



## **NFPA Compliance**

The E-ONE supplied components of the apparatus shall be compliant with NFPA 1901, 2016 edition.

## **Commercial Chassis**

The commercial chassis shall be a Freightliner Business Class M2 106 MD two (2) door and shall be supplied with the following equipment:

### **GVW Rating**

The gross vehicle weight rating shall be 35,000 lbs with an overall wheel base of 185".

### **Frame**

The chassis frame rails shall be channel type, 10-15/16" x 3-1/2" x 11/32" steel. The frame shall have a 41" rear frame overhang. The frame rails shall be clear with no protrusions outboard of the rail from the back of the cab to the rear suspension.

### **Tow Hooks**

There shall be two (2) front tow hooks, frame-mounted.

### **Front Axle and Suspension**

The front axle shall be set back with 12,000 lbs. capacity.

### **Front Suspension**

The front suspension shall be taper leaf with a 12,000 lb capacity and front shock absorbers.

### **Front Tires**

Front tires shall be 11R22.5 tubeless type 14 ply radial tires.  
Black hard rubber mudflaps shall be provided behind the front tires.

### **Rear Axle**

The rear axle shall have a 23,000 lbs. capacity. 4.89 rear axle ratio.

### **Rear Suspension**

The rear suspension shall be 52" variable rate multi-leaf spring with leaf spring helper rated at 23,000 lbs capacity.



## **Rear Tires**

Rear tires shall be 11R22.5 tubeless type 16 ply radial tires.

## **Brake System**

The vehicle shall be equipped with a WABCO 4S/4M ABS brake system without traction control. Reinforced nylon, fabric braid and wire braid chassis air lines. BW AD-9 brake line air dryer with heater. Air dryer frame mounted.

## **Cooling System**

950 square inch aluminum radiator. Antifreeze to -34F, Ethylene Glycol pre-charged SCA heavy duty coolant. Gates blue stripe coolant hoses or equivalent. Constant tension hose clamps for coolant hoses. Auxiliary engine cooling using water from the fire pump. Lower radiator guard.

## **Exhaust System**

RH outboard under step mounted horizontal after treatment system assembly with RH horizontal tailpipe exiting forward of rear tires. Engine after treatment device, automatic over the road active regeneration and dash mounted single regeneration request/inhibit switch.

## **Fuel Tank**

A fifty (50) gallon rectangular aluminum fuel tank shall be mounted at the driver side. Fuel lines shall be reinforced nylon fuel hose. 6 gallon diesel exhaust fluid tank. Alliance fuel filter/water separator. Equiflo inboard fuel system. High temperature reinforced nylon fuel line. Fuel cooler.

## **Transmission**

An Allison EVS3000 automatic 5 speed transmission shall be provided. The push-button electronic shift control shall be located within easy reach of the driver and shall be indirectly lit for after-dark operation. A label shall be provided within easy view of the driver to indicate the chassis transmission shift selector position to be used for pumping.

A transmission water-to-oil cooler shall be provided in the radiator end tank.

A transmission fluid check and fill with electronic oil level check.

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

## **Battery System**

(2) Alliance model 1131, group 31, 12 volt maintenance free 1900 CCA threaded stud batteries. Standard battery jumpers. Single battery box frame mounted LH side under cab. Wire ground return for battery cables with additional frame ground return.



### **Alternator**

The alternator shall be DR 12V 275 AMP 40-SI brushless pad with remote battery voltage sense.

### **Ember Separator**

Side of hood air intake with NFPA compliant ember screen and fire retardant Donaldson air cleaner.

### **Rims - Painted Steel**

The chassis rims shall be Accuride 22.5" x 8.25" 10 hub piloted 2-hand steel disc wheels. The rims shall be painted job color.

### **Air Horns**

Dual Stuttertone Hood Mounted Air Horns with Driver and Officer Foot Switches to be Supplied and Installed by Freightliner.

### **OEM Chassis Step Package**

The chassis shall be provided with the OEM step package on a Freightliner M2 106 and 112 chassis. Included shall be mounting plate/area for the battery charger receptacle and air inlet.

