



**State of Oklahoma
Office of Management and Enterprise Services
Central Purchasing Division**

Solicitation

1. Solicitation #: SW797-1

2. Solicitation Issue Date: 07/30/2015

3. Brief Description of Requirement:

STATEWIDE CONTRACT FOR ADA TRANSIT VEHICLES

This solicitation is to add two (2) additional vehicle types to this contract. All previous awards remain.

4. Response Due Date¹: 09/30/2015

Time: 3:00 PM CST/CDT

5. Issued By and RETURN SEALED BID TO:

Personal or Common Carrier Delivery or U.S. Postal Delivery:

Office of Management and Enterprise Services
Central Purchasing Division
Will Rogers Building
2401 N. Lincoln Blvd, Suite 116,
Oklahoma City, OK 73105

6. Solicitation Type (check one below):

- ☐ Invitation to Bid
- ☐ Request for Proposal
- ☐ Request for Quote

7. Requesting Agency: OMES, CENTRAL PURCHASING

8. Contracting Officer:

Name: Laura Bybee

Phone: (405) 522-1037

Email: laura.bybee@omes.ok.gov

¹ Amendments to solicitation may change the Response Due Date (read CP GENERAL PROVISIONS, section 3, "Solicitation Amendments")



State of Oklahoma
Office of Management and Enterprise Services
Central Purchasing Division

Responding Bidder Information

"Certification for Competitive Bid and Contract" **MUST** be submitted along with the response to the Solicitation.

1. RE: Solicitation # SW797-1

2. Bidder General Information:

FEI / SSN : _____ VEN ID: _____

Company Name: _____

3. Bidder Contact Information:

Address: _____

City: _____ State: _____ Zip Code: _____

Contact Name: _____

Contact Title: _____

Phone #: _____ FAX#: _____

Email: _____ Website: _____

4. Oklahoma Sales Tax Permit²:

☐ YES – Permit #: _____

☐ NO – Exempt pursuant to Oklahoma Laws or Rules

5. Registration with the Oklahoma Secretary of State:

☐ YES - Filing Number: _____

☐ NO - Prior to the contract award, the successful bidder will be required to register with the Secretary of State or must attach a signed statement that provides specific details supporting the exemption the supplier is claiming (www.sos.ok.gov or 405-521-3911).

6. Workers' Compensation Insurance Coverage:

Bidder is required to provide with the bid a certificate of insurance showing proof of compliance with the Oklahoma Workers' Compensation Act.

☐ YES – include a certificate of insurance with the bid

☐ NO - attach a signed statement that provides specific details supporting the exemption you are claiming from the Workers' Compensation Act (Note: Pursuant to Attorney General Opinion #07-8, the exemption from 85 O.S. 2011, § 311 applies only to employers who are natural persons, such as sole proprietors, and does not apply to employers who are entities created by law, including but not limited to corporations, partnerships and limited liability companies.)³

Authorized Signature

Date

Printed Name

Title

² For frequently asked questions concerning Oklahoma Sales Tax Permit, see <http://www.tax.ok.gov/faq/faqbusssales.html>

³ For frequently asked questions concerning workers' compensation insurance, see <http://www.ok.gov/oid/faqs.html#c221>



State of Oklahoma
Office of Management and Enterprise Services
Central Purchasing Division

Certification for Competitive
Bid and/or Contract
(Non-Collusion Certification)

NOTE: A certification shall be included with any competitive bid and/or contract exceeding \$5,000.00 submitted to the State for goods or services.

Solicitation or Purchase Order #: SW797-1

Supplier Legal Name: _____

SECTION I [74 O.S. § 85.22]:

A. For purposes of competitive bid,

1. I am the duly authorized agent of the above named bidder submitting the competitive bid herewith, for the purpose of certifying the facts pertaining to the existence of collusion among bidders and between bidders and state officials or employees, as well as facts pertaining to the giving or offering of things of value to government personnel in return for special consideration in the letting of any contract pursuant to said bid;
2. I am fully aware of the facts and circumstances surrounding the making of the bid to which this statement is attached and have been personally and directly involved in the proceedings leading to the submission of such bid; and
3. Neither the bidder nor anyone subject to the bidder's direction or control has been a party:
 - a. to any collusion among bidders in restraint of freedom of competition by agreement to bid at a fixed price or to refrain from bidding,
 - b. to any collusion with any state official or employee as to quantity, quality or price in the prospective contract, or as to any other terms of such prospective contract, nor
 - c. in any discussions between bidders and any state official concerning exchange of money or other thing of value for special consideration in the letting of a contract.

B. I certify, if awarded the contract, whether competitively bid or not, neither the contractor nor anyone subject to the contractor's direction or control has paid, given or donated or agreed to pay, give or donate to any officer or employee of the State of Oklahoma any money or other thing of value, either directly or indirectly, in procuring this contract herein.

SECTION II [74 O.S. § 85.42]:

For the purpose of a contract for services, the supplier also certifies that no person who has been involved in any manner in the development of this contract while employed by the State of Oklahoma shall be employed by the supplier to fulfill any of the services provided for under said contract.

The undersigned, duly authorized agent for the above named supplier, by signing below acknowledges this certification statement is executed for the purposes of:

☐ the competitive bid attached herewith and contract, if awarded to said supplier;

OR

☐ the contract attached herewith, which was not competitively bid and awarded by the agency pursuant to applicable Oklahoma statutes.

Supplier Authorized Signature

Certified This Date

Printed Name

Title

Phone Number

Email

Fax Number

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A. GENERAL PROVISIONS

A.1. Definitions

As used herein, the following terms shall have the following meaning unless the context clearly indicates otherwise:

- A.1.1. "Acquisition" means items, products, materials, supplies, services, and equipment a state agency acquires by purchase, lease purchase, lease with option to purchase, or rental pursuant to the Oklahoma Central Purchasing Act;
- A.1.2. "Bid" means an offer in the form of a bid, proposal, or quote a bidder submits in response to a solicitation;
- A.1.3. "Bidder" means an individual or business entity that submits a bid in response to a solicitation;
- A.1.4. "Solicitation" means a request or invitation by the State Purchasing Director or a state agency for a supplier to submit a priced offer to sell acquisitions to the state. A solicitation may be an invitation to bid, request for proposal, or a request for quotation; and
- A.1.5. "Supplier" or "vendor" means an individual or business entity that sells or desires to sell acquisitions to state agencies.

A.2. Bid Submission

- A.2.1. Submitted bids shall be in strict conformity with the instructions to bidders and shall be submitted with a completed Responding Bidder Information, OMES-FORM-CP-076, and any other forms required by the solicitation.
- A.2.2. Bids shall be submitted to the Central Purchasing Division in a single envelope, package, or container and shall be sealed, unless otherwise detailed in the solicitation. The name and address of the bidder shall be inserted in the upper left corner of the single envelope, package, or container. SOLICITATION NUMBER AND SOLICITATION RESPONSE DUE DATE AND TIME MUST APPEAR ON THE FACE OF THE SINGLE ENVELOPE, PACKAGE, OR CONTAINER.
- A.2.3. The required certification statement, "Certification for Competitive Bid and/or Contract (Non-Collusion Certification)", OMES-FORM-CP-004, must be made out in the name of the bidder and must be properly executed by an authorized person, with full knowledge and acceptance of all its provisions.
- A.2.4. All bids shall be legible and completed in ink or with electronic printer or other similar office equipment. Any corrections to bids shall be identified and initialed in ink by the bidder. Penciled bids and penciled corrections shall NOT be accepted and will be rejected as non-responsive. In addition to a hard copy submittal, the bidder will also be required to submit an electronic copy. Electronic responses must be submitted in the identical format contained in the solicitation (for example Microsoft Word, Microsoft Excel, but not Adobe PDF). In the event the hard copy of the price worksheets and electronic copy of the price worksheets do not agree, the electronic copy will prevail.
- A.2.5. All bids submitted shall be subject to the Oklahoma Central Purchasing Act, Central Purchasing Rules, and other statutory regulations as applicable, these General Provisions, any Special Provisions, solicitation specifications, required certification statement, and all other terms and conditions listed or attached herein—all of which are made part of this solicitation.

A.3. Solicitation Amendments

- A.3.1. If an "Amendment of Solicitation", OMES-FORM-CP-011, is issued, the bidder shall acknowledge receipt of any/all amendment(s) to solicitations by signing and returning the solicitation amendment(s). Amendment acknowledgement(s) may be submitted with the bid or may be forwarded separately. If forwarded separately, amendment acknowledgement(s) must contain the solicitation number and response due date and time on the front of the envelope. The Central Purchasing Division must receive the amendment acknowledgement(s) by the response due date and time specified for receipt of bids for the bid to be deemed responsive. Failure to acknowledge solicitation amendments may be grounds for rejection.
- A.3.2. No oral statement of any person shall modify or otherwise affect the terms, conditions, or specifications stated in the solicitation. All amendments to the solicitation shall be made in writing by the Central Purchasing Division.
- A.3.3. It is the Bidder's responsibility to check the OMES/Central Purchasing Division website frequently for any possible amendments that may be issued. The Central Purchasing Division is not responsible for a bidder's failure to download any amendment documents required to complete a solicitation.

A.4. Bid Change

If the bidder needs to change a bid prior to the solicitation response due date, a new bid shall be submitted to the Central Purchasing Division with the following statement "This bid supersedes the bid previously submitted" in a single envelope, package, or container and shall be sealed, unless otherwise detailed in the solicitation. The name and address of the bidder shall be inserted in the upper left corner of the single envelope, package, or container. SOLICITATION NUMBER AND SOLICITATION RESPONSE DUE DATE AND TIME MUST APPEAR ON THE FACE OF THE SINGLE ENVELOPE, PACKAGE, OR CONTAINER.

A.5. Certification Regarding Debarment, Suspension, and Other Responsibility Matters

By submitting a response to this solicitation:

- A.5.1. The prospective primary participant and any subcontractor certifies to the best of their knowledge and belief, that they and their principals or participants:
 - A.5.1.1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal, State or local department or agency;
 - A.5.1.2. Have not within a three-year period preceding this proposal been convicted of or pled guilty or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) contract; or for violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - A.5.1.3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph A.5.1.2. of this certification; and
 - A.5.1.4. Have not within a three-year period preceding this application/proposal had one or more public (Federal, State, or local) contracts terminated for cause or default.
- A.5.2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to its solicitation response.

