specified to have an ignition key it will be attached to steering column or dash with vinyl covered steel cable.

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B – 1160: SIX (6) - TIRE PRESSURE VISUAL INDICATORS

Each tire shall be equipped with an Accu-Pressure Safety Cap (or equal) visual indicator that indicates proper tire pressure.

B – 1170: HELMET STORAGE

No helmet storage is required in the in the cab driving or crew area.

Cab Integrity Certification: Commercial, NFPA Compliant

B – 1180: 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.

B – 1190: HUB AND NUT COVERS

Front and rear wheels shall be provided with stainless steel hub caps and wheel nut covers.

B – 1200: MUDDLAPS

There shall be rubber mudflaps furnished and installed behind each set of tires.

B – 1210: ROAD EMERGENCY SAFETY KIT



One (1) set of three (3) dual faced triangular warning flares with fold away base complete with storage case per DOT requirements shall be provided with the completed apparatus.

One (1) 2.5 lb. ABC type vehicle fire extinguisher with bracket shall be provided and mounted in the cab or the front streetside compartment.

B – 1220: FUEL FILL

There shall be one (1) Cast Products fuel fill shall be located on the rear panel of the body. Note: There will be no hinged door provided on fuel fill fixture. The fuel fill will have a permanent label with the text "DIESEL FUEL ONLY".

B – 1230: DEF FILL FIXTURE



There will be a Cast Products fill guard located in the **Driver's side wheel well area**, directly ahead of the rear wheel for refilling the DEF fluid reservoir. The fixture will be constructed from cast aluminum and shall have a polished bezel and bead blasted interior. There will NOT be a hinged door over the fill guard.

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SECTION C: BODY DESIGN

C- 1000: 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.

The sheet metal material requirements, including alloy and material thickness, throughout the specifications are considered to be a minimum. Since such materials are available to all Manufacturers, the material specifications shall be strictly adhered to.

The fabrication of the body shall be formed sheet metal. Formed components shall allow the HOUSTON FIRE DEPARTMENT to have the body repaired locally in the case where any object has struck the body and caused damage. The use of proprietary extrusions will prevent the HOUSTON FIRE DEPARTMENT from such repair and shall NOT be used.

Following construction of the subframe, which supports the apparatus body, the sheet metal portion of the body shall be built directly on the subframe. The joining of the subframe and body shall be of a welded integral construction.

The sheet metal fabrication of the body shall be performed using inert gas continuous feed welders only. The entire body shall be welded construction. The use of pop rivets in any portion of structural construction may allow premature failure of the body structure. 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.

C- 1010: EXTERIOR ALUMINUM BODY

The fabrication of the body shall be constructed from 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, No Exceptions.

The front and rear corners of body shall be formed as part of the front or rear body panels. This provides a stronger body corner and finished appearance. The use of extruded corners, or caps will not be acceptable, No Exceptions.

The door side frame openings shall be formed "C" channel design. An electrical wiring conduit raceway running the full length of exterior compartments shall be provided. This raceway shall contain all 12 volt wiring running to the rear of the apparatus, permitting easy accessibility to wiring.

Individual compartment modules, with dead air space voids between compartments, will not be an acceptable method of compartment construction.

The compartments shall be an integral part of the body construction. Compartment floors from front of body to ahead of rear axle, also from rear axle to rear of body shall be single one-piece sections. Compartment floors shall be preformed, then positioned in body and welded into final position.

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Compartment floors shall have a "sweep-out" design with door opening threshold positioned lower than compartment floor, permitting easy cleaning of compartments. Angles, lips, or door moldings are not acceptable in the base of compartment door opening. One-way rubber drain valves shall be provided in compartment floors so that a water hose may be used to flush-out compartment area.

All exterior seams in sheet metal below frame, and around the rear wheel well area shall be welded continuous to prevent moisture from entering compartments. All other interior seams and corners shall be sealed with silicone based caulk prior to painting.

Only stainless steel bolts, nuts, and sheet metal screws shall be used in mounting exterior trim, hardware and equipment.

Exterior compartments shall have louvers in lower back wall of compartment for ventilation.

C- 1020: DRIP RAILS

The body shall have drip rails over the side full height compartments. The drip rails shall be formed into the upper body panels providing a ridged lower panel and a flat upper body panel surface. The use of mechanically fastened, taped or glued on drip rails will not be acceptable, No Exceptions.

C- 1030: ROOF CONSTRUCTION

The roof shall be integral with the body and shall be all welded construction. The roof of the body shall not be less than 3/16" aluminum 3003H-14 alloy tread plate, fully and continuously welded. The roof shall be reinforced with 2" x 2" x 1/4" aluminum tubing running the full width of the body.

All seams in the roof area shall be welded to the radius and supports prior to paint to prevent entry of moisture. All roof seams shall be continuously welded.

A 2" formed radius shall be provided along the body sides. The use of extruded radius will not be acceptable, No Exceptions.

C- 1040: BODY SUBFRAME

The chassis frame rails shall be fitted with 1/4" custom extruded UHMW polyethylene rail cap to isolate the body frame members from direct contact with chassis frame rails.

The body subframe shall be constructed from 6061T6 aluminum alloy tubing. Subframe shall consist of two (2) 2" x 4" x 1/4" aluminum tubes minimum, the same width as the chassis frame rails. Welded to this tubing shall be cross members of 2" x 4" x 1/4" aluminum. Smaller dimension, lighter gauge tubing or angle material subframe shall not be accepted.

These cross members shall extend the full width of the body to support the compartments. Cross members shall be located at front and rear of the body, below compartment divider walls, and in front and rear of wheel well opening. Additional aluminum cross members shall be located on 16" centers, or as necessary to support walkway or heavy equipment.

To form the frame, the tubing shall be beveled and welded at each joint using 5356 aluminum alloy welding wire.

C- 1050: BODY MOUNTING

For optimum chassis frame and body life, the body subframe shall be fastened to the chassis frame with a minimum of six (6) 1/2" x 2" strap mounts, welded to the body subframe. The straps shall be bolted to the chassis frame work utilizing 1/2" Grade 8 bolts.