### **Battery Location**

The batteries shall be located under left hand side of cab.

### **Fire Apparatus/Rescue Chassis Prep**

The following items shall be installed on the commercial chassis in preparation for fire apparatus/rescue application:

- Exhaust Extension - The chassis exhaust pipe shall be extended to the front of the right rear wheels.
- Fast Idle System - A fast idle system shall be provided and controlled by a cab or pump panel mounted switch. The system shall increase engine idle speed to a preset RPM for increased alternator output.
- Master Light Switch - The master light switch shall consist of one (1) illuminated rocker switch wired through a solenoid to accessory switches to allow pre-selected switches to be turned on or off at one time.
- Battery Master Disconnect - A heavy duty on/off single battery master disconnect switch shall be mounted in the cab within easy reach of the driver.



- Auxiliary Engine Cooler - As required for pumping applications, an engine cooler shall be installed. The engine cooler shall be required to lower engine water temperature during prolonged pumping operations and shall be controlled at the pump operator's position.

## **Rear Underbody Support Frame**

The body shall be supported at the rear by a steel frame extension bolted to the chassis frame rails. The frame rails and frame extension shall be isolated from the aluminum body extrusions by 5/16" x 2" fiber reinforced rubber.

The frame extension shall be built with (2) 2.5" sq. x .25 wall thickness x full width cross rails welded to (2) 2.5" sq. x .25 wall thickness side rails. The frame extension assembly will be welded to steel weldments, which are secured to the chassis frame with grade 8 5/8" bolts.

The frame extension shall not interfere with N.F.P.A. minimum requirements for angle of departure.

## **Tire Pressure Indicators**

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

Real Wheel Part number RWC1234 was superseded by RWC1235 as of June 2015

## **Air Inlet**

A 1/4" male plug air hose inlet shall be connected to the air reservoir tank. A 1/4" inline check valve will be installed in the line. Air hose connection will provide the capability of filling the air brake system with air from an outside source. Location: driver's door step area.

## **Hood Mounted Air Horns**

Dual Stuttertone hood mounted air horns with driver and officer foot switches shall be supplied and installed by Freightliner.

## **Freightliner Engine**

The chassis shall be equipped with a Cummins ISL six-cylinder, EPA compliant, electronic engine.

The engine shall be 300HP @ 2000 RPM (2200 RPM Governed) with 860 lb/ft @ 1300 RPM.



## **Rear Tow Eyes**

Two (2) heavy duty tow eyes made of 3/4" (0.75") thick steel having 2-1/2" diameter holes shall be mounted below the body at the rear of the vehicle to allow towing (not lifting) of the apparatus without damage. The tow eyes will be welded to the lower end of a 5" steel channel that is bolted at the end of the chassis frame rails. The tow eyes shall be painted chassis black.

## **Tow Hooks**

The chassis shall have two (2) forward frame mounted tow hooks.

## **OEM Chassis Step Package**

The chassis shall be provided with the OEM step package on a Freightliner M2 106 and 112 chassis. Included shall be mounting plate/area for the battery charger receptacle and air inlet.

## **Battery Location**

The batteries shall be located under left hand side of cab.

## **Cab Door Reflective Material**

Reflective Red/Lemon Yellow material striping shall be supplied on each of the cab doors. The stripes shall be be angled from the lower outer corner to the upper inside corner, forming an "A" shape when viewed from the rear. The reflective material shall be at least 96 square inches to meet NFPA 1901 requirements.

## **Label ``Diesel Fuel Only``**

Located above each fuel filler housing shall be a metallic label that designates "Diesel Fuel Only" requirements. It shall be black with white or equivalent contrasting letters a minimum of 1/2" high.

## **Seating Capacity Tag**

A tag that is in view of the driver stating seating capacity of two (2) personnel shall be provided.

## **Battery Charger Receptacle**

A 20 amp battery charger receptacle shall be installed in the specified location.

The receptacle shall be located driver's door step area.

The cover color shall be Yellow.