A.6. Bid Opening

Sealed bids shall be opened by the Central Purchasing Division at the Will Rogers Building, 2401 N. Lincoln Blvd. First Floor, Suite 116, Oklahoma City, Oklahoma, 73105 at the time and date specified in the solicitation as Response Due Date and Time.

A.7. Open Bid / Open Record

Pursuant to the Oklahoma Public Open Records Act, a public bid opening does not make the bid(s) immediately accessible to the public. The procurement or contracting agency shall keep the bid(s) confidential, and provide prompt and reasonable access to the records only after a contract is awarded or the solicitation is cancelled. This practice protects the integrity of the competitive bid process and prevents excessive disruption to the procurement process. The interest of achieving the best value for the State of Oklahoma outweighs the interest of vendors immediately knowing the contents of competitor's bids. [51 O.S. § 24A.5(5)]

Additionally, financial or proprietary information submitted by a bidder may be designated by the Purchasing Director as confidential and the procurement entity may reject all requests to disclose information designated as confidential pursuant to 62 O.S. (2012) § 34.11.1(H)(2) and 74 O.S. (2011) § 85.10. Bidders claiming any portion of their bid as proprietary or confidential must specifically identify what documents or portions of documents they consider confidential and identify applicable law supporting their claim of confidentiality. The State Purchasing Director shall make the final decision as to whether the documentation or information is confidential pursuant to 74 O.S. § 85.10. Otherwise, documents and information a bidder submits as part of or in connection with a bid are public records and subject to disclosure after contract award or the solicitation is cancelled.

A.8. Late Bids

Bids received by the Central Purchasing Division after the response due date and time shall be deemed non-responsive and shall NOT be considered for any resultant award.

A.9. Legal Contract

- A.9.1. Submitted bids are rendered as a legal offer and any bid, when accepted by the Central Purchasing Division, shall constitute a contract.
- A.9.2. The Contract resulting from this solicitation may consist of the following documents in order of preference:
 - A.9.2.1. Purchase order, as amended by Change Order (if applicable);
 - A.9.2.2. Solicitation, as amended (if applicable); and

A.9.2.3. Successful bid (including required certifications), to the extent the bid does not conflict with the requirements of the solicitation or applicable law.

A.9.3. Any contract(s) awarded pursuant to the solicitation shall be legibly written or typed.

A.10. Pricing

A.10.1. Bids shall remain firm for a minimum of sixty (60) days from the solicitation closing date.

A.10.2. Bidders guarantee unit prices to be correct.

A.10.3. In accordance with 74 O.S. §85.40, ALL travel expenses to be incurred by the supplier in performance of the Contract shall be included in the total bid price/contract amount.

A.11. Manufacturers' Name and Approved Equivalents

Unless otherwise specified in the solicitation, manufacturers' names, brand names, information and/or catalog numbers listed in a specification are for information and not intended to limit competition. Bidder may offer any brand for which they are an authorized representative, and which meets or exceeds the specification for any item(s). However, if bids are based on equivalent products, indicate on the bid form the manufacturer's name and number. Bidder shall submit sketches, descriptive literature, and/or complete specifications with their bid. Reference to literature submitted with a previous bid will not satisfy this provision. The bidder shall also explain in detail the reason(s) why the proposed equivalent will meet the specifications and not be considered an exception thereto. Bids that do not comply with these requirements are subject to rejection.

A.12. Clarification of Solicitation

A.12.1. Clarification pertaining to the contents of this solicitation shall be directed in writing to the Central Purchasing Contracting Officer specified in the solicitation, and must be prior to the closing date of the solicitation.

A.12.2. If a bidder fails to notify the State of an error, ambiguity, conflict, discrepancy, omission or other error in the SOLICITATION, known to the bidder, or that reasonably should have been known by the bidder, the bidder shall submit a bid at its own risk; and if awarded the contract, the bidder shall not be entitled to additional compensation, relief, or time, by reason of the error or its later correction. If a bidder takes exception to any requirement or specification contained in the SOLICITATION, these exceptions must be clearly and prominently stated in their response.

A.12.3. Bidders who believe proposal requirements or specifications are unnecessarily restrictive or limit competition may submit a written request for administrative review to the contracting officer listed on the solicitation. This request must be made prior to the closing date of the solicitation.

A.13 Negotiations

A.13.1. In accordance with Title 74 §85.5, the State of Oklahoma reserves the right to negotiate with one, selected, all or none of the vendors responding to this solicitation to obtain the best value for the State. Negotiations could entail discussions on products, services, pricing, contract terminology or any other issue that may mitigate the State's risks. The State shall consider all issues negotiable and not artificially constrained by internal corporate policies. Negotiation may be with one or more vendors, for any and all items in the vendor's offer.

A.13.2. Firms that contend that they lack flexibility because of their corporate policy on a particular negotiation item shall face a significant disadvantage and may not be considered. If such negotiations are conducted, the following conditions shall apply:

A.13.3. Negotiations may be conducted in person, in writing, or by telephone.

A.13.4. Negotiations shall only be conducted with potentially acceptable offers. The State reserves the right to limit negotiations to those offers that received the highest rankings during the initial evaluation phase.

A.13.5. Terms, conditions, prices, methodology, or other features of the offeror's offer may be subject to negotiations and subsequent revision. As part of the negotiations, the offeror may be required to submit supporting financial, pricing, and other data in order to allow a detailed evaluation of the feasibility, reasonableness, and acceptability of the offer.

A.13.6. The requirements of the Request for Proposal shall not be negotiable and shall remain unchanged unless the State determines that a change in such requirements is in the best interest of the State Of Oklahoma.

A.14. Rejection of Bid

The State reserves the right to reject any bids that do not comply with the requirements and specifications of the solicitation. A bid may be rejected when the bidder imposes terms or conditions that would modify requirements of the solicitation or limit the bidder's liability to the State. Other possible reasons for rejection of bids are listed in OAC 260:115-7-32.

A.15. Award of Contract

- A.15.1. The State Purchasing Director may award the Contract to more than one bidder by awarding the Contract(s) by item or groups of items, or may award the Contract on an ALL OR NONE basis, whichever is deemed by the State Purchasing Director to be in the best interest of the State of Oklahoma.
- A.15.2. Contract awards will be made to the lowest and best bidder(s) unless the solicitation specifies that best value criteria is being used.
- A.15.3. In order to receive an award or payments from the State of Oklahoma, suppliers must be registered. The vendor registration process can be completed electronically through the OMES website at the following link: <https://www.ok.gov/dcs/vendors/index.php>.

A.16. Contract Modification

- A.16.1. The Contract is issued under the authority of the State Purchasing Director who signs the Contract. The Contract may be modified only through a written Contract Modification, signed by the State Purchasing Director.
- A.16.2. Any change to the Contract, including but not limited to the addition of work or materials, the revision of payment terms, or the substitution of work or materials, directed by a person who is not specifically authorized by the Central Purchasing Division in writing, or made unilaterally by the supplier, is a breach of the Contract. Unless otherwise specified by applicable law or rules, such changes, including unauthorized written Contract Modifications, shall be void and without effect, and the supplier shall not be entitled to any claim under this Contract based on those changes. No oral statement of any person shall modify or otherwise affect the terms, conditions, or specifications stated in the resultant Contract.

A.17. Delivery, Inspection and Acceptance

- A.17.1. Unless otherwise specified in the solicitation or awarding documents, all deliveries shall be F.O.B. Destination. The bidder(s) awarded the Contract shall prepay all packaging, handling, shipping and delivery charges and firm prices quoted in the bid shall include all such charges. All products and/or services to be delivered pursuant to the Contract shall be subject to final inspection and acceptance by the State at destination. "Destination" shall mean delivered to the receiving dock or other point specified in the purchase order. The State assumes no responsibility for goods until accepted by the State at the receiving point in good condition. Title and risk of loss or damage to all items shall be the responsibility of the supplier until accepted by the receiving agency. The supplier(s) awarded the Contract shall be responsible for filing, processing, and collecting any and all damage claims accruing prior to acceptance.
- A.17.2. Supplier(s) awarded the Contract shall be required to deliver products and services as bid on or before the required date. Deviations, substitutions or changes in products and services shall not be made unless expressly authorized in writing by the Central Purchasing Division.

A.18. Invoicing and Payment

- A.18.1. Pursuant to 74 O.S. §85.44(B), invoices will be paid in arrears after products have been delivered or services provided.
- A.18.2. Interest on late payments made by the State of Oklahoma is governed by 62 O.S. §34.71 and 62 O.S. §34.72.

A.19. Tax Exemption

State agency acquisitions are exempt from sales taxes and federal excise taxes. Bidders shall not include these taxes in price quotes.

A.20. Audit and Records Clause

- A.20.1. As used in this clause, "records" includes books, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or in any other form. In accepting any Contract with the State, the successful bidder(s) agree any pertinent State or Federal agency will have the right to examine and audit all records relevant to execution and performance of the resultant Contract.
- A.20.2. The successful bidder(s) awarded the Contract(s) is required to retain records relative to the Contract for the duration of the Contract and for a period of seven (7) years following completion and/or termination of the Contract. If an audit, litigation, or other action involving such records is started before the end of the seven (7) year period, the records are required to be maintained for two (2) years from the date that all issues arising out of the action are resolved, or until the end of the seven (7) year retention period, whichever is later.

A.21. Non-Appropriation Clause

The terms of any Contract resulting from the solicitation and any Purchase Order issued for multiple years under the Contract are contingent upon sufficient appropriations being made by the Legislature or other appropriate government entity. Notwithstanding any

language to the contrary in the solicitation, purchase order, or any other Contract document, the procuring agency may terminate its obligations under the Contract if sufficient appropriations are not made by the Legislature or other appropriate governing entity to pay amounts due for multiple year agreements. The Requesting (procuring) Agency's decisions as to whether sufficient appropriations are available shall be accepted by the supplier and shall be final and binding.

A.22. Choice of Law

Any claims, disputes, or litigation relating to the solicitation, or the execution, interpretation, performance, or enforcement of the Contract shall be governed by the laws of the State of Oklahoma.

