

URBAN ELECTRIC VEHICLE (UEV) TECHNICAL SPECIFICATIONS

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Prepared by
Electric Transportation Applications

MINIMUM UEV REQUIREMENTS

The UEVAmerica Program is sponsored by the U.S. Department of Energy Office of Transportation Technology to provide for an independent assessment of urban electric vehicles (UEV), designed specifically for use in an urban (surface street) environment with speeds no greater than 45 mph. Vehicles tested under this program are evaluated against specific qualitative and quantitative metrics. The results provide potential users a method for comparing various UEVs against consistent standards and against each other, comparisons that might not otherwise be possible. The U.S. Department of Energy recognizes the UEVAmerica program as requisite for funding of programs involving UEVs.

For a vehicle to be considered qualified for testing under the UEV America Program, it must comply with the minimum criteria defined by “shall” terminology utilized in the Specification. [For clarity, the use of the word “Shall” defines minimum requirements, whereas the use of the word “Should” defines design and performance objectives.] Vehicles that do not or cannot comply with all of the “Shall” requirements will be considered Prototypes, and will not be considered as having successfully completed the Program. The following requirements have been extracted from the body of the Vehicle Specification for convenience and clarity. In these requirements and in the Vehicle Specification, the term “Supplier” refers to the vehicle manufacturer. All of the following requirements must be met by any vehicle before it can receive consideration under the UEV America Program.

- (1) Vehicles shall comply with Federal Motor Vehicle Safety Standards applicable on the date of manufacture and such compliance shall be certified by the manufacturer in accordance with 49 CFR 567. If the vehicle is a converted vehicle, both the OEM, and Converter Manufacturer Certification labels, shall be visible per the requirements of 49 CFR 567. Suppliers shall provide a completed copy of Appendix A and Appendix B, providing vehicle specifications indicating the method of compliance with each required section of 49 CFR 571. If certification includes exemption, the exemption number issued by the National Highway Transportation Safety Administration (NHTSA), the date of its publication in the Federal Register and the page number(s) of the Federal Register acknowledging issuance of the exemption shall be provided along with Appendix B. Exemptions for any reason other than non-applicability shall not be allowed.
- (2) Suppliers shall supply Material Safety Data Sheets (MSDS) for all batteries the vehicle is equipped with, including auxiliary batteries
- (3) Suppliers shall provide information on their selected battery manufacturer’s recycling plan including how it has been implemented.
- (4) All vehicles shall comply with the FCC requirements for unintentional emitted electromagnetic radiation, as identified in 47 CFR 15, Subpart B, “Unintentional Radiators.”
- (5) Vehicles shall have a minimum payload of 400 pounds.
- (6) For conversions, OEM GVWR shall not be increased. For conversion vehicles, Suppliers shall specify the OEMs gross vehicle weight rating (GVWR).

- (7) For conversions, OEM Gross Vehicle Axle Weight Ratings (GAWR) shall not be increased. Suppliers shall provide axle weights for the vehicle as delivered, and at full rated payload.
- (8) Speedometers shall be provided and shall have an accuracy of at least $\pm 5\%$ at 45 mph. Odometers shall be provided as standard equipment or as an option and shall have an accuracy of at least $\pm 5\%$.
- (9) Tires shall be subject to the following requirements:
 - Tires provided with the vehicle shall be the standard tire for the vehicle being proposed.
 - Tires shall correspond to the requirements of the placard installed in accordance with 49 CFR 571.109 and 110, or 119 and 120, as applicable.
 - Suppliers shall specify manufacturer, model and size of the standard tire.
 - Tires sizes and inflation pressures shall be in accordance with the requirements of the placard.
 - At no time shall the tire's inflation pressure exceed the maximum pressure imprinted upon that tire's sidewall.
 - The tire shall be operable across the entire operation/load range of that vehicle.
 - Replacement tires shall be commercially available.
 - Tires provided as original equipment shall not have warranty restrictions in excess of those of the tire's manufacturer, unless the vehicle Supplier is the sole warrantor for the tires.
 - If the vehicle may be equipped with more than one standard tire, this information shall be provided for each type/manufacturer of each standard tire.
- (10) Seating capacity shall be a minimum of 1 driver. Suppliers shall specify seating capacity (available seat belt positions) for their vehicle. If the vehicle's seating capacity is changed from that specified by the OEM on their FMVSS placard, the seat(s) being added or abandoned shall be modified as required by 49 CFR 571.207, et al, and a new FMVSS placard installed as required by 49 CFR 567, 568 or 571, as applicable.
- (11) For conversion vehicles, the OEM passenger space shall not be intruded upon by the battery, battery box or other conversion materials. All vehicles shall comply with the requirements of 49 CFR 571.305
- (12) The vehicle speed shall be limited below maximum speed for reverse travel.
- (13) Vehicles shall comply with the requirements of 49 CFR 571.105.S5.2.1, or alternatively, 49 CFR 571.105.S5.2.2 for parking mechanisms.

- (14) The controller/inverter shall control the minimum traction battery discharge voltage to prevent degradation of battery life and abrupt loss of controller/inverter function, and should limit the maximum regeneration voltage to prevent external gassing of the batteries.
- (15) If different, customer available and battery available DOD ratings shall both be provided.
- (16) Batteries shall comply with the requirements of SAE J1718 APR97.