## **Battery Charger**

An E-ONE LPC 20 battery charger with remote mounted LED display shall be installed.

A fully automatic charging system shall be installed on the apparatus. The system shall have a 120 volt, 60 hertz, 7 amp AC input with an output of 20 amps 12 volts DC. The battery charging system shall be connected directly to the shoreline to ensure the batteries remain fully charged while the vehicle is in the fire station or firehouse.

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

## **Apparatus Body**

The apparatus body shall be constructed entirely of aluminum plate and extrusions. The interlocking framework, constructed from beveled 6061T5, 6061T6 and 6063T5 extrusions, shall be electrically seam welded both internally and externally at each joint using 5356 aluminum alloy welding wire. The entire exterior body shall be completely sanded and deburred to assure a smooth finish prior to painting. All horizontal surfaces, rear steps, and the rear body surface shall be constructed from aluminum fire apparatus quality diamond plate.

## **Heavy Rescue**

Each body corner rail shall be a 5" X 5" aluminum 6063T5 alloy corner section with 1/8" (.125) wall thickness and shall be welded as an integral part of the body. The corner extrusions shall have a 1-1/2" (1.5) outside radius and a full length 1/8" (.125) internal extruded gusset. The non walk-in body shall utilize a 5" x 5" aluminum 6063T5 alloy corner extrusion as the apparatus top rail. The horizontal body side extrusions shall be 1.5" x 4" 6063T6 aluminum tube with 3/16" (.187) wall thickness and 3/16" (.187) outside corner radius. The frame crossmember extrusions shall be 3" x 3" 6061T6 aluminum with 3/8" (.375) wall thickness. These crossmembers shall extend the full width of the body to support the compartment framing, and shall be welded to a 1-3/16" (1.187) x 3" solid aluminum, 6061T5 frame sill extrusion that shall be shaped to contour with the chassis frame rails. The wheel well frame, constructed from 1.5" x 4" 6063T5 aluminum extrusions shall be slotted the full length to permit an internal fit of 1/8" (.125) aluminum diamond plate. The front exterior of the body shall be constructed of 3/16" (.187) and the roof of the body shall be constructed of 1/8" (.125) fire apparatus quality diamond plate. All of the smooth aluminum plate and fire apparatus quality diamond plate shall be 3003 H-14 aluminum alloy.

## **Light Rescue**

Each body corner rail shall be a 5" X 5" aluminum 6063T5 alloy corner section with 1/8" (.125) wall thickness and shall be welded as an integral part of the body. The corner extrusions shall have a 1-1/2" (1.5) outside radius and a full length 1/8" (.125) internal extruded gusset. The non walk-in body shall utilize a 3" x 3" aluminum 6063T5 alloy square extrusion as the apparatus top rail. The horizontal body



side extrusions shall be 1.5" x 4" 6063T6 aluminum tube with 3/16" (.187) wall thickness and 3/16" (.187) outside corner radius. The frame crossmember extrusions shall be 3" x 3" 6061T6 aluminum with 3/8" (.375) wall thickness. These crossmembers shall extend the full width of the body to support the compartment framing, and shall be welded to a 1-3/16" (1.187) x 3" solid aluminum, 6061T5 frame sill extrusion that shall be shaped to contour with the chassis frame rails. The wheel well frame, constructed from 1.5" x 4" 6063T5 aluminum extrusions shall be slotted the full length to permit an internal fit of 1/8" (.125) aluminum diamond plate. The front exterior of the body shall be constructed of 3/16" (.187) and the roof of the body shall be constructed of 1/8" (.125) fire apparatus quality diamond plate. All of the smooth aluminum plate and fire apparatus quality diamond plate shall be 3003 H-14 aluminum alloy.

## **Body**

The rear tailboard shall be formed from 3/16" (.187) treadplate and reinforced with a 1.5" x 3" aluminum extrusion and .5" x 3" aluminum flatbar, shall be bolted on to the body from the underside, thereby assuring a clean surface.

Body handrails shall consist of two (2) 36" length of 1.25" O.D. anodized aluminum installed between chrome end stanchions on each side of B1 opening. The handrail extrusion shall be ribbed to assure a good grip for personnel safety.