A.23. Choice of Venue

Venue for any action, claim, dispute or litigation relating in any way to the Contract shall be in Oklahoma County, Oklahoma.

A.24. Termination for Cause

- A.24.1. The supplier may terminate the Contract for default or other just cause with a 30-day written request and upon written approval from the Central Purchasing Division. The State may terminate the Contract for default or any other just cause upon a 30-day written notification to the supplier.
- A.24.2. The State may terminate the Contract immediately, without a 30-day written notice to the supplier, when violations are found to be an impediment to the function of an agency and detrimental to its cause, when conditions preclude the 30-day notice, or when the State Purchasing Director determines that an administrative error occurred prior to Contract performance.
- A.24.3. If the Contract is terminated, the State shall be liable only for payment for products and/or services delivered and accepted.

A.25. Termination for Convenience

- A.25.1. The State may terminate the Contract, in whole or in part, for convenience if the State Purchasing Director determines that termination is in the State's best interest. The State Purchasing Director shall terminate the Contract by delivering to the supplier a Notice of Termination for Convenience specifying the terms and effective date of Contract termination. The Contract termination date shall be a minimum of 60 days from the date the Notice of Termination for Convenience is issued by the State Purchasing Director.
- A.25.2. If the Contract is terminated, the State shall be liable only for products and/or services delivered and accepted, and for costs and expenses (exclusive of profit) reasonably incurred prior to the date upon which the Notice of Termination for Convenience was received by the supplier.

A.26. Insurance

The successful bidder(s) awarded the Contract shall obtain and retain insurance, including workers' compensation, automobile insurance, medical malpractice, and general liability, as applicable, or as required by State or Federal law, prior to commencement of any work in connection with the Contract. The supplier awarded the Contract shall timely renew the policies to be carried pursuant to this section throughout the term of the Contract and shall provide the Central Purchasing Division and the procuring agency with evidence of such insurance and renewals.

A.27. Employment Relationship

The Contract does not create an employment relationship. Individuals performing services required by this Contract are not employees of the State of Oklahoma or the procuring agency. The supplier's employees shall not be considered employees of the State of Oklahoma nor of the procuring agency for any purpose, and accordingly shall not be eligible for rights or benefits accruing to state employees.

A.28. Compliance with the Oklahoma Taxpayer and Citizen Protection Act of 2007

By submitting a bid for services, the bidder certifies that they, and any proposed subcontractors, are in compliance with 25 O.S. §1313 and participate in the Status Verification System. The Status Verification System is defined in 25 O.S. §1312 and includes but is not limited to the free Employment Verification Program (E-Verify) through the Department of Homeland Security and available at www.dhs.gov/E-Verify.

A.29. Compliance with Applicable Laws

The products and services supplied under the Contract shall comply with all applicable Federal, State, and local laws, and the supplier shall maintain all applicable licenses and permit requirements.

A.30. Special Provisions

Special Provisions set forth in SECTION B apply with the same force and effect as these General Provisions. However, conflicts or inconsistencies shall be resolved in favor of the Special Provisions.

B. SPECIAL PROVISIONS

B.1. Contract Period

- B.1.1.** This contract is for the Date of Award through August 6, 2016, with option to renew for up to two (2) additional one year periods.

B.2. Agreement Period

- B.2.1.** The agreement period for this contract will be date of award through August 6, 2018.

B.3. Required Delivery

- B.3.1.** Delivery should be made within 120 calendar days after receipt of order by the successful vendor. If circumstances beyond the control of the vendor causes delivery to be longer than 120 calendar days, the vendor shall notify the ordering agency immediately. Vehicles with a build date longer than 120 days, should be noted in Solicitation Response.
- B.3.2.** The base price for a vehicle is to include delivery to the delivery address for the ordering end user. Vehicles are to be delivered to the end user with a full tank of gas. If end user elects to pick up their vehicle at the dealers location, that vehicle is to be turned over to the end user with a full tank of gas.

B.4. Type of Contract

- B.4.1.** This is a firm fixed price contract for indefinite delivery and indefinite quantity for the supplies/services specified.

B.5. Authorized Users

- B.5.1.** RFP's shall cover requirements during the specified period for all State Departments, Boards, Commissions, Agencies and Institutions. The Oklahoma Statutes state that Counties, School Districts and Municipalities may avail themselves of the contract subject to the approval of the successful offeror(s).

CHECK APPROPRIATE BLOCK

- B.5.1.1.** _____ Yes, permits usage by other than State Agencies

- B.5.1.2.** _____ No, permits usage by State Agencies only.

B.6. Notice of Award

- B.6.1.** Notice of award letter resulting from this RFP will be furnished to each successful vendor and shall result in a binding contract without further action by either party. It shall be the successful vendor's responsibility to reproduce and distribute copies to all authorized dealers listed in your RFP response. No additions, deletions or changes of any kind shall be made to this contract without prior approval of Central Purchasing.

B.7. Extension of Contract

- B.7.1.** The State may extend the term of this contract up to 90 days if mutually agreed upon by both parties in writing.

B.8. Contractor Invoices

- B.8.1.** The vendor shall be paid upon submission of proper certified invoices to the ordering agency at the prices stipulated on the contract. Invoices shall contain the contract number and purchase order number. Failure to follow these instructions may result in delay of processing invoices for payment. The Company or Corporation submitting a proposal shall be the only office authorized to receive orders, invoice and receive payment. If the Vendor wishes to ship or provide service from a point other than the address listed on the face of the RFP, the Vendor will furnish a list of these locations. No ordering or invoicing will be done at these locations.
- B.8.2.** Invoicing shall be made in accordance with instructions by agency or division issuing the purchase order.
- B.8.3.** If you are paid more than 45 days after submitting a proper invoice, you may be entitled to claim an interest penalty. Contact the Office of Management and Enterprise Services, Office of State Comptroller for a copy of the regulations.

- B.8.4.** In cases of partial delivery the state agency may make partial payment, dependent on the dollar value, or hold all invoices for final delivery to be completed.

B.9. Prompt Payment Discounts

- B.9.1.** Discounts for prompt payment will not be considered in the evaluation of offers. However, any discount offered will be annotated on the award and may be taken if payment is made within the discount period.

B.10. Gratuities

- B.10.1.** The right of the successful vendor to perform under this contract may be terminated by written notice if the Contracting Officer determines that the successful vendor, or its agent or another representative offered or gave a gratuity (e.g., an entertainment or gift) to an officer, official or employee of Central Purchasing.

B.11. RFP Proposal Conformity

- B.11.1.** By submitting a response to this solicitation, the vendor attests that the supplies or services conform to specified contract requirements.

B.12. Warranty

- B.12.1.** The Successful vendor agrees the products furnished under this contract shall be covered by the most favorable commercial warranties the contractor gives to any customer for such products; and rights and remedies provided herein are in addition to and do not limit any rights afforded to the State of Oklahoma by any other clause of this contract.

B.13. Contract Usage Reporting Requirements

- B.13.1.** Usage reports for this contract are to be submitted quarterly shall include but not limited to the following:

B.13.1.1. Order Information: contract number (if any), date, order or purchase order number.

B.13.1.2. Customer Information: agency name, location

B.13.1.3. Product or Service Information: category, detailed product or service description, manufacturer, manufacturer item number, vendor SKU, unit of measure, list price (current UOM).

B.13.1.4. Cost Specification: price paid (per contract), quantity purchased, extended price, shipping or other charges (if applicable), total invoice price per line.

- B.13.2.** Vendor shall submit reports quarterly. Reports shall be submitted quarterly regardless of quantity. Quarterly reports are to be received within 30 days following the reporting period described in Section B.12.3.

- B.13.3.** Usage reports shall be sent electronically to strategic.sourcing@omes.ok.gov and are to be submitted in Microsoft Excel format. Contract quarterly reporting periods shall be:

B.13.3.1. 1st Quarter: January 1 through March 31

B.13.3.2. 2nd Quarter: April 1 through June 30

B.13.3.3. 3rd Quarter: July 1 through September 30

B.13.3.4. 4th Quarter: October 1 through December 31

- B.13.4.** Failure to provide usage reports shall result in cancellation or suspension of contract.

- B.13.5.** A Quarterly Usage report template is posted as an Excel Spreadsheet with this solicitation.

B.14. Energy Conservation

- B.14.1.** Oklahoma is an energy conservation State and we welcome any comments on your RFP that would indicate energy savings.

B.15. Conflict of Interest

- B.15.1.** The Request for Proposal hereunder is subject to the provisions of the Oklahoma Statutes. All Vendors must disclose with the RFP the name of any officer, director or agent who is also an employee of the State of Oklahoma or any of its agencies. Further, all Vendors must disclose the name of any State Employee who owns, directly or indirectly, an interest of five percent (5%) or more in the suppliers firm or any of its branches.

B.16. Patents and Royalties

- B.16.1.** The Vendor, without exception, shall indemnify and save harmless the State of Oklahoma and its employees from liability of any nature or kind, including cost and expenses for or on account of any copyrighted, patented, or unpatented invention, process, or article manufactured or used in the performance of the contract including its use by the State of Oklahoma. If the vendor uses any design, device or materials covered by letters, patent or copyright, it is mutually agreed and understood without exception that the RFP prices shall include all royalties or cost arising from the use of such design, device, or materials in any way involved in the work.

B.17. Product Acceptability

- B.17.1.** Bids will only be considered on products, manufactured or produced for distribution and use in the United States and Canada.
- B.17.2.** Products shall be new and current. Factory reconditioned, refurbished or second equipment will not be accepted.

B.18. Product Availability

- B.18.1.** Vehicles must be a current product model and available for general marketing purposes at the opening of this solicitation. Bidders must use best effort to assure product availability through the duration of the contract period.
- B.18.2.** The awarded dealer will provide vehicles for length of the contract period without any price increases. The only exception will be if a model is discontinued or is replaced by a new model. Awarded vendors shall notify Central Purchasing of the new model and provide pricing sheets with vehicle information within 30 days of discontinuation. The new model will only be added if approved by Central Purchasing.