Propulsion batteries shall meet the requirements of NEC 625 and UL-2202 for charging in enclosed spaces without a vent fan. The vehicle shall be labeled as not requiring ventilation for charging (or have the appropriate classification label from a UL-recognized Testing Laboratory). Vented batteries shall not be used.
- (17) Batteries and/or battery enclosures shall meet the requirements of SAE J1766 FEB96 and shall be designed and constructed in such a way that batteries and electrolyte will not intrude into the passenger compartment during or following FMVSS frontal barrier, rear barrier and side impact collisions, and roll-over requirements of 49 CFR 571.301. The test vehicles shall also comply with the requirement of proposed 49 CFR 571.305. Suppliers shall provide verification of conformance to these requirements.
- (18) Concentrations of explosive gases shall not be allowed to exceed 25% of the LEL (Lower Explosive Limit) in the battery box. Suppliers shall describe how battery boxes will be vented, to allow any battery gases to escape safely to atmosphere during and following normal or abnormal charging and operation of the vehicle. Suppliers shall provide a verification of conformance to SAE J1718 APR97 on Battery Gas Evolution.
- (19) Suppliers shall verify that the method(s) of charging the propulsion batteries and the charging algorithm(s) do not impact the battery supplier's warranty available to the end-user
- (20) Supplier's shall provide a detailed description of the BMS operation. The description of the driver interface shall be consistent with that provided in the owner's manual.
- (21) Vehicles shall not contain exposed conductors, terminals, contact blocks or devices of any type that create the potential for personnel to be exposed to 50 volts or greater (the distinction between low-voltage and high voltage, as specified in SAE J1127, J1128, et al.). Access to any high voltage components shall require the removal of at least one bolt, screw, or latch. Devices considered to be high voltage components shall be clearly marked as HIGH VOLTAGE. Additionally, cable and wire marking shall consist of orange wire and/or orange sleeving as identified in SAE-J1127 MAR88.

- (22) Propulsion power shall be isolated from the vehicle chassis such that leakage current does not exceed 0.5 MIU. Charging circuits shall be isolated from the vehicle chassis such that ground current from the grounded chassis does not exceed 5 mA at any time the vehicle is connected to an off-board power supply. Furthermore, for impact conditions, the vehicles shall also comply with the requirement of proposed 49 CFR 571.305. Suppliers shall provide verification of conformance to these requirements.
- (23) Vehicles shall be equipped with an automatic disconnect for the main propulsion batteries. The disconnect shall operate to isolate the propulsion circuits any time the chassis becomes energized from contact with the propulsion battery or its associated circuits. This disconnect shall be capable of interrupting maximum rated controller/inverter current. The Supplier shall describe the automatic disconnect provided for the main propulsion batteries.

A manual service disconnect shall also be required. A decal or other label denoting the location of the device shall be affixed to the inside of the vehicle such that it is visible to individuals located outside the vehicle. It (the disconnect) shall include the following capabilities:

- Have manual action to break the connection
- The disconnection is physically verifiable
- The disconnection does not create exposed conductors capable of becoming energized while exposed.

Alternately, the key switch may be used to satisfy the operability portion of the manual service disconnect requirement, if it interrupts all control power going to the controller and the main battery contactor(s).

- (24) The vehicle shall be prevented from being driven with the key turned on and the drive selector in the "DRIVE" or "REVERSE" position while the vehicle's charge cord is attached. Additionally, the following interlocks shall be present:
- The controller shall not initially energize to move the vehicle with the gear selector in any position other than "PARK" or "NEUTRAL;"
 - The start key shall be removable only when the "ignition switch" is in the "OFF" position, with the drive selector in "PARK;"
 - With a pre-existing accelerator input, the controller shall not energize or excite such that the vehicle can move under its own power from this condition.
- (25) The vehicle shall include a state of charge indicator for the main propulsion batteries. Indications should be accurate to within 5% of full scale throughout its useable range.

- (26) Vehicles shall be supplied with a battery charger capable of recharging the main propulsion battery to a state of full charge from any possible state of discharge in less than twelve (12) hours at temperatures noted in Section 5.5.
The charger shall be fully automatic, determining when “end of charge” conditions are met and transitioning into a mode that maintains the main propulsion battery at a full state of charge while not overcharging it, if continuously left on charge.
- (27) Chargers shall have the capability of accepting input voltages of 120 or 208/240V single phase 60 Hertz alternating current service, with a tolerance of 10% of rated voltage. On-board personnel protection systems, which may include ground fault circuit interrupters (GFCI), shall be in accordance with the provisions of UL Standard 2202, June 1999.
- (28) Chargers shall have a true power factor of .95 or greater and a harmonic distortion of the current of less than 20%, when operating at full rated load.
- (29) Regardless of the charger type used, the charger shall conform to the requirements of UL Standard 2202, June 1999.
- (30) The installation of options shall not relieve Suppliers of meeting other “shall” requirements.
- (31) If fuel fired heaters are used, they shall meet the requirements of Section 1.2. Further, heater fuel containments shall meet the requirements of 49 CFR 571.301.
- (32) If a 120V charger is supplied, this charger shall comply with the requirements of Section 7.2 for isolation and Section 8.2 for personnel protection.
- (33) Vehicles shall be accompanied by non-proprietary manuals for parts, service, operation and maintenance, interconnection wiring diagrams and schematics, (with pricing for optional manuals).

The following sections constitute the Technical Requirements of the Vehicle Specification. Information has been categorized according to component and/or function. These sections provide an overview of the requirements and recommendations for Suppliers to use. This Technical Specification establishes the minimum requirements for Production level urban electric vehicles, as well as identifying design and performance objectives.