All body compartment shall be constructed from 1/8" (.125) formed aluminum 3003 H-14 alloy plate. All compartment floors shall be constructed of 1/8" (.125) aluminum fire apparatus quality diamond plate welded in place. Compartment floors shall be supported by a minimum 3/16" (.187) walled aluminum extrusions. The compartment seams shall be sealed by using a permanent pliable silicone caulking. The compartments shall be machine louvered for adequate ventilation.

The three (3), four (4) or five (5) compartments on each side of the body, along with the rear compartment, shall be provided with Robinson brand roll-up doors. The door slats shall be a double wall box frame design, and shall be manufactured from unpainted, anodized aluminum. Each door slat shall have interlocking joints with a pvc/vinyl inner seal to prevent any metal to metal contact and to inhibit moisture and dust penetration.

The door track shall be anodized aluminum with a finishing flange around the perimeter of the door. The track shall have a replaceable side seal to prevent water and dust from entering the compartment. The doors shall be counterbalanced for ease of operation.

A full width latch bar shall be provided along with a positive latch device. A magnetic type switch, integral to the door, shall be supplied for door ajar indication and compartment light activation.

The body shall have a body side protection rubrail along the length of the body on each side and at the rear. The rubrail shall be constructed of minimum 3/16" (.187) thick anodized aluminum 6063T6 extrusion. The rubrail shall be constructed of minimum .1875" thick 6063T6 aluminum extrusion. The rubrail shall be a minimum of 2.75" high X 1.25" deep and shall extend beyond the body width to protect the compartment doors and the body side. The design of the rubrail shall protect any specified



marker lights that are mounted inside its C-channel. The top surface of the rubrail shall have 5 serrations raised a minimum of 0.1" high with cross grooves designed to provide a slip resistant edge for the rear step and running boards. The rubrail shall be spaced away from the body using .1875" nylon spacers. The ends of each section shall be provided with a rounded corner piece. The area inside the rubrail C-channel shall be inset with a white reflective material for increased visibility.

A plastic wheel well liner shall be provided for each wheel well. Liner shall be constructed of ABS plastic. The wheel well liner is bolted in. SAE chain clearance shall be provided.

The upper rear compartment doors shall be constructed of 1/8" (.125) fire apparatus quality treadplate with the inner door pans being constructed of smooth aluminum plate. The latches and hinges shall be of the same make and model as the side compartments. The door springs shall be gas shock style for ease of operation.

The apparatus body structure shall be securely fastened to the chassis with 5/8" (.625) O.D. steel U-bolts. Chassis frame rails shall be lined with 5/16" (.312) x 2" fiber reinforced rubber strips to protect the body frame sills from contact with the rails.

A permanent plate mounted in the driver's compartment shall be supplied. It shall specify the quantity and type of the following fluids used in the vehicle: engine oil, engine coolant, chassis transmission fluid, and drive axle lubrication.

There shall be four (4) compartments per side on a 16' to 22' rescue or five (5) compartments per side on a 24' or 26' rescue. These compartments will be labeled L1, L2, L3, L4, and L5 on the driver's side, R1, R2, R3, R4, and R5 on the officer's side with L1/R1 located closest to the cab and L2/R2 located behind L1/R1 and so on. L1/R1 and L2/R2 to be located ahead of the rear wheels; L3/R3 will be located over the rear wheels and L4/R4 will be located behind the rear wheels on a 16' to a 22' body. L3/R3 and L4/R4 will be located over the rear wheels and L5/R5 will be located behind the rear wheels on a 24' or 26' body.

The 24' and 26' Non-walk in rescue has a separate module in front of the body containing L1/R1, has 2 compartments over the rear wheels L3/R3 and L4/R4, and is a tandem axle Chassis. The pans on both of these models are located on top of the front module, over L1/R1.

All stepping surfaces will be non slip, either with Gator Grip stepping surface or embossed diamond plate.