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C- 1060: 10" REAR STEP BUMPER

The full width rear bumper shall be constructed from 2" x 2" x 1/4" aluminum tubing frame and covered with 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 body for water drainage.

C- 1070: REAR TOW EYES

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

C- 1080: GROUND LIGHTS

Two (2) OnScene Solutions 9" LED Nightstik ground lights shall be mounted below the bumper.

There shall be two (2) OnScene Solutions 9" LED NightStik light(s) installed below 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 headlights are activated and vehicle park brake is set.

C- 1090: WHEEL WELL EXTERIOR PANEL

The exterior panel of the body wheel well enclosure shall be constructed from 1/8" smooth aluminum panels.

C- 1100: DIEFORMED BEADED EDGE BODY FENDERS

A die formed beaded edge shall be provided along the radius of the wheel well opening for a finished appearance.

C- 1110: WHEEL WELL LINERS

The wheel wells shall be provided with an easily removable polymer, circular inner fender liner. The inner liner shall be bolted to the wheel well with stainless steel bolts and spaced away from the wheel well so the liner will not accumulate dirt or water.

HOUSTON FIRE DEPARTMENT AIR TRUCK

SECTION D: PAINT SPECIFICATIONS

D- 1000: ALUMINUM BODY PAINT SPECIFICATIONS

D- 1010: BODY PAINT PREPARATION

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

The exterior 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. If the compartment interior is to be painted the interior shall be acid etched as described above then primed with an epoxy primer and all seams caulked.

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

D- 1020: PAINT PROCESS

The paint process shall follow the strict standards set forth by PPG Industries guidelines. Painters applying PPG products will be PPG Certified Commercial Technicians, and re-certified every two (2) years.

The body shall go through an eight-stage paint process;

- 1) Clean bare metal using a solvent base wax & grease remover.
- 2) Finish all exterior body seams as necessary, followed by a thorough sanding of all bare metal to be painted.
- 3) Re-clean bare metal using a solvent base wax & grease remover.
- 4) Bare Metal Epoxy Primer Coat - PPG Delfleet® Evolution corrosion resistance epoxy primer to be applied at 1.0-2.0 mills DFT over clean abraded bare metal.
- 5) Primer Filler Coat - PPG Delfleet® Evolution urethane build primer to achieve total thickness of 3.0-6.0 mills DFT after sanding.
- 6) Base coat (Color) - PPG Delfleet® Evolution High Solids Polyurethane Base coat. Apply 1.0-3.0 mills DFT of base coat color to achieve full hiding.
- 7) Clear coat PPG Delfleet® Evolution polyurethane premium quality clear coat with improved mar resistant finish. The clear coat shall be applied to achieve a total dry film thickness of 2.0-3.0 mils.
- 8) Curing process of the painted body shall go through a force dry/bake cycle process. The painted components shall be baked 180 degrees for 2 hours to achieve a complete coating cure on the finished product.

D- 1030: MACHINE POLISHED

After the force dry/bake cycle and ample cool down time, the coated surface shall be sanded using 1,000, 1,500, and or 3,000 grit sandpaper to remove surface defects. In the final step, the surface shall be buffed then polished to an extra high gloss smooth finish. Total dry film thickness of paint will average between 8.0-12.0 mils.

D- 1040: 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.

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D- 1050: PAINT FINISH - SINGLE COLOR

The body shall be painted with a single color of PPG Delfleet® Evolution paint per approved customer sprayout.

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

Touch-up paint shall be provided with completed vehicle.

- **Paint Color: Match cab/chassis supplied paint color.**

D- 1060: BODY UNDERCOATING

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

D- 1070: 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.

D- 1080: 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.

D- 1090: 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.

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SECTION E : REFLECTIVE STRIPING/LETTERING

E- 1000: REFLECTIVE STRIPING AND LETTERING

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 retroreflection of 10 with observation angle of 0.2 degrees and 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.

The apparatus will be lettered and striped as per the HOUSTON FIRE DEPARTMENT's instructions.

The final design and layout will be determined at the pre-construction meeting.

E- 1010: REFLECTIVE STRIPE - CAB DOOR INTERIOR

Any door of the apparatus designed to allow persons to enter or exit the apparatus shall have at least 96 in.2 (62,000 mm2) of retroreflective material affixed to the inside of the door.

The stripe material shall be 3M Scotchlite 680.

- This reflective stripe shall be white in color.

E- 1020: 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" width.

The rear side panels only of the body shall have a Chevron style reflective stripe layout, and cover as much of the rear side panels as possible. 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 Diamond Grade.

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

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SECTION F : BODY EXTERIOR

F- 1000: EXTERIOR COMPARTMENT DOORS

F- 1010: ROLL-UP DOOR CONSTRUCTION - ROBINSON (ROM)

The apparatus shall be equipped with Robinson ROM Series III roll-up exterior compartment doors. Robinson roll-up doors shall be complete with the following features;

- Doors shall be front roll with drum positioned at upper front portion of compartment to afford maximum clearances and head room for mounting equipment to ceiling of compartment
- There shall be a non-abrasive side brush seals
- Every slat must have interlocking end shoes to prevent slat from moving side-to-side and binding the door
- Between each slat must be a co-extruded PVC inner seal to prevent metal-to-metal contact and to repel moisture. This inner seal is not visible to detract from appearance of door
- Slat are to have interlocking joints with a folding locking flange to provide security and prevent penetration by sharp objects
- Slat to be double-wall extrusion 1.366" high by .315" thick. Exterior surface to be flat and interior surface to be concave to prevent loose equipment from interfering with door operation
- Latch system to be a full width one piece lift bar operable by one (1) hand
- A 2" wide finger pull integrated into the bottom rail extrusion for easy one (1) hand opening and closing
- Clip system that connects the curtain slats to the operator drum which allows for easy tension adjustment without tools
- Each roll-up door shall have a 4" diameter counterbalance operator drum to assist in lifting the door.
- Track shall be one-piece aluminum that has an attaching flange and finishing flange incorporated into its design
- Drip rail will have specially designed seal that prevents the seal from scratching the door
- Bottom rail extrusion must have smooth back to prevent loose equipment from jamming the door
- Bottom rail to have "V" shaped double seal to prevent water and debris from entering the compartment
- Standard replacement parts to be shipped from the United States and available in as little as 48 hours

Each shutter door shall decrease the compartment door frame opening approximately 2.00" in width and approximately 4.50" in height for the bottom section of door assembly.