B.19. Authorized Representative & Documentation

- B.19.1.** Bidders may offer any brand for which they are an authorized representative, which meets or exceeds the specification. **Only Oklahoma licensed dealers may submit proposals for this contract.** Per Oklahoma State Statute, Title 74, Section 564, any person or firm engaged in the sale or distribution of motor vehicles within the State of Oklahoma must possess a current, valid Motor Vehicle Dealer License. Bidders should submit a copy of both their Oklahoma dealer's license and a copy of the Manufacturer's license for each manufacturer they are bidding.
- B.19.2.** At the request of any State Agency, County, City, Municipality, School District, bidders must provide written documentation that guarantees that purchased buses meet all Federal, State, and State Board of Education standards for the year it was manufactured.

B.20. Price Adjustments

- B.20.1.** Manufacturer's price increases, or other increases in the cost of doing business may not be passed on to the State of Oklahoma. Any price decrease effectuated during the contract period by reason of market change shall be passed onto the State of Oklahoma. No price reduction on a statewide contract may be offered to an agency unless that reduction is offered to all agencies. The only exception to price increases is listed in B.20.2.
- B.20.2.** If the base price of a vehicle increases due to change in equipment or emissions, the dealer can increase the base price of the vehicle by the amount of the price increase. A letter from the manufacturer documenting the change and the amount of the change must be provided to Central Purchasing for review/approval before the contract base price will be changed.

B.21. Mandatory Contract

- B.21.1.** This contract is mandatory for State of Oklahoma agencies.

B.22. Extension of Retail Price with Rebates over Contract Price

- B.22.1.** If the Retail Price is lower than the contract price due to promotions or discounts, the Vendor shall charge the State the Retail price.
- B.22.2.** Any other instance that causes the Retail price to be lower than the contract price, the Vendor shall charge the State the Retail price.

B.23. Negotiations

- B.23.1.** The State may elect to negotiate with selected vendors during the procurement process to get the best price and business terms for its citizens. Negotiations would be through the State Purchasing Director or his designee. The State will consider all cost and business terms to be negotiable and not artificially constrained by internal corporate policies. In short, firms that contend that they lack flexibility because of their corporate policy on a particular negotiation item will face a significant disadvantage and may not be considered.

B.24. State and Federal Taxes

- B.24.1.** Purchases by the State of Oklahoma are not subject to any sales tax or Federal Excise tax. Exemption certificates will be furnished upon request.

B.25. Contract Management Fee

- B.25.1.** As provided by Oklahoma State Statute §85.33A, the Department of Central Services assesses an Administrative Fee in the sum of one (1%) percent on all sales transacted by any entity under this contract.
- B.25.2.** Supplier agrees to annotate the resultant amount on the quarterly "Contract Usage Report" as listed in B.13 and make payment by company check to OMES – Central Purchasing Division within thirty (30) calendar days from the completion of the quarterly reporting period as listed in B.13.3. To ensure the payment is credited properly, the supplier must identify the check as a "Contract Management Fee" and include the following information with the payment: SW797 ADA Transit Vehicle Contract, the report amount and the reporting period covered. The Contract Management Fee shall be mailed to:

OMES
Agency Business Services
5005 N. Lincoln Blvd., Suite 200
Oklahoma City, OK 73105
- B.25.3.** Failure to remit the fee quarterly may result in the cancellation of the contract. The State Contract Management Fee is non-refundable when an item is rejected, returned or declined due to the Supplier's failure to perform or comply with specifications or requirements of the contract.

C. SOLICITATION SPECIFICATIONS

C.1. Vehicle Specifications

- C.1.1.** See individual specification packets beginning with Section T.

D. EVALUATION

D.1. Evaluation Criteria

- D.1.1.** This RFP will be evaluated on the following criteria: Cost, Compliance with Specifications, and References

E. INSTRUCTIONS TO SUPPLIER

E.1. Questions regarding Solicitation

- E.1.1.** Questions regarding this Solicitation should be submitted no later than Friday, August 28th, 2015. Questions are to be submitted via email to laura.bybee@omes.ok.gov. Answers will be posted via an addendum posted on the Central Purchasing website, www.omes.ok.gov.

E.2. Submission of Proposal

- E.2.1.** One (1) CD, DVD or Flash Drive containing the following documents must be submitted. The format that the files are to be submitted in is also listed. Files are to be submitted in either Adobe PDF or Microsoft Word and/or Excel as listed below.
 - E.2.1.1.** Completed "Responding Bidder Information" including Workers Compensation Insurance Coverage Certificate - OMES/CP/Purchasing Form 076 – Adobe PDF format
 - E.2.1.2.** Completed "Certification for Competitive Bid and Contract" OMES/CP/Purchasing Form 004 – Adobe PDF format.
 - E.2.1.3.** Copy of Oklahoma Motor Vehicles Commission Dealers License as required in Section B.19.1 – Adobe PDF
 - E.2.1.4.** Acknowledgement of Amendments to the Solicitation (if applicable) - Adobe PDF
 - E.2.1.5.** Completed Specifications with Vendor Comments/Response – Microsoft Word
 - E.2.1.6.** Completed Response Sheets for each Model proposed – Microsoft Word

E.3. Response to Solicitation Instructions

- E.3.1.** Vendors taking exceptions to the Specifications shall provide a Letter of Exceptions Taken. The letter should contain the following information:
 - E.3.1.1.** The specification the Vendor is taking exception on.
 - E.3.1.2.** Information on the proposed change to the specification that the Vendor is taking exception on.
 - E.3.1.3.** Documentation on the proposed change listed in Section E.3.1.2.
- E.3.2.** A Response Sheet is provided for each type of vehicle on this contract. Suppliers are to provide responses to the listed items. Failure to provide these may be cause for your proposal to be considered non-responsive.

F. CHECKLIST

None

G. OTHER

G.1. FTA Special Provisions

- G.1.1.** These have been provided as a separate file on the Central Purchasing Solicitation System. These provisions should be completed and submitted for **EACH** type of Vehicle that is included in your response. For example, your response contains proposals for the two (2) different vehicles in the solicitation, the FTA Special Provisions are to be completed and submitted two (2) times.

G.2. Brand Names Listed

- G.2.1.** The specifications contained in this Solicitation list brand names of certain products within the models. If your response is for a brand other than those listed, they need to be Pre-Approved before the responses are submitted. A request for substitution must be submitted no later than the question deadline listed in Section E.1.1. Requests must contain documentation showing that the alternate brand meets the same specifications as the item being substituted.

H. PRICE AND COST

H.1. Pricing Submission

- H.1.1.** Prices are to be listed at the end of each of the individual Specification Sections.

I. NOT INCLUDED IN THIS SOLICITATION

J. NOT INCLUDED IN THIS SOLICITATION

K. NOT INCLUDED IN THIS SOLICITATION

L. NOT INCLUDED IN THIS SOLICITATION

M. NOT INCLUDED IN THIS SOLICITATION

N. NOT INCLUDED IN THIS SOLICITATION

O. NOT INCLUDED IN THIS SOLICITATION

- P. NOT INCLUDED IN THIS SOLICITATION**
- Q. NOT INCLUDED IN THIS SOLICITATION**
- R. NOT INCLUDED IN THIS SOLICITATION**
- S. 2014 FTA SPECIAL PROVISIONS**
- T. SPECIFICATIONS FOR CNG LOW FLOOR BUS**
- U. SPECIFICATIONS FOR 45' DIESEL MOTOR COACH**



TRANSIT PROGRAMS DIVISION

**FTA'S
SPECIAL PROVISIONS
FOR THE PROCUREMENT OF CAPITAL EQUIPMENT
WITH AN ESTIMATED CUMULATIVE COST
IN EXCESS OF \$100,000**

STATEMENT OF FEDERAL PARTICIPATION

THIS PROCUREMENT IS DEPENDENT UPON THE AVAILABILITY OF FEDERAL FUNDS THROUGH THE FEDERAL TRANSIT ADMINISTRATION (FTA)

***PAGES 2 THRU 15 OF THIS DOCUMENT ARE TO BE COMPLETED BY
BIDDER/VENDOR***

***PAGES 18 THRU 24 OF THIS DOCUMENT ARE TO BE COMPLETED BY ODOT AT
TIME OF THE BID AWARD***

***PAGES 26 THRU 32 ARE TO BE COMPLETED BY THE PURCHASER AT THE
TIME OF VEHICLE DELIVERY***

**SPECIAL PROVISIONS FOR THE PROCUREMENT OF CAPITAL EQUIPMENT
USING FEDERAL FUNDS**

**THE FOLLOWING REQUIREMENTS AND CONDITIONS ARE INCLUDED AS AN
ESSENTIAL PART OF THE SPECIFICATIONS ATTACHED HERETO.**

SECTION I. FOR ALL BIDS:

**FMVSS CERTIFICATION - 49 CFR 571 Part D
(Circle all applicable standard #s)**

#	Title	#	Title
101	##Controls and Displays	102	##Transmission shift lever sequence, starter, interlock, transmission braking effect
103	##Windshield defrost and defogging system	104	##Windshield wiping and washing system.
105	##Hydraulic brake system.	106	##Brake hoses
107	##Reflecting surfaces	108	##Lamps, reflective devices, and assoc. equip.
109	#New pneumatic tires	110	#Tire selection and rims.
111	##Rearview mirrors	112	##Headlamps concealment devices.
113	##Hood latch system	114	#Theft Protection (not for walk-in vans)
115	##VIN -basic requirements.	116	##Motor vehicle brake fluids.
117	#Re-treaded pneumatic tires (to be used on rear wheels only)	118	#Power-operated window, partition, roof panel system (GVWR < 10K)
119	*New pneumatic tires for vehicles other than passenger cars	120	*Tire selection & rims for vehicles other than passenger cars
121	*Air brake system	124	##Accelerator control system.
129	#New non-pneumatic tires for passenger cars.	201	##Occupant protection in interior impact
202	##Head restraints	203	##Impact protect, driver steering control system
204	##Steering control rearward displace (not walk-in vans)	205	##Glazing materials
206	#Doors, locks, and door retention components.	207	##Seating system
208	##Occupant crash protection	209	##Seat belt assemblies.
210	##Seat belt assembly anchorages.	211	#Wheels, nuts, wheel discs, and hub caps
212	##Windshield mounting	213	##Child restraint system.
214	##Side impact protection (not walk-in vans)	217	*Bus emergency. exits / window retention & release
219	##Windshield zone intrusion	220	*School Bus rollover protection
301	##Fuel system integrity (+School Bus >10K GVWR)	302	##Flammability of interior materials.