## **16' NWI BODY 3/3/5/3**

### **Front (L1/R1)**

There shall be one (1) compartment, each side of the body, at the forward most portion of the body. This compartment shall be a transverse compartment from the left side to the right side. The lower section shall be approximately 20" high x 26" deep on each side. The compartment door opening shall be



approximately 36`` wide x 70`` high. These compartments shall contain a total of 119 cubic feet of storage space.

Left and right side (L2/R2)

There shall be one (1) compartment, each side of the body, directly ahead of the rear wheels. This compartment shall be a transverse compartment from the left side to the right side. The lower section shall be approximately 20" high x 26" deep on each side. The compartment door opening shall be approximately 36`` wide x 70`` high. These compartments shall contain a total of 119 cubic feet of storage space.

Left and right side over the rear wheels (L3/R3)

There shall be one (1) compartment, each side of the body, over the rear wheels. This compartment shall be a transverse compartment from the left side to the right side. The compartment door opening shall be approximately 60`` wide x 39`` high. These compartments shall contain a total of 127 cubic feet of storage space.

Rear - left and right side (L4/R4)

There shall be one (1) compartment, each side of the body, directly behind the rear wheels. The compartment shall be approximately 36`` wide x 70`` high x 26`` deep. The compartments shall each contain 37 cubic feet of storage. The door opening shall be 36`` wide x 70`` high.

### **Rescue Non Walkin Compartmentation EA**

Extend the transverse floors in these compartments to the opening. The floors are made from 3/16" 3003 H230 diamond plate. Floors are welded in place.

### **Upper Body Height EA**

Upper Body Height 15": 15" is measured from top of 1.5" x 4" extrusion above the side body compartments to top of upper body.

### **Roof configuration EA**

A flat Diamond plate roof. Sealed with silicone and bolted in place using stainless steel hardware.

Constructed with 1/8" 3003 H230 diamond plate and 3/16" thick 6061 T6 extrusion.

### **Bdy w/ 3 upper compartments**

Rear With Upper Compartments: This rear end has 4 compartments. There is a center compartment with a drop floor (B1). Over the top of B1 there are 3 compartments with pan doors. The height of these



compartments are determined by the height of the truck, the depth's of the compartments run the full length of the truck, and the width of the compartments are as follows B2 is 21.75", B3 is 36", and B4 is 21.75".

B1 area between the frame rails shall have approximate interior dimensions of 20" high x 36" wide x 26" deep and the area above the frame rails to the top of the compartment shall have approximate interior dimensions of 36" wide by the following depth:

- 16' body: ; 40" deep
- 17', 18', 19' body: ; 52" deep
- 20', 21', 22', 24', 26' body: ; 64" deep

Rear end shall be composed of Aluminum plate welded together with at least 3/16" wall aluminum extrusions.

**STD NWI:**

The compartment shall be approximately 70" opening height and 62" opening height with roll-up doors.

**STD AIR:**

The compartment shall be approximately 78" opening height and 70" opening height with roll-up doors.

**STD WI:**

The compartment shall be approximately 66" opening height and 58" opening height with roll-up doors.

### **10 inch tlbrd**

10" tailboard made out of 3/16" diamond plate, supported by T6 extrusions. Tailboard is gator grip and runs full width of the body. The tailboard is bolted to the body.

### **Rear Body Panels**

The rear body panels shall be 3/16" aluminum smooth plate painted job color.

### **Front Body Trim**

The front head board of the body shall be 1/8" aluminum diamond plate.

### **ROM Door**

A ROM brand roll up door with satin finish shall be provided on a compartment 36" wide. The door(s) shall be installed in the following location(s): L1, L2, L4, R1, R2, R4, B1.



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

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

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

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

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

## **ROM Door**

A ROM brand roll up door with satin finish shall be provided on a compartment over the wheel well and 60" wide. The door(s) shall be located on L3, R3.

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

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

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

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

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

## **Rear Mud Flaps**

The rear tires shall have a set of black mud flaps mounted behind the rear chassis wheels with E-ONE logo.



## **Overall Height Restriction**

The apparatus shall have no overall height restrictions.