No inference should be drawn by Suppliers or any other person that the measures listed in this specification are sufficient to make the vehicle safe. Each Supplier shall acknowledge **in writing** that 1) it is solely responsible for determining whether each vehicle offered for sale is safe, and 2) it is not relying on Electric Transportation Applications or the U.S. Government as having, by this specification and its requirements, established minimally sufficient safety standards. This written statement shall be provided with the Supplier’s submittal.

1.0 REGULATORY REQUIREMENTS

1.1 FMVSS CERTIFICATION

Vehicles shall comply with Federal Motor Vehicle Safety Standards applicable on the date of manufacture and such compliance shall be certified by the manufacturer in accordance with 49 CFR 567. If the vehicle is a converted vehicle, both the OEM, and Converter Manufacturer Certification labels, shall be visible per the requirements of 49 CFR 567. Suppliers shall provide a completed copy of Appendix A and Appendix B, providing vehicle specifications indicating the method of compliance with each required section of 49 CFR 571. If certification includes exemption, the exemption number issued by the National Highway Transportation Safety Administration (NHTSA), the date of its publication in the Federal Register and the page number(s) of the Federal Register acknowledging issuance of the exemption shall be provided along with Appendix B. Exemptions for any reason other than non-applicability shall not be allowed.

1.2 ZEV CERTIFICATION

Vehicles should be certifiable under current California Air Resources Board (CARB) regulations as zero-emission vehicles. Further, the vehicle should conform to Environmental Protection Agency (EPA) requirements for receiving a ZEV Certificate of Conformity. If the vehicle is certified as other than ZEV (e.g., ULEV), similar documentation should be provided.

1.3 SAFETY FEATURES

Suppliers should describe safety measures and safety-related design features included in their vehicle design and provide an explanation of the purpose and anticipated effect on vehicle reliability and performance of any such safety measure or design feature.

1.4 MATERIAL SAFETY DATA SHEETS

Suppliers shall supply Material Safety Data Sheets (MSDS) for all batteries the vehicle is equipped with, including auxiliary batteries.

1.5 BATTERY RECYCLING PLANS

Suppliers shall provide information on their selected battery manufacturer's recycling plan including how it has been implemented. This plan should also identify post-purchase costs associated with recycling that will be passed on to the vehicle purchaser.

1.6 FEDERAL COMMUNICATIONS REQUIREMENTS

All vehicles shall comply with the FCC requirements for unintentional emitted electromagnetic radiation, as identified in 47 CFR 15, Subpart B, "Unintentional Radiators."

2.0 CHASSIS

2.1 RATED PAYLOAD

Vehicles shall have a minimum payload of 400 pounds.

2.2 CURB WEIGHT AND GROSS VEHICLE WEIGHT RATING (GVWR)

For conversions, OEM GVWR shall not be increased. Suppliers should provide the curb weight, rated payload and GVWR of their vehicles. For conversion vehicles, Suppliers shall specify the OEMs gross vehicle weight rating (GVWR).

2.3 VEHICLE WEIGHT DISTRIBUTION

For conversions, OEM Gross Vehicle Axle Weight Ratings (GAWR) shall not be increased. Suppliers shall provide axle weights for the vehicle as delivered, and at full rated payload.

2.4 SPEEDOMETER AND ODOMETER

Speedometers shall be provided and shall have an accuracy of at least $\pm 5\%$ at 45 mph. Odometers shall be provided as standard equipment or as an option and shall have an accuracy of at least $\pm 5\%$.

2.5 BRAKING AND STEERING PERFORMANCE

For conversions, braking and steering efforts should be similar to OEM models of comparable size and weight that are equipped with power brakes and power steering.

2.6 TIRES

Tires shall be subject to the following requirements:

- Tires provided with the vehicle shall be the standard tire offered for the vehicle being proposed.
- Tires shall correspond to the requirements of the placard installed in accordance with 49 CFR 571.109 and 110, or 119 and 120, as applicable.
- Suppliers shall specify manufacturer, model and size of the standard tire.
- Tires sizes and inflation pressures shall be in accordance with the requirements of the placard.
- At no time shall the tire's inflation pressure exceed the maximum pressure imprinted upon that tire's sidewall.
- The tire shall be operable across the entire operation/load range of that vehicle.
- Replacement tires shall be commercially available.

2.6 TIRES (continued)

- Tires provided as original equipment shall not have warranty restrictions in excess of those of the tire's manufacturer, unless the vehicle Supplier is the sole warrantor for the tires.
- If the vehicle may be equipped with more than one standard tire, this information shall be provided for each type/manufacturer of each standard tire.

Additionally, the tires should meet the following requirement:

- The standard tire should be a low-rolling-resistance tire.

2.7 GROUND CLEARANCE

Vehicles should have a ground clearance of at least five (5) inches to all sprung portions of the vehicle, with the vehicle loaded to GVWR.

3.0 VEHICLE CHARACTERISTICS

3.1 SEATING CAPACITY

Seating capacity shall be a minimum of 1 driver. Suppliers shall specify seating capacity (available seat belt positions) for their vehicle. If the vehicle's seating capacity is changed from that specified by the OEM on their FMVSS placard, the seat(s) being added or abandoned shall be modified as required by 49 CFR 571.207, et al, and a new FMVSS placard installed as required by 49 CFR 567, 568 or 571, as applicable.

3.2 PASSENGER AND CARGO SPACE

For conversion vehicles, the OEM passenger space shall not be intruded upon by the battery, battery box or other conversion materials. Suppliers should specify interior passenger and cargo dimensions and volumes. All vehicles shall comply with the requirements of 49 CFR 571.305.