The specified retroreflective stripe material shall be applied on the roll-up compartment doors. The stripe shall be precision machine cut for each door slat of the roll-up doors. Under no circumstance will the stripe material be cut on roll-up door surface.

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F- 1020: BODY HEIGHT MEASUREMENTS

The vertical body dimensions shall be as follows:

AHEAD OF REAR AXLE

	<u>Description</u>	<u>Dimension</u>
A	Bottom of Subframe to Top of Body	69.0"
B	Bottom of Subframe to Bottom of Body	18.0"
C	Vertical Door Opening	
	-with roll-up door	60.5"
	-with hinged door	64.5"

ABOVE REAR AXLE

	<u>Description</u>	<u>Dimension</u>
D	Vertical Door Opening - Above Rear Wheel	
	-with roll-up door	37.0"
	-with hinged door	40.0"

BEHIND REAR AXLE

	<u>Description</u>	<u>Dimension</u>
E	Bottom of Subframe to Bottom of Body	15.0"
F	Vertical Door Opening	
	-with roll-up door	58.0"
	-with hinged door	62.0"

GENERAL

	<u>Description</u>	<u>Dimension</u>
G	Bottom or Drip Rail to Top of Body	18.5"

(Dimensions are generic and subject to change during the actual design process)

F- 1030: BODY WIDTH DIMENSIONS

The body shall be 96.0" wide, not including drip rail or non-permanent fixtures. Interior compartment depth dimensions shall be approximately:

<u>Area Description</u>	<u>Dimension</u>
Transverse Area above Subframe	91.0"
Compartment Depth below Subframe	21.0"

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F- 1040: STREETSIDE COMPARTMENT - FRONT (S1)



The interior useable compartment width shall be approximately 49.0" wide.

The compartment door opening shall be approximately 42.0" wide.

This compartment shall have a ROM roll-up door.

- The roll-up door shall have an **unpainted satin aluminum** 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.
- There shall be **NO keyed lock** on this roll-up compartment door.
- One (1) **aluminum drip pan**/door finish guard shall be provided with the rollup 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.
- There shall be one (1) SCBA cylinder storage module for 8" OD (maximum) SCBA bottles. The module shall have an exterior shell fabricated from 1/8" (.125) 3003H-14 aluminum alloy sheet. The module shall have a 2" slope, front to back to prevent cylinders from sliding out. The SCBA cylinder storage tubing shall be fabricated from PVC pipe to prevent damage or abrasion to cylinders. In addition there shall be rubber matting provided in the base of each storage tube for bottle protection and to prevent slipping.
 - The SCBA cylinder module shall be capable of **storing ten (12) SCBA** cylinders up to 7.5" diameter.
- 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 EFH1516-17-18 high pressure air hose reel(s) capable of storing 300' of high pressure air hose. The rewind button for each reel shall be located adjacent to the reel it controls.
 - The hose reel shall be equipped with **300' of 3/16", 6,000 psi, high pressure air hose**. Molded plastic ball clamp shall be provided on the hose to stop it at the 4-way roller. The hose shall be **Gray in color with a red color coded end**.
 - The fitting on the end of the high pressure air hose reel shall be a CGA-347 high pressure fitting.
 - The air supply shall be from the mobile breathing air system. A reel shut-off valve, pressure regulator, and 0-6,000 psi gauge shall be provided at the air control panel which will be mounted low in the compartment to provide easier access.
 - The air supply shall be from the mobile breathing air system.
 - The fairlead roller shall be mounted directly to the reel.
- The 12 volt electrical distribution panel shall be located in the front transverse compartment **above the subframe**.

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- Two (2) OnScene Solutions 63" LED Nightstik compartment lights, vertically mounted. 
- The 12 volt electrical distribution panel shall be located in the front transverse compartment above the subframe.



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F- 1050: STREETSIDE COMPARTMENT - ABOVE REAR WHEELS (S2)

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 ROM roll-up door.

- The roll-up door shall have an unpainted satin aluminum 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.
- There shall be NO keyed lock on this roll-up compartment door.
- One (1) aluminum drip pan/door finish guard shall be provided with the rollup 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.
- Two (2) OnScene Solutions 36" LED Nightstik compartment lights, vertically mounted. 
- A Bauer model BP-13H-E3 air compressor with a recharging rate of 13.0 SCFM @ 6,000 PSI shall be provided, . Compressor skid shall include soft start electric motor, P5 Securus purification system, electronic CO monitor, and fill station inter-connecting harness.
 - There will be a catch reservoir provided to catch moisture purged from the air compressor.
 - An Appleton inlet and base for providing shore power shall be provided for operating compressor system from in-house electrical building system. The matching Appleton plug shall be provided loose with delivered unit. Any building wiring shall be responsibility of HOUSTON FIRE DEPARTMENT.
- Air storage system consisting of three (3) 6,000 PSI, ASME cylinders with gauges and valves shall be provided.
 - There will be a welded reinforcement above the body frame to carry specified DOT or ASME cylinders. The mounting of the cylinders will be with adjustable track and powder coated steel band straps to securely hold all cylinders in place.

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F- 1060: STREETSIDE COMPARTMENT - REAR (S3)

The interior useable compartment width shall be approximately 35.0" wide.

The compartment door opening shall be approximately 28.0" wide.

This compartment shall have a ROM roll-up door.