The undersigned **BIDDER/VENDOR** hereby certifies that all vehicles furnished meet the **FMVSS IAW 49 CFR 571.**

Name of Company	Date
Printed Name of Person Signing Form	Signature

*Bus

@Bus with GVWR below 10,000 lbs.

#Passenger Car

In submitting this bid, the undersigned **BIDDER/VENDOR** as noted in Section III - Certification to Purchaser, certifies and agrees to the following clauses, assurances and certifications.

The **BIDDER/VENDOR** agrees to include these requirements in subcontracts financed in whole or in part by Federal Transit Administration funding. The bidder/vendor must execute all certifications below.

A. INCORPORATION of FEDERAL TRANSIT ADMINISTRATION (FTA) TERMS: The following provisions include, in part, certain Standard Terms and Conditions required by DOT, whether or not expressly set forth in the preceding contract provisions. All contractual provisions required by DOT, as set forth in [FTA Circular 4220.1E](#) are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Agreement. The **BIDDER/VENDOR** shall not perform any act, fail to perform any act, or refuse to comply with any **PURCHASER'S** requests which would cause the **PURCHASER** to be in violation of the FTA terms and conditions

B. FEDERAL CHANGES: **BIDDER/VENDOR** shall at all times comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference in the Master Agreement between the **PURCHASER** and FTA, as they may be amended or promulgated from time to time during the term of this contract **BIDDER/VENDOR's** failure to so comply shall constitute a material breach in this contract.

C. DBE CERTIFICATION: The **BIDDER/VENDOR** complies with 49 CFR 26.49 regarding the transit vehicle manufacturer=s overall DBE goal.

D. AIR CONDITIONING PERFORMANCE: The **BIDDER/VENDOR** will provide vehicles that meet or exceed the performance requirements of the air conditioning system(s) as detailed in the specification.

E. INTEREST of MEMBERS of or DELEGATES to CONGRESS: The **BIDDER/VENDOR** certifies that no member of or delegate to the Congress of the United States shall be admitted to any share or part of this contract or to any benefit arising there from.

F. PROHIBITED INTEREST: The **BIDDER/VENDOR** certifies that no member, officer, or employee of the Public Body or of a local public body during his or her tenure or one year thereafter shall have any interest, direct or indirect, in this contract or the proceeds thereof.

G. CARGO PREFERENCE - USE of UNITED STATES-FLAG VESSELS: The **BIDDER/VENDOR** agrees: a. to use privately owned United States-Flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to the underlying contract to the extent such vessels are available at fair and reasonable rates for United States-Flag commercial vessels; b. to furnish within 20 working days following the date of loading for shipments originating within the United States or within 30 working days following the date of leading for shipments originating outside the United States, a legible copy of a rated, "on-board" commercial ocean bill-of-lading in English for each shipment of cargo to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590 and to the FTA recipient (through the contractor in the case of a subcontractor's bill-of-lading.)

H. ENERGY CONSERVATION: The **BIDDER/VENDOR** agrees to comply with mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

I. CLEAN WATER & AIR: The **BIDDER/VENDOR** agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. The **BIDDER/VENDOR** agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. 1701 et seq. The **BIDDER/VENDOR** agrees to report each violation to the **PURCHASER** and understands and agrees that the **PURCHASER** will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office.

J. NO OBLIGATION by the FEDERAL GOVERNMENT: The **PURCHASER** and **BIDDER/VENDOR** acknowledge and agree that, notwithstanding any concurrence by the Federal Government in or approval of the solicitation or award of the underlying contract, absent the express written consent by the Federal Government, the Federal Government is not a party to this contract and shall not be subject to any obligations or liabilities to the **PURCHASER, BIDDER/VENDOR**, or any other party (whether or not a party to that contract) pertaining to any matter resulting from the underlying contract.

K. PROGRAM FRAUD and FALSE or FRAUDULENT STATEMENTS or REALTED ACTS: The **BIDDER/VENDOR** acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. 3801 et seq. and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 C.F.R. Part 31, apply to its actions pertaining to this Project. The **BIDDER/VENDOR** certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the resultant contract or the FTA assisted project for which this work is being performed. The **BIDDER/VENDOR** further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the **BIDDER/VENDOR** to the extent the Federal Government deems appropriate. The **BIDDER/VENDOR** also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the Federal Government under a contract connected with a project that is financed in whole or in part with Federal assistance originally awarded by FTA under the authority of 49 U.S.C. 5307, the Government reserves the right to impose the penalties of 18 U.S.C. 1001 and 49 U.S.C. 5307(n)(1) on the **BIDDER/VENDOR**, to the extent the Federal Government deems appropriate.

L. CONTRACT WORK HOURS:

1. Overtime requirements: No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages: In the event of any violation of the clause set forth in paragraph (1) of this section the contractor and any subcontractor responsible therefore shall be liable for unpaid wages. Such contractor and subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to

each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of \$ 10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this section.

3. Withholding for unpaid wages and liquidated damages: The **PURCHASER** shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.

4. Subcontracts: The contractor or subcontractor shall include the clauses set forth in this section and require the same from subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these clauses.

5. Payrolls and basic records: (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

M. CIVIL RIGHTS:

1. Nondiscrimination: In accordance with Title VI of the Civil Rights Act, as amended, 42 U.S.C. ' 2000d, section 303 of the Age Discrimination Act of 1975, as amended, 42 U.S.C. ' 6102, section 202 of the Americans with Disabilities Act of 1990, 42 U.S.C. ' 12132, and Federal transit law at 49 U.S.C. ' 5332, the **BIDDER/VENDOR** agrees that it will not discriminate against any employee or applicant for employment because of race, color, creed, national origin, sex, age, or disability. In addition, the **BIDDER/VENDOR** agrees to comply with applicable Federal implementing regulations and other implementing requirements FTA may issue.

2. Equal Employment Opportunity: The following equal employment opportunity requirements apply:

Race, Color, Creed, National Origin, Sex - In accordance with Title VII of the Civil Rights Act, as amended, 42 U.S.C. ' 2000e, and Federal transit laws at 49 U.S.C. ' 5332, the **BIDDER/VENDOR** agrees to comply with all applicable equal employment opportunity requirements of U.S. Department of Labor (U.S. DOL) regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor," 41 C.F.R. Parts 60 et seq ., (which implement Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," 42 U.S.C. ' 2000e note), and with any applicable Federal statutes, executive orders, regulations, and Federal policies that may in the future affect construction activities undertaken in the course of the Project. The **BIDDER/VENDOR** agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, creed, national origin, sex, or age. Such action shall include, but not be limited to employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. In addition, the **BIDDER/VENDOR** agrees to comply with any implementing requirements FTA may issue. (b) Age - In accordance with section 4 of the Age Discrimination in Employment Act of 1967, as amended, 29 U.S.C. ' ' 623 and Federal transit law at 49 U.S.C. ' 5332, the **BIDDER/VENDOR** agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the **BIDDER/VENDOR** agrees to comply with any implementing requirements FTA may issue. (c) Disabilities - In accordance with section 102 of the Americans with Disabilities Act, as amended, 42 U.S.C. ' 12112, the **BIDDER/VENDOR** agrees that it will comply with the requirements of U.S. Equal Employment Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 C.F.R. Part 1630, pertaining to employment of persons with disabilities. In addition, the **BIDDER/VENDOR** agrees to comply with any implementing requirements FTA may issue.

N. ALTOONA TEST CERTIFICATION: (Check one of the following):

- ☐ The vehicle has been Altoona tested, report number: _____
- ☐ The vehicle is exempt from testing in accordance with 49 CFR 665
- ☐ The vehicle is currently being tested at Altoona

O. DEBAREMENT AND SUSPENSIONS: This contract is a covered transaction for purposes of 2 CFR Part 1200, which adopts and supplements the provisions of U.S. Office of Management and Budget (U.S. OMB) "Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement)," 2 CFR Part 180. As such, the contractor is required to verify that none of the contractor, its principals, as defined at 2 CFR 180.995, or affiliates, as defined at 2 CFR 180.905, are excluded or disqualified as defined at 2 CFR 180.940, 180.935 and 180.945.

The **BIDDER/VENDOR** is required to comply with 2 CFR 180, Subpart C and must include the requirement to comply with 2 CFR 180, Subpart C in any lower tier covered transaction it enters into.

By signing and submitting its bid or proposal, the **BIDDER/VENDOR** or proposer certifies as follows:

The certification in this clause is a material representation of fact relied upon by the **Procuring Agency**. If it is later determined that the **BIDDER/VENDOR** or proposer knowingly rendered an erroneous certification, in addition to remedies available to **Procuring Agency**, the Federal Government may pursue available remedies, including but not limited to suspension and/or

debarment. The bidder or proposer agrees to comply with the requirements of 2 CFR 180, Subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The **BIDDER/VENDOR** or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

The Procuring Agency agrees and assures that its third party contractors and lessees will review the “Excluded Parties Listing System” at <http://epls.gov/> before entering into any subagreement, lease or third party contract.

The Procuring Agency will be reviewing all third party contractors under the Excluded Parties Listing System at <http://epls.gov/> before entering into any contracts.

FEDERAL FUNDS WILL NOT BE RELEASED UNTIL THE PURCHASING AGENCY RECEIVES A COPY OF THE ALTOONA TEST REPORT IF REQUIRED IN ACCORDANCE WITH 49 CFR 665



SECTION II

A. BUY AMERICA CERTIFICATION:

BIDDER/VENDOR to complete the Buy America Certification listed below. **BIDDER/VENDOR** shall certify **EITHER COMPLIANCE OR NON-COMPLIANCE** (not both).

Certification requirement for procurement of buses, other rolling stock, and associated equipment.

Certificate of Compliance with 49 U.S.C. 5323(j)(2)(C)

The **bidder/vendor** or offer or hereby certifies that it **will meet** the requirements of 49 U.S.C. 5323(j)(2)(C) and the regulations at 49 C.F.R. Part 661.11.