3.3 ELECTROMAGNETIC SUSCEPTIBILITY

Vehicles should comply with the relevant sections of SAE J551 JUN94, "Test Limits and Methods of Measurement of Radio Disturbance Characteristics of Vehicles and Devices, Broadband and Narrowband, 150kHz to 1000MHz" for electromagnetic radiated fields. Vehicles should not be susceptible to externally generated electromagnetic radiation from an on-board transmitter (i.e., interaction will not render the vehicle un-safe or preclude operation of any systems required for safe operation of the vehicle).

Vehicles should be designed to minimize occupant exposure to electromagnetic fields generated by the propulsion system.

4.0 DRIVE SYSTEM

4.1 TRANSMISSION

The vehicle should utilize a single speed or multi-speed automatic transmission and a parking mechanism. The vehicle speed shall be limited below maximum speed for reverse travel.

4.2 PARKING MECHANISM

Vehicles shall comply with the requirements of 49 CFR 571.105.S5.2.1, or alternatively, 49 CFR 571.105.S5.2.2 for parking mechanisms.

4.3 REGENERATIVE BRAKING SYSTEM

Regenerative braking should not adversely impact the vehicle's braking ability on varying road surfaces to such extent that the vehicle's certification to 49 CFR 571.105 or 49 CFR 571.135 (as applicable) is impacted. Suppliers should describe the operation of the regenerative braking system and its interface with braking and anti-lock brake systems.

4.4 OVERHEATING

The vehicle motor and controller/inverter should be capable of continuous operation at maximum vehicle speed and/or sustained grades without overheating or loss of component life.

4.5 BATTERY VOLTAGE LIMITS

The controller/inverter shall control the minimum traction battery discharge voltage to prevent degradation of battery life and abrupt loss of controller/inverter function, and should limit the maximum regeneration voltage to prevent external gassing of the batteries. Suppliers should specify the voltage limits and describe how these limits are implemented.

4.6 DRIVE TRAIN

Drive train components should not produce or develop unusual vibrations over the entire design speed range of the vehicle.

5.0 VEHICLE PERFORMANCE

5.1 ACCELERATION

The vehicle should have a 0-30 mph acceleration time of 8.5 seconds, or less, when operated with a payload of 332 pounds and starting with batteries at a 50% State of Charge.

5.2 MINIMUM TOP SPEED

The vehicle should have a minimum top speed of 45 MPH within 1 mile, when operated with a payload of 332 pounds and starting with batteries at a 50% state of charge.

5.3 LOW SPEED GRADEABILITY

Vehicles should be capable of starting and ascending a 25% grade when operated with a payload of 332 pounds and starting with batteries at 50% state of charge.

5.4 RANGE BETWEEN CHARGES

Vehicles should have a range of at least 30 miles when operated with a payload of 332 pounds and subjected to the UDS Drive Cycle (established in SAE J1634 MAY93) at an ambient temperature of $77 \pm 9^{\circ}\text{F}$.

5.5 TEMPERATURE DURABILITY

Vehicles should be capable of standing for extended periods in extreme temperatures without damage to or failure of the vehicle or its systems. This includes ambient air temperatures of -20F to +120F, paved surface temperatures greater than 150F, and occupant compartment temperatures exceeding 170F.

5.6 WATER DURABILITY

Vehicles should be able to endure two (2) inches of standing water at a speed of 20 mph without damage, without becoming inoperable, and without battery to chassis leakage current exceeding 0.5 MIU per UL Standard 2202, June 1999.

6.0 BATTERY

6.1 BATTERY TYPE

Suppliers should provide a detailed description of the main propulsion battery pack (including specific energy, specific power and discharge capacity to 80% DOD at the one-hour and three-hour rates), battery pack voltage, number of battery modules, and a summary of previous battery performance tests. Summary results of actual performance tests or computer simulations of the proposed battery in a compact pick-up or sedan should also be provided. If different, customer available and battery available DOD ratings shall both be provided.

6.2 BATTERY CHARACTERISTICS

Batteries shall comply with the requirements of SAE J1718 APR97. Suppliers should describe projected charge cycles at a specified level of discharge, how battery life is maximized, how end of life of each battery module and of the full battery pack is determined and how battery temperature gradients are minimized. Suppliers should specify maximum normal and abnormal gassing rates for the battery pack.

Propulsion batteries shall meet the requirements of NEC 625 and UL-2202 for charging in enclosed spaces without a vent fan. The vehicle shall be labeled as not requiring ventilation for charging (or have the appropriate classification label from a UL-recognized Testing Laboratory). Vented batteries shall not be used.

6.3 BATTERY PACK

Suppliers should specify the weight of each battery module, and the weight of the battery pack (including removable pack structures). Suppliers should describe how batteries are installed in the vehicle (including details of module connection), the method of installation and removal of the batteries (and the battery box, if required) for maintenance and repair, the time required for battery removal and any special training, tools or equipment required for battery removal.

6.4 ELECTROLYTE CONTAINMENT

Batteries and/or battery enclosures shall meet the requirements of SAE J1766 FEB96 and shall be designed and constructed in such a way that batteries and electrolyte will not intrude into the passenger compartment during or following FMVSS frontal barrier, rear barrier and side impact collisions, and roll-over requirements of 49 CFR 571.301. The test vehicles shall also comply with the requirement of proposed 49 CFR 571.305. Suppliers shall provide verification of conformance to these requirements.