- The roll-up door shall have an unpainted satin aluminum 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.
- There shall be NO keyed lock on this roll-up compartment door.
- One (1) aluminum drip pan/door finish guard shall be provided with the rollup 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.
- There shall be one (1) adjustable shelf/shelves approximately 22" deep. Each shelf shall be fabricated from 3/16" (.188) aluminum 3003H-14 alloy smooth plate with a 2" vertical flange along the front and rear edges
- There shall be one (1) SCBA cylinder storage module for 8" OD (maximum) SCBA bottles. The module shall have an exterior shell fabricated from 1/8" (.125) 3003H-14 aluminum alloy sheet. The module shall have a 2" slope, front to back to prevent cylinders from sliding out. The SCBA cylinder storage tubing shall be fabricated from PVC pipe to prevent damage or abrasion to cylinders. In addition there shall be rubber matting provided in the base of each storage tube for bottle protection and to prevent slipping.
- The SCBA cylinder module shall be capable of storing three (3) SCBA cylinders up to 7.5" diameter.
 - 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 Solutions 63" LED Nightstik compartment lights, vertically mounted.
- Two (2) 3-1/2" x 3-1/2" black plastic louvered vents shall be provided in the lower compartment.



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F- 1070: CURBSIDE COMPARTMENT - FRONT (C1)

The interior useable compartment width shall be approximately 49.0" wide.





The compartment door opening shall be approximately 42.0" wide.

This compartment shall have a ROM roll-up door.

- The roll-up door shall have an unpainted satin aluminum 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.
- There shall be NO keyed lock on this roll-up compartment door.
- One (1) aluminum drip pan/door finish guard shall be provided with the rollup 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.
- There shall be one (1) adjustable shelf/shelves approximately 46" deep. Each shelf shall be fabricated from 3/16" 3003 aluminum sheet with a 2" vertical flange along the front and rear edges 
- There shall be one (1) SCBA cylinder storage module for 8" OD (maximum) SCBA bottles. Each PVC tube shall be capable of storing two (2) cylinders, end-to-end. The module shall have an exterior shell fabricated from 1/8" (.125) 3003H-14 aluminum alloy sheet. The module shall have a 2" slope, front to back to prevent cylinders from sliding out. The SCBA cylinder storage tubing shall be fabricated from PVC pipe to prevent damage or abrasion to cylinders. In addition there shall be rubber matting provided in the base of each storage tube for bottle protection and to prevent slipping. 
- The SCBA cylinder module shall hold ten (10) individual 7.5" diameter PVC tubes with a capacity of (2) SCBA cylinders per tube.  
- 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.
- Two (2) OnScene Solutions 63" LED Nightstik compartment lights, vertically mounted.
- One (1) OnScene Solutions 9" LED Nightstik ground light shall be provided below the body.

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F- 1080: CURBSIDE COMPARTMENT - ABOVE REAR WHEEL (C2)

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 ROM roll-up door.

- The roll-up door shall have an unpainted satin aluminum 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.
- There shall be NO keyed lock on this roll-up compartment door.
- One (1) aluminum drip pan/door finish guard shall be provided with the rollup 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.
- Two (2) OnScene Solutions 36" LED Nightstik compartment lights, vertically mounted.
- One (1) 120/240 VAC load center. 
- The generator gauge panel.
- Bauer air compressor with air storage module.

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F- 1090: CURBSIDE COMPARTMENT - REAR (C3)

The interior useable compartment width shall be approximately 35.0" wide.


The compartment door opening shall be approximately 28.0" wide.

This compartment shall have a ROM roll-up door.

- The roll-up door shall have an unpainted satin aluminum 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.
- There shall be NO keyed lock on this roll-up compartment door.
- One (1) aluminum drip pan/door finish guard shall be provided with the rollup 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.
- There shall be one (1) adjustable shelf/shelves approximately 22" deep. Each shelf shall be fabricated from 3/16" (.188) aluminum 3003H-14 alloy smooth plate with a 2" vertical flange along the front and rear edges
- There shall be one (1) SCBA cylinder storage module for 8" OD (maximum) SCBA bottles. Each PVC tube shall be capable of storing two (2) cylinders, end-to-end. The module shall have an exterior shell fabricated from 1/8" (.125) 3003H-14 aluminum alloy sheet. The module shall have a 2" slope, front to back to prevent cylinders from sliding out. The SCBA cylinder storage tubing shall be fabricated from PVC pipe to prevent damage or abrasion to cylinders. In addition there shall be rubber matting provided in the base of each storage tube for bottle protection and to prevent slipping.
- The SCBA cylinder module shall hold three (3) individual 7.5" diameter PVC tubes with a capacity of (2) SCBA cylinders per tube. 
- 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.
- Two (2) OnScene Solutions 63" LED Nightstik compartment lights, vertically mounted.
- Two (2) 3-1/2" x 3-1/2" black plastic louvered vents shall be provided in the lower compartment.



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F- 1100: REAR COMPARTMENT - CENTER (RC1)

The rear center compartment shall be closed to both side rear compartments.

The rear center compartment shall start at the top of the frame and be as high as the body permits.


The interior useable compartment width shall be approximately 49.0" wide.

The compartment door opening shall be approximately 42.0" wide.

This compartment shall have a ROM roll-up door.

- The roll-up door shall have an unpainted satin aluminum 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.
- There shall be NO keyed lock on this roll-up compartment door.
- One (1) aluminum drip pan/door finish guard shall be provided with the rollup 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.

- Two (2) OnScene Solutions 63" LED Nightstik compartment lights, vertically mounted. 
- One (1) Bauer model CFSII-2S (Containment Type), two (2) position filling station with compressor controls shall be provided with proper reinforcement for weight of fill station.
- Filling operation shall be controlled with manual controls mounted on front of fill station. An air flow selector valve to fill from either compressor or storage, and manual valves and gauges for each air storage cylinder (maximum of four (4)).
 - An air storage refill port shall be provided on the fill station.
 - Air fill shut off switch bolt shall be replaced with a Grade 8 bolt.
 - One (1) high pressure air hose reel gauge(s), adjustable regulator(s), and fill control(s) shall be provided on front panel with outlet port located on the rear of the fill station.
 - The fill station fill whip(s) shall terminate in a high pressure 4,500 PSI, CGA-347 threaded SCBA connectors.