Signature_____

Company Name_____

Title _____

Date _____

Certificate of Non-Compliance with 49 U.S.C. 5323(j)(2)(C)

The **bidder/vendor** or offer or hereby certifies that it **cannot comply** with the requirements of 49 U.S.C. 5323(j)(2)(C) and 49C.F.R. 661.11, but it may qualify for an exception pursuant to 49 U.S.C. 5323(j)(2)(A), 5323(j)(2)(B), or 5323(j)(2)(D), and 49 C.F.R. 661.7.

Signature _____

Company Name _____

Title _____

Date _____

Instructions:

Special Note: Make sure you have signed only one of the above statements -- either Compliance OR Non-Compliance (not both).

Subscribed and sworn to before me this ____day of _____ 20__.

Notary Public

Commission Expiration Date

My Commission Number

Seal:

This form **MUST** be prepared and signed by the offeror/vendor and submitted with all bids or offers on FTA-funded contracts. Bids or offers not accompanied by this form will be **REJECTED**

B. DOMESTIC CONTENT WORKSHEET:

(Typical Components of Buses from Appendix B to 49 CFR Sec. 661.11, an itemized component listing from the **manufacturer** that verifies compliance with the Buy America Provisions may be submitted in lieu of this form)

If you plan on using another components listing, you must include it with your bid and place an X in the following box. ☐

I. Components	% Domestic	X % Value	Dom. Value
engines			
transmissions			
front axle assemblies			
rear axle assemblies			
drive shaft assemblies			
front suspension assemblies			
rear suspension assemblies			
air compressor and pneumatic systems			
generator, alternator & electrical systems			
steering system assemblies			
front and rear air brake assemblies			
air conditioning compressor assemblies			
air conditioning evaporator/condenser assemblies			
heating systems.			
passenger seats			
driver's seat assemblies			
window assemblies			
entrance and exit door assemblies			
door control systems			
destination sign assemblies			
interior lighting assemblies			
front and rear end cap assemblies			
front and rear bumper assemblies			
specialty steel (structural steel tubing etc.) and aluminum extrusions			
aluminum, steel or fiberglass exterior panels and interior trim			
flooring and floor coverings			
TOTAL DOMESTIC CONTENT OF COMPONENTS (%)			

B. CONTINUED DOMESTIC CONTENT WORKSHEET:

II. Construction Activities (Describe Activities)	
Location of Construction Activities:	% OF DOMESTIC CONSTRUCTION ACTIVITIES:

Vehicle Manufacturer	Model	Model Year
Vendor Name	Signature	Date



C. LOBBYING:

The **BIDDER/VENDOR** certifies compliance with the Anti-Lobbying amendment, 31 U.S.C. ' 1352, as amended by the Lobbying Disclosure Act of 1995, Public Law 104-65 [to be codified at 2 U.S.C. ' 1601, et seq.]. The **BIDDER/VENDOR** also certifies that it will execute the following, "Certification Regarding Lobbying", as required by 49 CFR Part 20, AA New Restriction on Lobbying.@"

EXECUTE THE FOLLOWING

CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements
(To be submitted with each bid or offer exceeding \$100,000)

The undersigned,

(Bidder/Vendor)

certifies, to the best of his or her knowledge and belief, that:

A. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal Contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal Contract, grant, loan, or cooperative agreement.

B. If any funds other than Federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal Contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions [as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/96). Note: Language in paragraph "B" herein has been modified in accordance with Section 10 of the Lobbying Disclosure Act of 1995 (Public Law 104-65, to be codified at 2 U.S.C. ' 1601, et seq .)]

C. The undersigned shall require that the language of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, sub grants, and contracts under grants, loans, and cooperative agreements) and that all Subrecipient's shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. ' 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

C. CONTINUED LOBBYING:

[Note: Pursuant to 31 U.S.C. ' 1352(c)(1)-(2)(A), any person who makes a prohibited expenditure or fails to file or amend a required certification or disclosure form shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such expenditure or failure.

_____,
(Bidder/Vendor)

certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the **BIDDER/VENDOR** understands and agrees that the provisions of 31 U.S.C. ' 3801, et seq., apply to this certification and disclosure, if any.

Signature of BIDDER/VENDOR's Authorized Official

Name and Title of BIDDER's Authorized Official

Date



SECTION III

CERTIFICATION TO PURCHASER:

The undersigned **BIDDER/VENDOR** certifies that the vehicle(s) furnished will meet or exceed the specifications.

The **BIDDER/VENDOR** hereby certifies that it has attached all applicable documentation including:

1. Federal Motor Vehicle Safety Standards (**FMVSS**)
2. Altoona Test Certification
3. Buy America Certification Form
4. Domestic Content Worksheet
5. Lobbying Certification Form
6. Government wide Debarment & Suspension Certification Form
7. Certification to Purchaser Form
8. Drawing of proposed floor plan.
9. Printed product literature of the vehicle and all ancillary equipment

The undersigned **BIDDER/VENDOR** certifies that it has read all of the bid documents and agrees to abide by the terms, certifications, and conditions thereof.

Name of Company:	Printed Name of Person Completing Form:
Address: (City, State, Zip)	SS# or Tax ID #:
Telephone: (Area Code)	Signature:

Disadvantaged Business Enterprise Information (DBE)	Bidders type of organization (circle)	
Is your firm a DBE?	Sole Proprietorship	General Proprietorship
(yes) (no)	Corporation	Limited Partnership
If yes, what type?	Other? Please List	

BIDDER/VENDOR CHECKLIST

THE FOLLOWING CHECKLIST MUST BE COMPLETED BY THE BIDDER/VENDOR BEFORE THE BID IS SUBMITTED.

This checklist will be used to ensure that all required procurement clauses and certifications listed within these special provisions have been read, initialed, and signed by the Bidder/Vendor along with any necessary signed certifications.

Section I. FOR ALL BIDS:

Bidder's initial all lines below:

FMVSS CERTIFICATION: Circled all applicable Standards & Signed? _____

- A. **Incorporation of Federal Transit Administration Terms:** Read? _____
- B. **Federal Changes:** Read? _____
- C. **DBE Certification:** Read? _____
- D. **Air Conditioning Performance:** Read? _____
- E. **Interest of Members of or Delegates to Congress:** Read? _____
- F. **Prohibited Interest:** Read? _____
- G. **Cargo Preference:** Read? _____
- H. **Energy Conservation:** Read? _____
- I. **Clean Water and Air:** Read? _____
- J. **No Obligation By the Federal Government:** Read? _____
- K. **Program Fraud and False or Fraudulent Statements:** Read? _____
- L. **Contract Work Hours:** Read?
 - 1. Overtime requirements: _____
 - 2. Violation; liability for unpaid wages: _____
 - 3. Withholding for unpaid wages: _____
 - 4. Subcontracts: _____
 - 5. Payrolls and basic records: _____
- M. **Civil Rights:** Read?
 - 1. Nondiscrimination: _____
 - 2. Equal Employment Opportunity: _____
- N. **Altoona Test Certification:** Completed the following?
 - 1. Report Summary enclosed? Attached? _____
 - 2. Report # _____: Completed? _____
- O. **Debarment and Suspensions:** Read & Understood? _____
 - 1. EPLS Report www.epls.gov (Must Not be Debarred) _____

CONTINUED BIDDER/VENDOR CHECKLIST

Section II.

- A. **Buy America Certification:** Completed and signed? _____
- B. **Domestic Content Worksheet:** Calculated, Completed & Signed? _____
- C. **Lobbying Certification signed:** Completed and signed? _____

Section III. **CERTIFICATION TO PURCHASER** Completed and signed? _____

I hereby attest that each item was reviewed and that my initials above indicate that the item was properly executed on this date.

Bidder/Vendor Company

Date

Bidder/Vendor Representative

Date



Pre-Award Reviewer
Replace This Blank Page
With A Screen Print
Of The
EPLS Report

***NOTE: PAGES 18 THRU 24
ARE TO BE COMPLETED BY ODOT
AT TIME OF THE BID AWARD***

SECTION IV PRE AWARD AUDIT:

A. Purchaser's Certification - 49 CFR 663, subpart B:

The **bidder/vendor** has certified that the vehicle to be provided will be the same product as described in the advertised specification. (See attached consolidated certification form signed by the **bidder/vendor**, part III -A). ODOT certifies that the **bidder/vendor** is responsible and will provide a vehicle that will meet or exceed the specifications.

EXECUTE THE FOLLOWING

PRE-AWARD PURCHASER'S REQUIREMENTS CERTIFICATION

As required by Title 49 of the CFR, Part 663 – Subpart B,

(ODOT)

certifies that the buses to be purchased,

(Number and Description of Buses)

from

(The Manufacturer),

are the same product described in the recipient's solicitation specification and that the proposed **bidder/vendor** is a responsible **bidder/vendor** with the capability to produce a bus that meets the specifications.

Date:

Signature:

Title:

B. BUY AMERICA - 49 CFR 663, subpart B:

The total price of this purchase is less than the small purchase threshold of \$100,000 and is not subject to Buy America requirements. **OR**

The vehicles provided by the **bidder/vendor** (# of vehicles, make, and model) cannot comply with the Buy America requirements, but may qualify for an exception (see attached consolidated certification form signed by the **bidder/vendor**, part II-A).. **OR**

The **bidder/vendor** has certified that the vehicles (# of vehicles, make, and model) will comply with the Buy America requirements. (See attached consolidated certification form signed by the **bidder/vendor**, part II-A). The **bidder/vendor** has also completed the attached domestic content worksheet. (Or the **bidder/vendor** has provided a certificate from the manufacturer that lists the domestic content of each component, states that the vehicle is composed of at least 60% domestic content, describes construction activities, and gives the location of construction activities.) The agency certifies that the vehicles provided will meet the Buy America requirements.

NOTE: Only one of the following Certifications should be signed, not both.

PRE-AWARD BUY AMERICA COMPLIANCE CERTIFICATION:

As required by Title 49 of the CFR, Part 663 – Subpart B,

(ODOT)

is satisfied that the buses to be purchased,

(Number and Description of Buses)

from

(The Manufacturer)

meet all requirements of Section 165(b)(3) of the Surface Transportation Assistance Act of 1982, as amended. The recipient, or its appointed analyst

(The Analyst Not the Manufacturer or Its Agent)

has reviewed documentation provided by the **manufacturer**, which lists (1) the actual component and subcomponent parts of the buses identified by the **manufacturer**, country of origin, and cost; and (2) the actual location of the final assembly point for the buses, including a description of the activities that took place at the final assembly point and the cost of final assembly.