6.5 BATTERY BOX

Concentrations of explosive gases shall not be allowed to exceed 25% of the LEL (Lower Explosive Limit) in the battery box. Suppliers shall describe how battery boxes will be vented, to allow any battery gases to escape safely to atmosphere during and following normal or abnormal charging and operation of the vehicle. Suppliers shall provide a verification of conformance to SAE J1718 APR97 on Battery Gas Evolution.

Suppliers should describe the methods used to prevent or accommodate condensation in the battery box, and the quantity and maximum rate of explosive gas generation, by gas type, under normal and abnormal charging conditions.

6.6 PARALLEL BATTERY PACKS

Suppliers should not provide vehicles with parallel battery packs. If a Supplier provides a vehicle with parallel battery packs, the Supplier should provide detailed information on the equipment and charging algorithms required to prevent the parallel strings from becoming unbalanced.

6.7 BATTERY MAINTENANCE

Maintenance requirements for the propulsion batteries should be described and any associated cost(s) to the consumer/end user should be clearly defined.

6.8 BATTERY CHARGING ALGORITHM

Suppliers shall verify that the method(s) of charging the propulsion batteries and the charging algorithm(s) do not impact the battery supplier's warranty available to the end-user. The charging algorithm(s) should have been reviewed and approved by the battery manufacturer.

6.9 BATTERY MANAGEMENT SYSTEM

The vehicle should be equipped with a Battery Management System (BMS). This system should control propulsion battery pack and module voltages, temperatures and state of charge. Further, the BMS should automatically limit battery discharge below a pre-determined minimum level. Supplier's shall provide a detailed description of the BMS operation. The description of the driver interface shall be consistent with that provided in the owner's manual.

The charger system should include equipment to maintain each module in the battery pack at equal temperature and within the allowed temperature range of the battery throughout each charge-discharge cycle.

7.0 ELECTRICAL

7.1 ELECTRICAL SAFETY

Vehicles shall not contain exposed conductors, terminals, contact blocks or devices of any type that create the potential for personnel to be exposed to 50 volts or greater (the distinction between low-voltage and high voltage, as specified in SAE J1127, J1128, et al.). Access to any high voltage components shall require the removal of at least one bolt, screw, or latch. Devices considered to be high voltage components shall be clearly marked as HIGH VOLTAGE. These markings should be installed at any point the voltage can be accessed by the end user. Additionally, cable and wire marking shall consist of orange wire and/or orange sleeving as identified in SAE-J1127 MAR88.

7.2 ELECTRICAL ISOLATION

Propulsion power shall be isolated from the vehicle chassis such that leakage current does not exceed 0.5 MIU. Charging circuits shall be isolated from the vehicle chassis such that ground current from the grounded chassis does not exceed 5 mA at any time the vehicle is connected to an off-board power supply. Suppliers should provide details on grounding and isolation methods. Furthermore, for impact conditions, the vehicles shall also comply with the requirement of proposed 49 CFR 571.305. Suppliers shall provide verification of conformance to these requirements.

7.3 BATTERY DISCONNECT

Vehicles shall be equipped with an automatic disconnect for the main propulsion batteries. The disconnect shall operate to isolate the propulsion circuits any time the chassis becomes energized from contact with the propulsion battery or its associated circuits. This disconnect shall be capable of interrupting maximum rated controller/inverter current. The Supplier shall describe the automatic disconnect provided for the main propulsion batteries.

A manual service disconnect shall also be required. A decal or other label denoting the location of the device shall be affixed to the inside of the vehicle such that it is visible to individuals located outside the vehicle. The requirements for visibility and labeling should be the same as those denoted in 49 CFR 565 for VIN labels. This disconnect should be operable from the driver's seated position. It shall include the following capabilities:

- Have manual action to break the connection
- The disconnection is physically verifiable
- The disconnection does not create exposed conductors capable of becoming energized while exposed.

7.3 BATTERY DISCONNECT (continued)

Alternately, the key switch may be used to satisfy the operability portion of the manual service disconnect requirement, if it interrupts all control power going to the controller and the main battery contactor(s). The manual service disconnect is not required to operate under load.

7.4 SAFETY INTERLOCK SYSTEM

The vehicle shall be prevented from being driven with the key turned on and the drive selector in the "DRIVE" or "REVERSE" position while the vehicle's charge cord is attached. Additionally, the following interlocks shall be present:

- The controller shall not initially energize to move the vehicle with the gear selector in any position other than "PARK" or "NEUTRAL;"
- The start key shall be removable only when the "ignition switch" is in the "OFF" position, with the drive selector in "PARK;"
- With a pre-existing accelerator input, the controller shall not energize or excite such that the vehicle can move under its own power from this condition.

7.5 OPERATION OF HAZARD LIGHTS

Hazard lights should be capable of at least one hour of continuous operation in the event of shutdown or isolation of the main battery pack or failure of the DC/DC converter system as described in SAE J590b.

7.6 STATE OF CHARGE INDICATOR

The vehicle shall include a state of charge indicator for the main propulsion batteries. Indications should be accurate to within 5% of full scale throughout its useable range.

7.7 CONNECTORS

High voltage plugs, receptacles and couplers should meet the proposed requirements of UL2251-1.

Low voltage connectors should meet the requirements of applicable SAE Standards, including J163, J561, J858, et al.

High voltage connectors should utilize locking devices, should be keyed to prevent mis-connection, and should be moisture proof.

8.0 CHARGER SYSTEM

8.1 CHARGER OPERATIONS

Vehicles shall be supplied with a battery charger capable of recharging the main propulsion battery to a state of full charge from any possible state of discharge in less than twelve (12) hours at temperatures noted in Section 5.5. The preferred recharge time should be less than eight (8) hours.