F- 1110: PLASTIC FLOOR AND SHELF TILE

All compartment floors, shelves, and trays shall be covered with Turtle Tile plastic interlocking grating.

- The plastic floor tile shall be red.
 - The plastic edge trim shall be yellow.

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SECTION G : BODY EXTERIOR COMPONENTS

G – 1000: SIDE BODY PROTECTION - RUB RAIL

OnScene Solutions rub rails shall be provided below the compartment door openings on both the streetside and curbside.

The rub rail shall be fabricated from 6063 extruded aluminum, measuring approximately 2-3/4" high x 1-3/8" thick with tapered aluminum end caps. The rub rail shall be bolted to the body using stainless steel bolts and 1-1/2" diameter x 5/8" thick rubber mount isolators to prevent damage to the body.

The rails shall incorporate LED clearance marker lighting recessed into the rail fascia to avoid damage to the light in case of impact. The rub rail shall have an accessory mounting track integrated into the backside of the rail to allow mounting of accessories such as ground lighting.

3M™ Diamond Grade™ Conspicuity striping shall be provided in the rub rail. The striping shall be diamond grad red/fluorescent yellow – green in color. 

G – 1010: REAR BODY HANDRAILS

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

G – 1020: REAR ROLL-OUT AWNING

The upper rear of truck shall be equipped with a Carefree Ltd Freedom wall mount awning. The box the awning is stored in is approximately 8' wide x 5-3/8" high x 3-3/8" deep and white in color. The awning shall be 8' wide with an extension length of 6-1/2'. The awning support arms are hidden inside the lead rail.

The awning shall activate the door ajar warning system in the cab when not in the stowed position.

There are no latches or knobs to unlock. To extend awning, simply engage and turn the hand crank. Awning arms foldout of the lead bar once it's eye level and within easy reach. Arms adjust easily with flip lock controls. To close, just crank the opposite direction; the awning case locks shut automatically.

- The awning fabric shall be red.

G – 1030: ROOF ACCESS HATCH COVER

One (1) roof access hatch cover(s) shall be provided in the roof structure to allow for installation or removal of large equipment into the compartment area. The roof around the hatch opening shall be reinforced as necessary to prevent deflection in the roof area. The hatch cover shall overlap a 2" vertical lip on the body roof to prevent entry of moisture. It shall be sealed with automotive type rubber molding to provide a weather resistant seal.

The hatch cover shall have a lift-up type door hinged on the front side. The door shall be fabricated from 3/16" aluminum treadplate with a pair of pneumatic type cylinders mounted to hold the door in the open position. The door shall be mounted using a full length 14 gauge stainless steel hinge, with 1/4" stainless steel pin. A polyester barrier film gasket shall be placed between the stainless steel hinge and any dissimilar metals as necessary to prevent corrosion.

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SECTION H : 12 VOLT SYSTEMS

H – 1000: 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 vehicle body shall be run in full length electrical wiring raceway down each side of 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 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.

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Circuits shall be provided with properly rated low voltage overcurrent protective devices. Such devices shall be readily accessible and protected against heat in excess of the overcurrent 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:

- SAE J156, *Fusible Links*
- SAE J553, *Circuit Breakers*
- SAE J554, *Electric Fuses (Cartridge Type)*
- SAE J1888, *High Current Time Lag Electric Fuses*
- SAE J2077, *Miniature Blade Type Electrical Fuses*

Switches, relays, terminals, and connectors shall have a direct current (dc) rating of 125 % of 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:

- The propulsion engine and transmission
- All legally required clearance and marker lights, headlights, and other electrical devices except windshield wipers and four-way hazard flashers
- 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)
- 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
- The minimum optical warning system, where the apparatus is blocking the right-of way
- The continuous electrical current required to simultaneously operate any fire pumps, aerial devices, and hydraulic pumps
- 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.

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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 actual system shall be provided with 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 delivered apparatus.

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H – 1010: 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, 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 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.

Outputs:

The outputs shall perform all the following items without added modules to perform any of the tasks;

1. Load Shedding: The system shall have the capability to load shed with 8 levels any output. This means you can specify which outputs (barring NFPA restrictions) you would like load shed. Level 1 12.9v, Level 2 12.5V, Level 3 - 12.1V, Level 4 - 11.7V, Level 5 11.3V, Level 6 10.9V, Level 7 10.5, Level 8 10.1. Unlike conventional load shedding devices you can assign a level to any or all outputs.
2. Load Sequencing: The system shall be able to sequence from 0 8 levels any output. With 0 being no delay and 1 being a 1 second delay, 2 being a 2 second delay and so on. Sequencing reduces the amount of voltage spikes and drops on your vehicle, and can help limit damage to your charging system.
3. Output Device: The system shall have solid-state output devices. Each solid-state output shall be a MOS-FET (Metal Oxide Semiconductor - Field Effect Transistors); MOS-FETs are solid-state devices with no moving parts to wear out. A typical relay when loaded to spec has a life of 100,000 cycles. The life of a FET is more than *100 times* that of a relay.
4. Flashing Outputs: The system shall be able to flash any output in either A or B phase, and logic is used to shut down needed outputs in park, or any one of several combined interlocks. The flash rate can be selected at either 80, 160 or 200 FPM. This means any light can be specified with a multiplex truck with no need to add flashers. Flashing outputs can also be used to warn of problems or other unique idea you may come up with.
5. PWM: The modules shall have the ability to PWM at some outputs so that a headlight PWM module is not needed.
6. Diagnostics: An output should be able to detect either a short or open circuit. The system should be able report in "real time" a text based message that points the maintenance person to a specific output.