## **Overall Length Restriction**

The unit has no overall length restrictions.

## **Data Recorder**

A vehicle data recorder system shall be provided to comply with NFPA 1901, 2009 edition. The following data shall be monitored:

- Vehicle speed MPH
- Acceleration (from speedometer) MPH/Sec.
- Deceleration (from speedometer) MPH/Sec.
- Engine speed RPM
- Engine throttle position % of full throttle
- ABS Event On/Off
- Seat occupied status Occupied Yes/No by position
- Seat belt status Buckled Yes/No by position
- Master Optical Warning Device Switch On/Off
- Time 24 hour time
- Date Year/Month/Day

## **Occupant Detection System**

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

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

The visual warning shall consist of a graphical display that will continuously indicate the validity of each seat position.

The system shall include a display panel with LED back-lit ISO indicators for each seating position, seat sensor and safety belt latch switch for each cab seating position, audible alarm and braided wiring harness.

The display panel shall be located cab dash above transmission shift panel.

## **Electrical System**



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

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

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

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

### **Multiplex System**

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

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

### **Wiring**



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

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

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

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

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

### **Wiring Protection**

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

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

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

### **Wiring Connectors**

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

### **NFPA Required Testing of Electrical System**

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



### **1. Reserve capacity test:**

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

### **2. Alternator performance test at idle:**

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

### **3. Alternator performance test at full load:**

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

### **4. Low voltage alarm test:**

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

### **NFPA Required Documentation**

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

- A. Documentation of the electrical system performance tests required above.
- B. A written load analysis, including:
  - a. The nameplate rating of the alternator.
  - b. The alternator rating under the conditions.



- c. Each specified component load.
- d. Individual intermittent loads.

## **Multiplex Display**

The V-MUX multiplex electrical system shall include a text display.

The display shall have the following features:

- Rugged vacuum fluorescent technology
- Two twenty character lines
- Programmed to show door ajar status and diagnostic information

The display shall be located center of dash.

## **Light Bar**

A Federal Signal JLX6001C 60" LED JetSolaris light bar shall be installed with clear domes. The light bar shall contain nine (9) SOL 6 red LED Solaris reflectors, and six (6) SOL 3 red LED Solaris reflectors.

The light bar shall be installed in the following location: Centered on the front cab roof.

## **Lower Level Warning Light Package**

Ten (10) Federal Signal QuadraFlare LED light heads with red lenses and bezels shall be provided.

The rectangular lights shall be wired with weatherproof connectors and shall be mounted as close to the corner points of the apparatus as is practical as follows:

- Two (2) QL64XF-R lights on the front of the apparatus facing forward.
- Two (2) QL64XF-R lights on the rear of the apparatus facing rearward.
- Two (2) QL64XF-R lights each side of the apparatus, one (1) each side at the forward most point (as practical), and one (1) each side at the rearward most point (as practical).
- One (1) QL64XF-R light each side of the apparatus centrally located to provide mid ship warning light.

The side facing lights shall be located at forward most position, in rear wheelwell offset to front, and on tailboard mounted light box above rear tailboard.

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

## **Lower Level LED Warning Light Flash Rate**



The lower level Federal Signal QuadraFlare LED warning lights shall be set to flash at 75 quad flashes per minute.

### **Upper Rear Warning Lights**

Two (2) Federal Signal Sentry model SY12FS rotating lights with a polycarbonate base, a single 55 watt halogen lamp, and a twist-on lexan dome. Each light shall produce 175 flashes per minute. The dome colors to be driver amber, officer red.

The lights shall be located rear upper body on aerial style brackets to meet upper Zone C requirements.

### **Hazard (Door Ajar) Light**

There shall be a 2” red LED hazard light installed as specified.

The light shall be located center overhead.

### **Directional Light Wired to Warning Lights**

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

### **Electronic Siren**

A Federal PA300 siren model 690010 solid state electronic siren with attached noise-canceling microphone shall be installed. The unit shall be capable of driving a single high power speaker up to 200 watts to achieve a sound output level that meets Class "A" requirements.