The charger should maintain each battery module at a consistent state of charge over the life cycle of the battery. The charger should not charge the batteries in a manner that would cause venting of gas or liquid. The charger shall be fully automatic, determining when "end of charge" conditions are met and transitioning into a mode that maintains the main propulsion battery at a full state of charge while not overcharging it, if continuously left on charge. The charger should also minimize the energy required to maintain the main propulsion battery in a fully charged state, particularly during extended periods on charge.

8.2 CHARGING INPUT POWER

Chargers shall have the capability of accepting input voltages of 120 or 208/ 240V single phase 60 Hertz alternating current service, with a tolerance of 10% of rated voltage. On-board personnel protection systems, which may include ground fault circuit interrupters (GFCI), shall be in accordance with the provisions of UL Standard 2202, June 1999.

8.3 POWER QUALITY

Chargers shall have a true power factor of .95 or greater and a harmonic distortion of the current of less than 20%, when operating at full rated load.

8.4 VEHICLE CHARGER CONNECTIONS

Suppliers should describe the type, size and location of the point of the vehicle charging port. The charge connector should comply with the requirements of SAE J1772 or SAE J1773, as appropriate. Regardless of the charger type used, the charger shall conform to the requirements of UL Standard 2202, June 1999.

9.0 OPTIONS

Suppliers should describe the following options, which are to be priced separately from the base vehicle. The installation of options shall not relieve Suppliers of meeting other “shall” requirements. Suppliers should specify the impact on range and payload for each option. Suppliers are encouraged to include pricing and technical information on the following options.

9.1 AIR CONDITIONING SYSTEM

Suppliers should describe the design of the air conditioning system and verify that it uses no chloroflourocarbons (CFCs).

9.2 OCCUPANT COMPARTMENT PRE-HEATING AND COOLING SYSTEM

Suppliers should briefly describe the design of a pre-heating and pre-cooling system that allows passenger compartment temperatures to be maintained while the vehicle is on charge.

9.3 RANGE EXTENSION OPTIONS

Suppliers should describe options that increase the vehicle’s range between recharges. Such options may include, but should not be limited to, advanced batteries and more efficient drive systems.

9.4 COLD WEATHER RANGE EXTENSION

Suppliers should describe the design of a system that will ensure a vehicle range of at least 30 miles when subjected to the UDS Drive Cycle contained in SAE J1634 MAY93 with the vehicle operated in an outdoor ambient temperature that does not exceed 25F after the vehicle has been parked for 48 hours at ambient 10F with the vehicle plugged in. This system should operate concurrent with the charging system, and should not require the use of additional connection points. It should not require manual intervention, and should operate at all input voltages for which the charger is rated

9.5 PASSENGER COMPARTMENT HEATER

Suppliers should describe the design feature(s) that ensure the vehicle heating system is capable of maintaining interior temperatures of at least 65F at an ambient temperature of 10F. If fuel fired heaters are used, they shall meet the requirements of Section 1.2. Further, heater fuel containments shall meet the requirements of 49 CFR 571.301.

9.6 CONTROLLER/INVERTER DIAGNOSTIC SYSTEM

Suppliers should describe a diagnostic system for the controller/inverter.

9.7 120V CHARGER

Suppliers should make available a 120V charger, either as permanent installation or as a portable carry-on. This charger shall comply with the requirements of Section 7.2 for isolation and Section 8.2 for personnel protection. The charger should recharge the vehicle as quickly as possible from a 15A single phase GFCI breaker.

9.8 AMMETER

Suppliers should offer an ammeter or similar indicator capable of providing an indication of the charging and discharging currents of the propulsion battery.

9.9 AMP-HOUR INDICATOR

The vehicle should include at least one of the following devices:

- An amp-hour indicator which integrates on both charge and discharge
 - A kilowatt meter capable of measuring power out of the main propulsion batteries
- If an ammeter or kilowatt meter is used, it should also provide measurement of current or power

10.0 DOCUMENTATION

10.1 SERVICE MANUALS

Vehicles shall be accompanied by non-proprietary manuals for parts, service, operation and maintenance, interconnection wiring diagrams and schematics, (with pricing for optional manuals). Included should be details on the design and operation of vehicle systems, as well as prices and availability of parts and service and a list of additional or special maintenance tools required.

10.2 TRAINING PROGRAM

Suppliers should offer a training program for the purchaser's maintenance personnel covering vehicle safety and proper operation and maintenance of vehicles.

APPENDIX A

PERFORMANCE

Time required to accelerate from 0-30 on a level grade _____
Maximum speed attainable on a level grade _____
Maximum grade attainable from a standing start _____
Range at a constant speed of 45 mph _____
Range over the SAE J1634 UDS drive cycle _____

BATTERY CHARACTERISTICS (referenced to 25°C)