Inputs:

1. The inputs shall have the ability to switch by a ground or vbatt signal.
2. The inputs shall be filtered for noise suppression via hardware and software so that RF or dirty power will not trick an input into changing its status.

Auto-Throttle:

The multiplex system shall be able to perform automatic high idle via a network gateway or by using an existing output on a module to provide the proper signals to an OEM Engine ECU. This task should be handled with existing inputs and outputs.

Displays:

Displays shall be able to provide real time information regarding load shedding and system status, such as network traffic/errors or shorts and open circuits.

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System Network:

The multiplex system shall contain a Peer-to-Peer network. A Master Slave Type network is not suitable for this type of unit. A Peer-to-Peer network means that all the modules are equal on the network; a Master is not needed to tell other nodes when to talk, **No Exceptions.**

System Reliability:

The multiplex system shall be able to perform in extreme temperature conditions, from 40° to +85° C (-40° to +185° F.) The system shall be sealed against the environment, moisture, humidity, salt or fluids such as diesel fuel, motor oil or brake fluid. The enclosures shall be rugged to withstand being mounted in various locations or compartments around the vehicle. The modules shall be protected from over voltage and reverse polarity.

H – 1030: 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.

H – 1040: MULTIPLEX SYSTEM VISTA III V-MUX COLOR DISPLAY

One (1) Weldon V-MUX Vista III shall be provided. The Vista III shall have seven switches with custom legends and a wide temperature operating range. The four wires shall control all lighting and HVAC. The Vista III shall have color changes for button status. The display shall be pre-programmable (OEM Level) and be colored. The auto climate control shall display temperature set point and outside temperatures. The Vista III shall be ready for back-up camera, thermal cameras and DVDs. Virtual switches, GPS, on-board diagnostics, 6" and 9" Pana Vise options and large font size shall also be included.

The Vista III allows for peer to peer networking. The Vista III shall have the ability to automatically change screens based on a predetermined state or condition for warning message or status.

This display shall be tilted towards the driver for ease of view, and a sun visor shall be installed on the vista display to reduce the amount of glare on the vista screen.

The V-Mux display shall be located in the cab center console for control of all master and emergency lights.

H – 1050: CAB CONSOLE

A center cab console shall be provided between the Driver's and Officer's seats. Console shall be as large as possible and fabricated of 1/8" smooth aluminum. A textured powder coat paint finish shall be provided for durability and finished appearance.

The rear portion of the console shall be provided with open top storage for notebooks or maps. Two (2) adjustable dividers shall be provided in the storage area. The forward portion of console shall be slanted for easy viewing of the V-Mux display screen, and any siren or radio equipment. The area shall be within easy access to both Driver and Officer.

The final design of console shall be determined by the HOUSTON FIRE DEPARTMENT **at the pre-construction meeting.**

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H – 1060: BATTERY SYSTEM

The battery connectors shall be heavy duty type with cables terminating in 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 to 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.

A master load disconnect switch shall be provided between the starter solenoid(s) and the remainder of the electrical loads on the apparatus. The starter solenoids shall be connected directly to the batteries.

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 on" pilot light that is visible from the driver's position shall be provided.

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.

H – 1070: BATTERY SWITCH

One (1) battery "On/Off" switch in cab located within easy reach of Driver with green "BATTERY ON" pilot light that is visible from the driver's position shall be provided.

H – 1080: BATTERY SOLENOID

Battery switch shall consist of a minimum 200 ampere, constant duty solenoid to feed from positive side of battery.

H – 1090: BATTERY CONDITIONER




One (1) Kussmaul model Auto Charge 1000 single battery conditioner, with 120 VAC input and 15 amp, 12 volt output shall be provided. This system shall monitor the condition of batteries and provide an electrical current at variable rates to overcome battery failure. A display shall be provided with charge indicator, remote mounted.

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H – 1100: SHORE POWER INLET

One (1) Kusssmaul 120 VAC, 20 amp Super Auto-Eject shore power inlet(s) shall be provided. The shore power connection shall automatically disengage from vehicle when chassis ignition is engaged.

The protective ground from the shoreline inlet shall be bonded to the vehicle frame.

- The outlet cover shall be yellow.
- The shore power inlet shall be located on the streetside side of the Ranch Hand front push bar. 

H – 1110: FIVE (5) ANTENNA RAIL

One (1) radio antenna rail(s) shall be provided and installed on roof of vehicle. Each rail be constructed of aluminum, forming a two piece box design. The top section shall be removable for easy access to the individual antenna wiring. Five (5) antenna bases shall be provided and installed in each rail. Each antenna base shall include enough cable to reach radio location plus a service loop of at least 3' of LMR195 flexible communications cable. The antenna wiring shall enter the vehicle roof at a single point under the end of the rail. The end of each radio antenna shall be routed to radio mounting locations, or as determined by the HOUSTON FIRE DEPARTMENT.

Due to the various configurations of antenna whips, the contractor shall provide the antenna base only, and HOUSTON FIRE DEPARTMENT shall provide the antenna whip. 

This rail shall run from front to rear in the streetside of the upper body so that radio shop personnel can access the rail with a ladder and not have to get on the roof.

H – 1120: ENGINE COMPARTMENT LIGHT

There shall be one (1) light(s) mounted in the engine compartment with integral switch with a light output of at least 20 candlepower (250 lumens). The engine compartment light(s) shall operate only when the master battery switch is turned "On".

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H – 1130: CAB HAZARD WARNING LIGHT

A red flashing or rotating light, located in the driving compartment, 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 meeting 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 less than 5 ft (1.5 m).

The hazard light shall be labeled "DO NOT MOVE APPARATUS WHEN LIGHT IS ON".

An audible alarm shall be provided for the door ajar light.

H – 1140: BACK-UP ALARM

The body manufacturer shall furnish and install one (1) 107 dB(A) electronic back-up alarm. Back-up alarm to actuate automatically when the transmission gear selector is placed in reverse.