Date:

Signature:

Title:

OR

If not applicable, execute the following exemption certification

On

next

page

B. PRE-AWARD BUY AMERICA EXEMPTION CERTIFICATION

For the Procurement of vehicle(s) that require an FTA waiver:

As required by Title 49 of the CFR, Part 663 – Subpart B,

(ODOT)

certifies that there is a letter from FTA that grants a waiver to the buses to be purchased

(Manufacturer, Number and Description of Buses)

from the Buy America requirements under Section 165(b)(1), (b)(2), or (b)(4) of the Surface Transportation Assistance Act of 1982, as amended.

Date:

Signature:

Title:

C. FEDERAL MOTOR VEHICLE SAFETY STANDARDS (FMVSS) - 49 CFR 663, subpart D:

The **bidder/vendor** has certified that the vehicle complies with relevant **FMVSS** issued by the National Highway Traffic Safety Administration in 49 CFR Part 571 (see attached **FMVSS** certification form signed by **bidder/vendor**). The **PURCHASER** certifies that the vehicles that the vehicles will meet **FMVSS**.

EXECUTE THE FOLLOWING:

EXECUTE THE FOLLOWING (Only one of the following FMVSS Certifications should be signed, not both.

PRE-AWARD FMVSS COMPLIANCE CERTIFICATION:

As required by Title 49 of the CFR, Part 663 – Subpart D,

(ODOT)

certifies that it received, at the post-delivery stage, a copy of

(The Manufacturer)

self-certification information stating that the buses,

(Manufacturer, Number and Description of Buses)

comply with the relevant Federal Motor Vehicle Safety Standards issued by the National Highway Traffic Safety Administration in Title 49 Code of Federal Regulations, Part 571.

Date:

Signature:

Title:

OR

NEXT PAGE

C. PRE-AWARD FMVSS EXEMPTION CERTIFICATION:

As required by Title 49 of the CFR, Part 663 – Subpart D,

(ODOT)

certifies that it received at the pre-award stage, a statement from

(The Manufacturer)

indicated that the buses,

(Number and Description of Buses)

will not be subject to the Federal Motor Vehicle Safety Standards issued by the National Highway Traffic Safety Administration in Title 49 Code of Federal Regulations, Part 571.

Date:

Signature:

Title:

PRE- AWARD CHECKLIST:

THE FOLLOWING CHECKLIST IS TO BE COMPLETED BY THE BUYER AND ODOT PERSONNEL BEFORE BID IS AWARDED.

This checklist will be used to ensure that all required clauses and certifications are included in the vendor=s returned bid packet and that all required certifications have been signed by the vendor.

Section I. FOR ALL BIDS:

Buyer's initial all lines below:

FMVSS CERTIFICATION: Signed by Bidder/Vendor? _____

- A. **Incorporation of Federal Transit Administration Terms:** Initialed by Bidder? _____
- B. **Federal Changes:** Initialed by Bidder? _____
- C. **DBE Certification:** Initialed by Bidder? _____
- D. **Air Conditioning Performance:** Initialed by Bidder? _____
- E. **Interest of Members of or Delegates to Congress:** Initialed by Bidder? _____
- F. **Prohibited Interest:** Initialed by Bidder? _____
- G. **Cargo Preference:** Initialed by Bidder? _____
- H. **Energy Conservation:** Initialed by Bidder? _____
- I. **Clean Water and Air:** Initialed by Bidder? _____
- J. **No Obligation By the Federal Government:** Initialed by Bidder? _____
- K. **Program Fraud and False or Fraudulent Statements:** Initialed by Bidder? _____
- L. **Contract Work Hours:** Initialed by Bidder? _____
 - 1. Overtime requirements: _____
 - 2. Violation; liability for unpaid wages: _____
 - 3. Withholding for unpaid wages: _____
 - 4. Subcontracts: _____
 - 5. Payrolls and basic records: _____
- M. **Civil Rights:** Initialed by Bidder? _____
 - 1. Nondiscrimination: _____
 - 2. Equal Employment Opportunity: _____
- N. **Altoona Test Certification completed:** Initialed by Bidder? _____
 - 1. Report Summary enclosed? Attached to bid? _____
 - 2. Altoona Test Report # listed by Bidder? _____
- O. **Debarment and Suspensions:** Initialed by Bidder? _____
 - 1. **EPLS Report** from www.epls.gov: Attached to bid by Procuring Agency? _____

CONTINUED PRE- AWARD CHECKLIST:

Section II.

- A. Buy America Certification signed:** Signed by Bidder/Vendor? _____
- B. Domestic Content Worksheet signed:** Signed by Bidder/Vendor? _____
- C. Lobbying Certification signed:** Signed by Bidder/Vendor? _____

Section III. CERTIFICATION TO PURCHASER:

- A.** Completed and signed? _____

The previous checklist was to determine if the Bidder/Vendor read and completed all required necessary documentation. The following checklist is to determine if ODOT signed and completed the required Certifications.

Section IV. PRE AWARD AUDIT (signed by ODOT STAFF)

- A. Purchaser=s Certification - 49 CFR 663, subpart B:** Executed by ODOT?
Pre-Award Purchaser's Requirements Certification: _____
- B. Buy America - 49 CFR 663, subpart B:** Executed by ODOT?
**Pre-Award Buy America Compliance Certification, or
Pre-Award Buy America Exemption Certification:** _____
- C. FMVSS - 49 CFR 663, subpart D:** Executed by ODOT?
**Pre-Award FMVSS Compliance Certification, or
Pre-Award FMVSS Exemption Certification:** _____

I hereby attest that each item was reviewed and that my initials above indicate that the item was properly executed on this date.

ODOT	Date
-------------	-------------

ODOT Reviewer	Date
----------------------	-------------

***NOTE: PAGES 26 THRU 32
ARE TO BE COMPLETED BY THE PURCHASER
AT TIME OF VEHICLE DELIVERY***

SECTION V POST DELIVERY AUDIT:

A. Purchaser's Certification - 49 CFR 663, subpart C:

After visually inspecting and road testing the contract buses, the agency certifies that the (# of vehicles, make, and model) meet the contract specifications.

- or, Grantees in areas with populations of 200,000 or less that purchase more than 20 buses.

The agency's resident inspector monitored manufacturing and completed a report providing accurate records of all construction activities. The report addresses how the construction and operation of the vehicles fulfill the contract specifications. After reviewing the report, visually inspecting and road testing the contract buses, the agency certifies that the (# of vehicles, make, and model) meet the contract specifications.

EXECUTE THE FOLLOWING:

NOTE: Only one of the following Certifications should be signed, not both.

POST-DELIVERY PURCHASER'S REQUIREMENTS CERTIFICATION

As required by Title 49 of the CFR, Part 663 – Subpart C, after visually inspecting and road testing the contract buses,

(The Purchaser)

certifies that the buses,

(Number and the Description of Buses)

from

(The Manufacturer),

meet the contract specifications.

Date:

Signature:

Title:

OR

NEXT PAGE

A. POST-DELIVERY PURCHASER’S REQUIREMENTS CERTIFICATION:

As required by Title 49 of the CFR, Part 663 – Subpart C,

(The Purchaser)

certifies that a resident inspector,

(Not an Agent or Employee of the Manufacturer),

was at manufacturing site during the period of manufacture of

(Number and Description of Buses)

The inspector monitored manufacturing and completed a report on the manufacture of the buses providing accurate records of all bus construction activities. The report addresses how the construction and operation of the buses fulfill the contract specifications. After reviewing the report, visually inspecting the buses, and road testing the buses, the recipient certifies that the buses meet the contract specifications.

Date:

Signature:

Title:

B. BUY AMERICA - 49 CFR 663, subpart C:

The total price of this purchase is less than the small purchase threshold of \$100,000 and is not subject to Buy America requirements. **OR**

The agency certifies that there is a letter from FTA, which grants a waiver to the vehicles provided by the vendor (# of vehicles, make, and model) from the Buy America requirements, under Section 165 (b)(1), (b)(2), or (b)(4) of the Surface Transportation Assistance Act of 1982, as amended. **OR**

The agency certifies that it is satisfied that the (# of vehicles, make, and model) meet the requirements of Section 165 (b)(3) . The agency has reviewed documentation provided by the **manufacturer** that lists the domestic content of each component, states that the vehicle is composed of at least 60% domestic content, describes construction activities, and gives the location of final construction activities.

NOTE: Only one of the following Certifications should be signed, not both.

POST-DELIVERY BUY AMERICA COMPLIANCE CERTIFICATION:

As required by Title 49 of the CFR, Part 663 – Subpart C,

(The Purchaser)

certifies that the buses received are in fact what they ordered and are satisfied with the,

(Number and Description of Buses)

from

(The Manufacturer)

meet the requirements of section 165(b)(3) of the Surface Transportation Assistance Act of 1982, as amended. The recipient or its appointed analyst

(The Analyst Not the Manufacturer or Its Agent)

has reviewed documentation provided by the **manufacturer**, which lists (1) the actual component and subcomponent parts of the buses identified by the **manufacturer**, country of origin, and cost; and (2) the actual location of the final assembly point for the buses, including a description of the activities that took place at the final assembly point and the cost of final assembly.

Date:

Signature:

Title:

OR

**If not applicable, execute the following exemption certification
On next page**

B. POST-DELIVERY BUY AMERICA EXEMPTION CERTIFICATION:

As required by Title 49 of the CFR, Part 663 – Subpart C,

(The Purchaser)

certifies that there is a letter from FTA, which grants a waiver to the buses received,

(Manufacturer, Number and Description of Buses)

from the Buy America requirements under Section 165(b)(1), (b)(2), or (b)(4) of the Surface Transportation Assistance Act of 1982, as amended.

Date:

Signature:

Title:

Vehicle Vin Numbers:

This image shows a full page of blank white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

C. FEDERAL MOTOR VEHICLE SAFETY STANDARDS (FMVSS) - 49 CFR 663, subpart D:

The vendor has certified that the vehicle complies with relevant FMVSS issued by the National Highway Traffic Safety Administration in 49 CFR Part 571 (see attached FMVSS certification form provided by the **bidder** upon vehicle delivery). The agency certifies that the vehicles provided meet FMVSS.