Manufacturer _____
Model _____
Type _____
Description _____
Vehicle requires ventilation per NEC 625 and UL-2202 ☐ Yes ☐ No
Batteries labeled by UL recognized authority as not requiring ventilation ☐ Yes ☐ No
Number of batteries in the pack _____
Arrangement (series or parallel) _____
Battery module voltage _____
Battery pack voltage _____
Battery module weight _____ kg
Battery pack weight (including removable pack structures) _____ kg
Maximum normal gassing rate (cc/min) _____ volume (cc) _____
Maximum abnormal gassing rate (cc/min) _____ volume (cc) _____
Battery capacity to 100% Manufacturer's DOD, 1 hour rating (Ah) _____
Battery capacity to 100% Manufacturer's DOD, 2 hour rating (Ah) _____
Battery capacity to 100% Manufacturer's DOD, 3 hour rating (Ah) _____
Battery energy to 100% Manufacturer's DOD, 1 hour rating (Wh) _____
Battery energy to 100% Manufacturer's DOD, 2 hour rating (Wh) _____
Battery energy to 100% Manufacturer's DOD, 3 hour rating (Wh) _____
Probable life of an average battery (number of cycles) to a Manufacturer's DOD of:
50% _____
80% _____
Price of replacement batteries, per battery module (\$) _____
Price of replacement for entire battery pack (\$) _____
Time required to recharge the batteries at 208V from a Customer's DOD of:
50% _____
80% _____
Maximum recommended Customer DOD _____ % _____ Ah
Battery specific power at 0% DOD _____ Wh/kg

APPENDIX A (continued)

CHARGER CHARACTERISTICS

Manufacturer _____
Model _____
UL file number _____
Description _____
Location _____
Charger efficiency at rated load (%) _____
Charger input voltages (VAC) _____
Charger input power factor at rated load (%) _____
Charger input total harmonic distortion at rated load (%) _____
Maximum charger current output at rated power (A) _____

MOTOR CHARACTERISTICS

Manufacturer _____
Model _____
Description _____
Type (AC, DC, Brushless, etc.) _____
Rated efficiency _____ % @ _____ kW
Operating range (RPM) _____
Maximum intermittent power _____ kW for _____ minutes
Maximum continuous power _____
Cooling medium and method _____

CONTROLLER CHARACTERISTICS

Manufacturer _____
Model _____
Description _____
Type and Phase _____
Input Voltage Range _____
Maximum Output (A) _____
Type of Power Electronics (IGBT, mosfet, etc.) _____
Rated Efficiency _____ % @ _____ A
Method used to limit maximum battery discharge _____

APPENDIX A (continued)

TRANSMISSION CHARACTERISTICS

Manufacturer _____
Type _____
Model _____
Description _____
Gear Ratio(s) _____

CHASSIS CHARACTERISTICS - Pre-Conversion

Make, Year and Model _____
Gross vehicle weight rating (kg) _____
Gross axle weight rating (kg) _____ front _____ rear
Curb weight (kg) _____
Weight distribution _____ % front _____ % rear
Payload capacity (kg) _____
Ground clearance from lowest point on chassis at GVWR (cm) _____
Drive wheels (F/R) _____
Number of seating positions _____
Passenger area dimension _____
Passenger area volume _____
Cargo area dimensions _____
Cargo area volume _____
Wheelbase _____ inches
Track _____ inches front _____ inches rear
Body height _____ inches
Body width _____ inches

CHASSIS CHARACTERISTICS - Post-Conversion

Make, Year and Model _____
Gross vehicle weight rating (kg) _____
Gross axle weight rating (kg) _____ front _____ rear
Curb weight (kg) _____
Weight distribution _____ % front _____ % rear
Payload capacity (kg) _____
Ground clearance from lowest point on chassis at GVWR (cm) _____
Drive wheels (F/R) _____
Number of seating positions _____
Passenger area dimension _____
Passenger area volume _____

APPENDIX A (continued)

CHASSIS CHARACTERISTICS - Post-Conversion (continued)

Cargo area dimensions _____
Cargo area volume _____
Wheelbase _____ inches
Track _____ inches front _____ inches rear
Body height _____ inches
Body width _____ inches

BRAKING

Type front _____
Type rear _____
Power source, if used _____
Average power, if used (W) _____
Maximum regenerative braking (kW) _____

TIRES

Manufacturer _____
Model _____
Description _____
Size and profile _____
Rolling resistance rating _____
Pressure (psi) _____ front _____ rear
Weight capacity (lbs) _____
Are these tires standard equipment ☐ or optional equipment ☐
Describe warranty term and coverage _____

SUSPENSION

Type front _____
Type rear _____
Modifications made during conversion, if any _____

STEERING

Type _____
Description _____
Manufacturer _____
Power source, if used _____
Average Power Required (W) _____

APPENDIX A (continued)

AIR CONDITIONING

Manufacturer _____

Model _____

Description _____

Compressor Type _____

Maximum cooling output (BTU/hr) _____

Motor type _____

Maximum power required (kW) _____

HEATING SYSTEMS

Manufacturer _____

Model _____

Description _____

Type _____

Maximum heating output (BTU/hr) _____

Maximum power required (kW) _____

Certifiable under CARB ZEV requirements Yes ☐ No ☐

EPA ZEV Certificate of Conformity Yes ☐ No ☐

APPENDIX A (continued)

REQUIRED SUBMITTALS

The following submittals are required from the Supplier prior to vehicle delivery.