H – 1150: REAR VIEW CAMERA

There shall be one (1) Voyager rear observation camera system provided and installed on the apparatus. The system shall include one (1) color camera installed on the rear the body. The image shall be displayed on the vista display when the vehicle in placed into reverse.

H – 1160: TAIL LIGHTS

Rear body tail lights shall be vertically mounted per Federal Motor Vehicle Safety Standards. The following lights shall be furnished:

- Two (2) Whelen amber LED M6 Series M6T turn signal lights
- Two (2) Whelen red LED M6 Series M6BTT stop/tail lights
- Two (2) Whelen LED M6 Series M6BUW back-up lights with clear lens

Each of the lights above shall be mounted in a M6FC, chrome finish bezel.

H – 1170: MIDSHIP MARKER/TURN SIGNAL

Two (2) Whelen LED midship body clearance marker/turn signal lights (T0A00MAR) shall be installed. There shall be one (1) light on each side of the body, in the wheel well, ahead of the rear axle. Both lights shall have an amber lens and operate with the chassis clearance marker and turn signals.

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H – 1180: MARKER LIGHTS

The apparatus body shall be equipped with all necessary clearance lights and reflectors in accordance with Federal Motor Vehicle Safety Standards (FMVSS) 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.

H – 1190: CAB STEP LIGHTS / GROUND LIGHTS

There shall be two (2) OnScene Solutions 9" LED NightStik light(s) installed on the vehicle 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.

H – 1200: LICENSE PLATE MOUNTING BRACKET

There shall be one (1) Cast Products aluminum license plate mounting with chrome shielded license plate light mounted on the rear of the body.

H – 1210: ELECTRONIC SIREN



One (1) Whelen model 295SLSC9 electronic siren control with standard hard wired microphone and user programmable siren tones shall be provided in cab. Siren to be installed in cab within easy access of Driver.

H – 1220: SIREN SPEAKERS

Two (2) Whelen model SA314B 100 watt siren speaker shall be provided, one (1) streetside and one (1) curbside. Locate on the push bumper.

H – 1230: SIDE SCENE LIGHTS - LED

There shall be two (2) Whelen Pioneer model PFA1 with a single lamp Super LED light on the upper body sides. Lights shall be 12 VDC, 6 amp, 70 watt, with 6,000 useable lumens.

Each light shall be mounted in PBA103 mounting bracket, semi recessed into the apparatus body with chrome trim ring housing. The light mounts will provide either a straight out, 0 degree or a 15 degree downward angle.

The lights shall be switched at the Vista display in the cab.

H – 1240: REAR SCENE LIGHTS

Two (2) Whelen M9LZC series (9" x 7") surface mounted Super-LED scene lights shall be provided on the upper rear body to light the work area immediately behind the vehicle to a level of at least 3 fc (30 lx) within a 10 ft x 10 ft (3 m x 3 m) square. Each light will have a 8-32 degree gradient lens and chrome flange.

The lights shall be switched at the Vista display in the cab.

The rear scene lights shall also be activated when the apparatus is in reverse.

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H – 1250: TRAFFIC ADVISOR: SURFACE MOUNTED WHELEN M6 LIGHTS

There shall be six (6) Whelen M6ACS Amber LED with clear lens locate in the upper portion of the rear face of the body to act as a traffic advisor. The direction of the light will be controlled through the Vista display. The light will always default to a warning feature every time the ignition is engaged and will not be tied to the emergency master.

H – 1260: WARNING LIGHT PACKAGE



Each apparatus shall have a system of optical 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 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 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 separate signaling modes during emergency operations. One mode shall signal to drivers and pedestrians that the apparatus is responding to an emergency and is calling for the right-of-way. One 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 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 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.

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H – 1270: UPPER LEVEL OPTICAL WARNING DEVICES

The upper-level optical warning 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

There shall be five (5) Whelen M9*C series warning lights permanently mounted to the upper front exterior wall of the body

The staggered light configuration (streetside to curbside) shall be:

<u>POSTION</u>	<u>INTERNAL COMPONENTS</u>	<u>LENS COLOR</u>
1	Whelen M9 Red/White LED	Clear
2	Whelen M9 Blue/Red LED	Clear
3	Whelen M9 Red/Red LED	Clear
4	Whelen M9 Blue/Red LED	Clear
5	Whelen M9 Red/White LED	Clear

All clear lights shall shut down when the parking brake is set to comply with "Blocking" mode requirements as outlined in NFPA 1901.

Warning Lights shall be programmed to "Com Alert 150 Diagonal"

The lightbar shall be separately switched at the vista display in the cab.

H – 1280: GTT 794 OPTICOM

One (1) GTT 794H Surface Mount Opticom emitter light shall be provided on the front of the body. The Opticom shall be activated with emergency master switch de-activated when the vehicles transmission is set in park and the vehicle is in blocking mode.

The Opticom will be set to high priority code 1.

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ZONES B AND D - SIDE WARNING LIGHTS

UPPER REAR CORNER WARNING LIGHTS

There shall be two (2) Whelen M9 series Red Linear Super-LED lights (M9RC) provided, one (1) each side. Each light shall have a clear lens and chrome flange.

Warning Lights shall be programmed to "Com Alert 150 Diagonal"

The lights shall be switched at the Vista display in the cab.

UPPER FORWARD CORNER WARNING LIGHTS

There shall be two (2) Whelen M9 series Red Linear Super-LED lights (M9RC) provided, one (1) each side. Each light shall have a clear lens and chrome flange.

Warning Lights shall be programmed to "Com Alert 150 Diagonal"

The lights shall be switched at the Vista display in the cab.

ZONE C - REAR WARNING LIGHTS

There shall be two (2) Whelen M9 series Red Linear Super-LED lights (M9RC) provided, one (1) each side. Each light shall have a clear lens and chrome flange.

Warning Lights shall be programmed to "Com Alert 150 Diagonal"

The lights shall be switched at the Vista display in the cab.

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H – 1290: LOWER LEVEL OPTICAL 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 1220 mm) above level ground for small apparatus.