Operating modes shall include Hi-Lo, yelp, wail, P.A., air horn and radio re-broadcast.

The siren shall be recessed mounted in the cab.

### **Electronic Siren Control Location**

The electronic siren control shall be located in the center overhead.

### **Siren Speaker**

One (1) Federal Signal model ES100 Dynamax 100 watt speaker shall be flush mounted as far forward and as low as possible on the front of the vehicle. A polished model MSFMT with "E-ONE" grille shall be provided on the outside of the speaker to prevent road debris from entering the speaker.

Speaker dimensions shall be: 5.5 in. high x 5.9 in. wide x 2.5 in. deep. Weight = 5.5 lbs.



The speaker shall produce a minimum sound output of 120 dB at 10 feet to meet current NFPA 1901 requirements.

The speaker shall be located driver side front bumper.

### **License Plate Light**

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

### **LED Body Marker Lights**

LED clearance lights shall be installed as specified.

#### **Upper Body:**

- One (1) red Trucklite LED clearance light each side rear of body to the side.
- One (1) red Trucklite LED clearance light each side rear of body to the rear.
- One (1) amber Trucklite LED clearance light each side front of body to the side.
- One (1) amber Trucklite LED clearance light each side front of body to the front (if applicable).

#### **Lower Body:**

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

### **Tail Lights**

One (1) Federal Signal model QL64Z-BTT red LED (Light Emitting Diode) light, one (1) Federal Signal model QL64Z-ARROW amber LED light and one (1) Federal Signal QL64Z-BACKUP white LED light shall be installed in a Cast 3 housing in a vertical position each side at rear and wired with weatherproof connectors.

Light functions shall be as follows:

- LED red running light with red brake light in upper position.
- LED amber populated arrow pattern turn signal in middle position.
- LED white back-up light in lower position.

A one-piece polished aluminum trim casting shall be mounted around the three (3) individual lights in a vertical position.



## **Compartment Light Package**

There shall be a minimum of one (1) 4” circular LED (Light Emitting Diode) mounted in each body compartment greater than 4 cu. ft. Compartments over 36” in height shall have a minimum of two (2) lights, one (1) high and one (1) low. Transverse compartments shall have a minimum of two (2) lights, located one (1) each side.

Compartment lights shall be wired to a master on/off rocker switch on the cab switch panel. Each light shall be in a resilient shock shock-absorbent mount for improved bulb life.

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

## **Step Lights**

The apparatus shall be equipped with a sufficient quantity of lights to properly illuminate the steps around the apparatus in accordance with current NFPA requirements. The lights shall be 4” circular with clear lenses (2” if space is limited) mounted in a resilient shock absorbent mount for improved bulb life. The wiring connections shall be made with a weather resistant plug in style connector.

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

## **Ground Lights**

The apparatus shall be equipped with a sufficient quantity of lights to properly illuminate the ground areas around the apparatus in accordance with current NFPA requirements. The lights shall be 4” circular with clear lenses mounted in a resilient shock-absorbent mount for improved bulb life. The wiring connections shall be made with a weather-resistant plug-in style connector.

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

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

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

## **Scene Lights**

Two (2) Federal GHSCENE lights with clear lenses shall be provided. Each light shall include (2) 20 watt halogen fixtures within the light housing. Both lights, within each housing, shall be adjustable horizontally and vertically to provide desired coverage. All electrical connectors are to be enclosed in the housing providing protection against the elements.



The lights shall be 12VDC, 40 watts, and provide 1050 candelas.

Lights shall be located (1) each side of body rear facing up high and switched in cab (side facing lights switched separately).

### **Engine Compartment Light**

There shall be lighting provided in compliance with NFPA to illuminate the engine compartment area.

### **Cab Dome Lights**

A large (7") clear dome light with 3-position switch shall be installed above each front cab door.

### **Foot Switch**

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

### **Back-Up Alarm**

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

### **Electrical Location**

Locate electrical components in lower forward L1 back wall. Compartment depth will be limited by approximately 6".