- Each Supplier shall acknowledge **in writing** that 1) it is solely responsible for determining whether each vehicle offered for sale is safe, and 2) it is not relying on Electric Transportation Applications or the U.S. Government as having, by this specification and its requirements, established minimally sufficient safety standards.
- Suppliers should describe safety measures and safety-related design features included in their vehicle design and provide an explanation of the purpose and anticipated effect on vehicle reliability and performance of any such safety measure or design feature.
- Suppliers shall supply Material Safety Data Sheets (MSDS) for all batteries the vehicle is equipped with, including auxiliary batteries.
- Suppliers shall provide information on their selected battery manufacturer's recycling plan, including how it has been implemented. This plan should also identify post-purchase costs associated with recycling that will be passed on to the vehicle purchaser.
- Suppliers should specify interior passenger and cargo dimensions and volumes.
- Suppliers should describe the operation of the regenerative braking system and its interface with braking and anti-lock brake systems.
- Suppliers should specify the voltage limits which limit the maximum battery discharge and describe how these limits are implemented.
- Suppliers should provide a detailed description of the main propulsion battery pack (including specific energy, specific power and discharge capacity to 80% DOD at the one-hour and three-hour rates), battery pack voltage, number of battery modules, and a summary of previous battery performance tests. Summary results of actual performance tests or computer simulations of the proposed battery in a compact pick-up or sedan should also be provided.
- Suppliers should describe projected charge cycles at a specified level of discharge, how battery life is maximized, how end of life of each battery module and of the full battery pack is determined and how battery temperature gradients are minimized.
- Suppliers should describe how batteries are installed in the vehicle (including details of module connection), the method of installation and removal of the batteries (and the battery box, if required) for maintenance and repair, the time required for battery removal and any special training, tools or equipment required for battery removal.
- Suppliers shall provide verification of conformance to the requirements of Section 6.4 of UEV America Vehicle Technical Specification Revision 2, January 1, 2003.

APPENDIX A (continued)

- Suppliers shall describe how battery boxes will be vented, to allow any battery gases to escape safely to atmosphere during and following normal or abnormal charging and operation of the vehicle. Suppliers shall provide a verification of conformance to SAE J1718 APR97 on Battery Gas Evolution.
- Suppliers should describe the methods used to prevent or accommodate condensation in the battery box, and the quantity and maximum rate of explosive gas generation, by gas type, under normal and abnormal charging conditions.
- If a Supplier provides a vehicle with parallel battery packs, the Supplier should provide detailed information on the equipment and charging algorithms required to prevent the parallel strings from becoming unbalanced.
- Maintenance requirements for the propulsion batteries should be described and any associated cost(s) to the consumer/end user should be clearly defined.
- Suppliers shall verify that the method(s) of charging the propulsion batteries and the charging algorithm(s) do not impact the battery supplier's warranty available to the end-user. The charging algorithm(s) should have been reviewed and approved by the battery manufacturer.
- Supplier's shall provide a description of the BMS operation. This description shall be consistent with that provided in the owner's manual.
- Suppliers should provide details on grounding and isolation methods. Suppliers shall provide verification of conformance to the requirements of Section 7.2 of UEV America Vehicle Technical Specification Revision 2, January 1, 2003.
- The Supplier shall describe the automatic disconnect provided for the main propulsion batteries.
- Suppliers should describe the type, size and location of the point of the vehicle charging port.
- Suppliers should describe the following options (if available);
 - Air conditioning system
 - Occupant compartment pre-heating and pre-cooling system
 - Range extension options
 - Cold weather range extension
 - Passenger compartment heater
 - Controller/inverter diagnostic system
 - 120V charger
 - Ammeter
 - Amp-hour indicator

APPENDIX A (continued)

- Vehicles shall be accompanied by non-proprietary manuals for parts, service, operation and maintenance, interconnection wiring diagrams and schematics, (with pricing for optional manuals).

APPENDIX B - FMVSS Certification Methodology

	OEM Certified	Analysis Only	Test Only	Test & Analysis	Not Required	Not Certified
49 CFR 571.100 SERIES						
101 - Controls and Displays	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
102 - Transmission Shift Lever Sequence, Starter Interlock & Transmission Braking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
103 - Windshield Defrosting and Defogging Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
104 - Windshield Wiping and Washing Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
105 - Hydraulic Brake Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
106 - Brake Hoses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
107 - Reflecting Surfaces	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
108 - Lamps, Reflective Devices, and Associated Equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
109 - New Pneumatic Tires	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
110 - Tire Selection and Rims	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
111 - Rearview Mirrors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
113 - Hood Latch System	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
114 - Theft Protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
116 - Motor Vehicle Brake Fluids	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
117 - Retreaded Pneumatic Tires	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
118 - Power Operated Window, Partition, and Roof Panel Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
119 - New Pneumatic Tires for Vehicles Other Than Passenger Cars	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
120 - Tire Selection and Rims for Motor Vehicles Other Than Passenger Cars	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
121 - Air Brake Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
124 - Accelerator Control Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
125 - Warning Devices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
126 - Truck-Camper Loading	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
129 - New Non-Pneumatic Tires for Passenger Cars	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
135 - Passenger Car Brake Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX B (continued)

	OEM Certified	Analysis Only	Test Only	Test & Analysis	Not Required	Not Certified
49 CFR 571.200 SERIES						
201 - Occupant Protection in Interior Impact	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
202 - Head Restraints	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
203 - Impact Protection for the Driver from the Steering Control System	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
204 - Steering Control Rearward Displacement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
205 - Glazing Materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
206 - Door Locks and Door Retention Components	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
207 - Seating Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
208 - Occupant Crash Protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
209 - Seat Belt Assemblies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
210 - Seat Belt Assembly Anchorages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
212 - Windshield Mounting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
213 - Child Restraint Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
214 - Side Impact Protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
216 - Roof Crush Resistance - Passenger Cars	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
219 - Windshield Zone Intrusion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
225 - Child Restraint Anchorage System	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49 CFR 571.300 SERIES						
301 - Fuel System Integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
302 - Flammability of Interior Materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
305 - EV: Electrolyte Spillage and Shock Protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49 CFR 581						
Bumper Standard Requirements - All Sections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49 CFR 565						

Vehicle Identification Number Requirements

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