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

There shall be two (2) Whelen M4 series Red Linear Super-LED lights (M4RC) provided, one (1) each side. Each light shall have a clear lens and chrome flange.

Warning Lights shall be programmed to "Com Alert 150 Diagonal"

The lights shall be switched at the Vista display in the cab.

ZONES B AND D - CAB INTERSECTOR LIGHT (CAB FRONT CORNERS)

There shall be two (2) Whelen M4 series Red Linear Super-LED lights (M4RC) provided, one (1) each side. Each light shall have a clear lens and chrome flange.

Warning Lights shall be programmed to "Com Alert 150 Diagonal"

The lights shall be switched at the Vista display in the cab.

ZONES B AND D - BODY INTERSECTOR LIGHT (BODY REAR CORNERS)

There shall be two (2) Whelen M6 series Red Linear Super-LED lights (M6RC) provided, one (1) each side. Each light shall have a clear lens and chrome flange.

Warning Lights shall be programmed to "Com Alert 150 Diagonal"

The lights shall be switched at the Vista display in the cab.

ZONE C - REAR WARNING LIGHTS (LOWER REAR CORNERS)

There shall be two (2) Whelen M6 series Red Linear Super-LED lights (M6RC) provided, one (1) each side. Each light shall have a clear lens and chrome flange.

Warning Lights shall be programmed to "Com Alert 150 Diagonal"

The lights shall be switched at the Vista display in the cab.

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SECTION I : 120 VOLT SECTION

I – 1000: LINE VOLTAGE ELECTRICAL SYSTEM

I – 1010: 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, 144/48 amps, three phase. 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 breakover 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.

I – 1020: 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 advancement of the engine speed in the driving compartment or at any operator's panel unless the parking brake is engaged, and the transmission is in neutral or the output of the transmission is correctly connected to a pump or generator instead of the drive wheels.

I – 1030: 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.

I – 1040: 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.

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I – 1050: 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 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.

I – 1060: 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.

I – 1070: 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 engagement of the PTO.

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, driven accessories (power takeoffs (PTO), etc.) shall meet the engine and transmission manufacturers' installation recommendations for the service intended.

Model part number shall be Muncie FR63-F1506-D4BX, 129% Ratio.



I – 1080: ENGINE SPEED CONTROL

The apparatus shall be equipped with an InPower ETM, Electronic Throttle Module to maintain a stable cycle output from generator.

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.

I – 1090: GENERATOR MONITORING PANEL



To properly monitor the generator performance and load demand during operation, the generator installation shall be equipped with a full instrument monitor panel.

- Generator frequency in hertz
- Line voltage, phase to neutral or phase to phase, in volts
- Line current in amperes

Individual line current and voltage shall be displayed at the push of a button.

The program shall support the accumulation of elapsed generator hours. Generator hours shall be displayed.

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I – 1100: LOADCENTER



The loadcenter shall be a Cutler Hammer, BR Series, specifically designed for protection and distribution of 120/208 volt AC, such as lighting and small motor branch circuits. The loadcenter enclosure shall be made of 16 gauge galvanized sheet steel. The galvanized coating provides corrosion protection and as such does not require paint. All trims used on the BR Loadcenter shall be chromate sealed and finished with electro disposition epoxy paint (ASA61) which exceeds requirements for outdoor and indoor applications. A combination surface/flush cover with integral door shall be supplied.

The loadcenter shall be UL / CSA listed, **NO EXCEPTIONS** will be allowed.

I – 1110: SHORE POWER OUTLET - 150 AMP

A 150 ampere, 240 VAC, single phase shore power outlet shall be provided on the apparatus to provide an external power source for apparatus electrical circuits. **A matching 150 ampere plug shall be shipped with the apparatus** for HOUSTON FIRE DEPARTMENT supplied external power source wiring.

Shore power shall be wired to apparatus main circuit breaker in the circuit breaker distribution panel and feed all 120/240 electrical circuits on apparatus.

To protect both the generator and external power source from back feed, a manual switch shall be installed at the generator control panel, to cut off the connection between the apparatus circuits and the generator when the external power source plug is in use.

I – 1120: LINE VOLTAGE ELECTRICAL SYSTEM

I – 1130: 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 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.

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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 ampere rating, as defined in 310.15, "Ampacities for Conductors Rated 0–2000 Volts," of *NFPA 70*, of 115 percent of the rated ampere 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

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(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:

- Voltmeter
- Current meters for each ungrounded leg
- Frequency (Hz) meter
- 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.

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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 cord 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).

Overcurrent Protection

Manually resettable over current devices shall be installed to protect the line voltage electrical system components.

Power Source Protection

A main over current 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 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 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 a Type 4-rated enclosure.

Branch Circuit Overcurrent Protection

Over current protection devices shall be provided for each individual circuit and shall be sized at not 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.
- 1) 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.

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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 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 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 prewiring 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 an 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.

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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

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.

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Wiring Schematics

An "As-Built" Wiring diagrams for line voltage systems shall be provided to include the following information;

- 1) Pictorial representations of circuit logic for all electrical components and wiring
- 2) Circuit identification
- 3) Connector pin identification
- 4) Zone location of electrical components
- 5) Safety interlocks
- 6) Alternator–battery power distribution circuits
- 7) Input/output assignment sheets or equivalent circuit logic implemented in multiplexing systems

SECTION J : EQUIPMENT

J – 1000: EQUIPMENT PAYLOAD WEIGHT ALLOWANCE

In compliance with NFPA 1901 standards, the special service vehicle shall be designed for an equipment loading allowance of 2,500 lbs. of HOUSTON FIRE DEPARTMENT provided loose equipment based on a 15,001 - 20,000 pound gross vehicle weight rating.

J – 1010: 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.

J – 1020: REMAINING NFPA MINOR EQUIPMENT BY PURCHASER

All other minor equipment not specified above, but required by NFPA 1901 before the unit is placed in service shall be supplied and mounted by HOUSTON FIRE DEPARTMENT.