Electrical components on a multiplex system will include:

1. All PDM's
2. Relay Panel
3. Strobe Packs
4. Flashers

Electrical components on a non-multiplex system will include:

1. Relay Panel
2. Strobe Packs
3. Flashers

### **DOT Required Drive Away Kit**



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

## **Paint Body Large**

The apparatus body shall be painted Sikkens FLNA3225E-1 Red. The paint process shall meet or exceed current state regulations concerning paint operations. Pollution control shall include measures to protect the atmosphere, water, and soil. Contractor shall, upon demand, provide evidence that the manufacturing facility is in compliance with State EPA rules and regulations.

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

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

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

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

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

## **Commercial Cab Paint**

The Freightliner cab shall be painted by the chassis supplier. The cab paint color shall match FLNA3225E-1 Red.



Paint shall be warranted by the cab/chassis manufacturer.

### **Cab and Body Scotchlite Striping**

A straight Scotchlite reflective stripe, 4" minimum in width, shall be applied horizontally around the cab and body to comply with NFPA 1901. The color and location of the stripe to be specified by the purchaser.

Location: bottom of stripe flush with bottom of cab and straight back.

Color: White.

### **Rear Body Scotchlite Striping**

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

### **Designated Standing / Walking Area Indication**

A 1" wide yellow line shall be applied to indicate the outside perimeter of designated standing and walking areas above 48" from the ground in compliance with 2016 NFPA 1901. Steps, ladders and areas with a railing or structure at least 12" high are excluded from requiring the line.

### **Standard 1 Year Warranty**

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

### **10 Year 100,000 Mile Structural Warranty**

The apparatus manufacturer shall provide a comprehensive 10 year/100,000 mile structural warranty. This warranty shall cover all structural components of the cab and/or body manufactured by the apparatus manufacturer against defects in materials or workmanship for 10 years or 100,000 miles, whichever occurs first. Excluded from this warranty are all hardware, mechanical items, electrical items, or paint finishes. A copy of the warranty document shall be provided with the proposal.

### **10 Year Paint and Corrosion Warranty**



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

The paint shall be prorated for 10 years as follows:

|                                  |      |  |      |
|----------------------------------|------|--|------|
| Topcoat & Appearance:            |      | Coating System, Adhesion & Corrosion:                              |      |
| Gloss, Color Retention, Cracking |      | Includes Dissimilar metal corrosion, Flaking, Blistering, Bubbling |      |
| 0 to 72 months                   | 100% | 0 to 36 months   | 100% |
| 73 to 120 months                 | 50%  | 37 to 84 months  | 50%  |
|                                  |      | 85 to 120 months   | 25%  |

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

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

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

### Electronic Manuals

Two (2) copies of all operator, service, and parts manuals MUST be supplied at the time of delivery in electronic format (CD-ROMs). The electronic manuals shall include the following information:

- Operating Instructions, descriptions, specifications, and ratings of the cab, chassis, body, aerial (if applicable), installed components, and auxiliary systems.
- Warnings and cautions pertaining to the operation and maintenance of the fire apparatus and fire fighting systems.
- Charts, tables, checklists, and illustrations relating to lubrication, cleaning, troubleshooting, diagnostics, and inspections.
- Instructions regarding the frequency and procedure for recommended maintenance.
- Maintenance instructions for the repair and replacement of installed components.
- Parts listing with descriptions and illustrations for identification.
- Warranty descriptions and coverage.

The CD-ROM shall incorporate a navigation page with electronic links to the operator’s manual, service manual, parts manual, and warranty information, as well as instructions on how to use the manual. Each copy shall include a table of contents with links to the specified documents or illustrations.



The CD must be formatted in such a manner as to allow not only the printing of the entire manual, but to also the cutting, pasting, or copying of individual documents to other electronic media, such as electronic mail, memos, and the like.

A find feature shall be included to allow for searches by text or by part number.

These electronic manuals shall be accessible from any computer operating system capable of supporting portable document format (PDF). Permanent copies of all pertinent data shall be kept file at both the local dealership and at the manufacturer`s location.