EXECUTE THE FOLLOWING:

NOTE: Only one of the following Certifications should be signed, not both.

POST-DELIVERY FMVSS COMPLIANCE CERTIFICATION:

As required by Title 49 of the CFR, Part 663 – Subpart D,

(The Purchaser)

certifies that it received, at the post-delivery stage, a copy of

(The Manufacturer)

self-certification information stating that the buses,

(Manufacturer, Number and Description of Buses)

comply with the relevant Federal Motor Vehicle Safety Standards issued by the National Highway Traffic Safety Administration in Title 49 Code of Federal Regulations, Part 571.

Date:

Signature:

Title:

OR
NEXT PAGE

C. POST-DELIVERY FMVSS EXEMPTION CERTIFICATION:

As required by Title 49 of the CFR, Part 663 – Subpart D,

(The Purchaser)

certifies that it received, at the Post-delivery stage, a statement from

(The Manufacturer)

indicating that the buses,

(Number and Description of Buses)

are not subject to the Federal Motor Vehicle Safety Standards issued by the National Highway Traffic Safety Administration in Title 49 Code of Federal Regulations, Part 571.

Date

Signature

Title

POST DELIVERY AUDIT

THE FOLLOWING CHECKLIST IS TO BE COMPLETED BY THE BUYER AND ODOT PERSONNEL BEFORE THE VEHICLE(S) ARE ACCEPTED.

Section V VEHICLE DELIVERY CHECKLIST: (to be signed by buyer upon acceptance of vehicle)

Buyer initials all lines below:

A. Purchaser's Certification - 49 CFR 663, subpart C:

Post-Delivery Purchaser's Requirements Certification or
Post-Delivery Purchaser's Requirements Certification (Inspector): _____

B. Buy America - 49 CFR 663, subpart C:

Post-Delivery Buy America Compliance Certification or
Post-Delivery Buy America Exemption Certification: _____

B. FMVSS - 49 CFR 663, subpart D:

Post-Delivery FMVSS Compliance Certification or
Post-Delivery FMVSS Exemption Certification: _____

Section VI CERTIFICATION OF DELIVERY:

By executing this document,

A. You hereby request that a Lien Entry Form – Motor Vehicle be issued naming the Oklahoma Department of Transportation as Secured Party and that said form(s) will be delivered by the purchaser to a local tag agent for executing and

B. Assure the vehicle be used in accordance with the federal regulations and current provisions, as applicable.

I hereby attest that each item was reviewed and that my initials above indicate that the item was properly executed.

Purchaser

Date

ODOT Reviewer

Date

Section "T" – CNG Low Floor Bus

GENERAL

SCOPE

Technical Specifications define requirements for a heavy duty, low floor Compressed Natural Gas (CNG) powered transit bus which, by the selection of specifically identified alternative configurations, may be used for both suburban express service and general service on urban arterial streets. It should have a minimum expected life of 12 years or 500,000 miles whichever comes first and is intended for the widest possible spectrum of passengers, including children, adults, the elderly, and persons with disabilities.

DEFINITIONS

The following are definitions of special terms.

- (1) dBA. Decibels with reference to 0.0002 microbar as measured on the "A" scale.
- (2) Audible Discrete Frequency. An audible discrete frequency is determined to exist if the sound power level in any 1/3-octave band exceeds the average of the sound power levels of the two adjacent 1/3-octave bands by 4 decibels (dB) or more.
- (3) Standee Line. A line marked across the bus aisle to designate the forward area that passengers may not occupy when the bus is moving.
- (4) Free Floor Space. Floor area available to standees, excluding the area under seats, area occupied by feet of seated passengers, the vestibule area forward of the standee line, and any floor space indicated by manufacturer as non-standee areas such as, the floor space "swept" by passenger doors during operation. Floor area of 1.5 square feet should be allocated for the feet of each seated passenger that protrudes into the standee area.
- (5) Curb Weight. Weight of vehicle, including maximum fuel, oil and coolant; and all equipment required for operation and required by this Specification, but without passengers or operator.
- (6) Seated Load. One hundred fifty pounds for every designed passenger seating position and for the operator.
- (7) Gross Load. One hundred fifty pounds for every designed passenger seating position, for the operator, and for each 1.5 square feet of free floor space.
- (8) SLW (Seated Load Weight). Curb weight plus seated load.
- (9) GVW (Gross Vehicle Weight). Curb weight plus gross load.
- (10) GVWR (Gross Vehicle Weight Rated). The maximum total weight as determined by the vehicle manufacturer, at which the vehicle can be safely and reliably operated for its intended purpose.
- (11) GAWR (Gross Axle Weight Rated). The maximum total weight as determined by the axle manufacturer, at which the axle can be safely and reliably operated for its intended purpose.

Section "T" – CNG Low Floor Bus

- (12) Heavy Heavy-Duty Gas Engine (HHDG). Heavy heavy-duty gas engines have sleeved cylinder liners, are designed for multiple rebuilds, and a rated horsepower that generally exceeds 250.
- (13) Operator's Eye Range. The 95th-percentile ellipse defined in SAE Recommended Practice J941, except that the height of the ellipse should be determined from the seat at its reference height.
- (14) Fireproof. Materials that will not burn or melt at temperatures less than 2,000° F.
- (15) Fire-Resistant. Materials that have a flame spread index less than 150 as measured in a radiant panel flame test per ASTM-E 162-90.
- (16) Human Dimensions. The human dimensions used in Part 5: Technical Specifications are defined in Human scale 1/2/3, N. Different, A. R. Tilley, J. C. Bardagjy, MIT Press.
- (17) HIC (Head Injury Criteria). The following equation presents the definition of head injury criteria:
 - where:
 - a = the resultant acceleration at the center of gravity of the head form expressed as a multiple of g, the acceleration of gravity.
 - t1 and t2 = any two points in time during the impact.
- (18) The destination sign reading list and other information should be provided by the agency after award.

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Section "T" – CNG Low Floor Bus

(19) Design Operating Profile. The operating profile for design purposes should consist of simulated transit type service. The duty cycle is described in the figure "Transit Bus Duty Cycle." The duty cycle consists of three phases to be repeated in sequence: a central business district (CBD) phase of 2 miles with 7 stops per mile and a top speed of 20 mph, an arterial route phase of 2 miles with 2 stops per mile and a top speed of 40 mph, and a commuter phase of 4 miles with 1 stop and a maximum speed of 55 mph and a 5 minute idle phase.

Phase	Stops/ Total	Top Speed	Miles	Accel. Dist.	Accel. Time	Cruise Dist.	Cruise Time	Decel. Rate	Decel. Dist.	Decel. Time	Dwell Time	Cycle Time
	Mile Stops	(mph)		(ft.)	(s)	(ft.)	(s)	(fpsps)	(ft.)	(s)	(s)	(min-s)
CBD	7 14	20	2	155	10	540	18.5	6.78	60	4.5	7	9-20
Idle	- -	-	-	-	-	-	-	-	-	-	-	5-0
Arterial	2 4	40	2	1035	29	1350	22.5	6.78	255	9	7	4-30
CBD	7 14	20	2	155	10	510	18.5	6.78	60	4.5	7	9-20
Arterial	2 4	40	2	1035	35	1350	22.5	6.78	255	9	7	4-30
CBD	7 14	20	2	155	10	510	18.5	6.78	60	4.5	7	9-20
Commuter	6.78	1 stop for phase 480	12	20	Max. or 5-10	55 1	4	5500	90	2 miles +		188
4580 ft.												
Total	51		14									47-10

Average Speed - 17.8 mph

The bus should be loaded to SLW and should average approximately 18 mph while operating on this duty cycle. Operation should continue regardless of the ambient temperature or weather conditions. The passenger doors should be opened and closed at each stop, and the bus should be knelt at each stop during the CBD phase. The braking profile should be:

Section “T” – CNG Low Floor Bus

16 percent of the stops at 3 ft/sec/sec

50 percent of the stops at 6 ft/sec/sec

26 percent of the stops at 9 ft/sec/sec

8 percent of the stops at 12 ft/sec/sec

These percentages of stops should be evenly distributed over the three phases of the duty cycle. For scheduling purposes, the average deceleration rate is assumed.

Class of Failures. Classes of failures are described below.

- a. Class 1: Physical Safety. A failure that could lead directly to passenger or operator injury or represents a severe crash situation.
- b. Class 2: Road Call. A failure resulting in an en route interruption of revenue service. Service is discontinued until the bus is replaced or repaired at the point of failure.
- c. Class 3: Bus Change. A failure that requires removal of the bus from service during its assignments. The bus is operable to a rendezvous point with a replacement bus.
- d. Class 4: Bad Order. A failure that does not require removal of the bus from service during its assignments but does degrade bus operation. The failure should be reported by operating personnel.

Maintenance Personnel Skill Levels. Defined below are maintenance personnel skill levels used in Part 5: Technical Specifications.

- a. 5M: Specialist Mechanic or Class A Mechanic Leader
- b. 4M: Journeyman or Class A Mechanic
- c. 3M: Service Mechanic or Class B Servicer
- d. 2M: Mechanic Helper or Bus Servicer
- e. 1M: Cleaner, Fueller, Oiler, Hostler, or Shifter

Note: Whenever a specific time is indicated to access components or complete a task, it is assumed the vehicle is in the location where the work is to be performed. All necessary equipment is in its correct position (tools, jacks, vehicle lifts, lighting, fluid recovery systems, etc.) and ready for use.

Standards. Standards referenced in Part 5: Technical Specifications are the latest revisions unless otherwise stated.

Wheelchair. A mobility aid belonging to any class of three or four-wheeled devices, usable indoors, designed for and used by individuals with mobility impairments, whether operated manually or powered. A “common wheelchair” is such a device that does not exceed 30 inches in width and 48 inches in length measured two inches above the ground, and does not weigh more than 600 pounds when occupied.

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Structure. The structure should be defined as the basic body, including floor deck material and installation, load bearing external panels, structural components, axle mounting provisions and suspension beams and attachment points.

Low Floor Bus. A bus which, between at least the front (entrance) and rear (exit) doors, has a floor sufficiently low and level so as to remove the need for steps in the aisle between the doors and in the vicinity of these doors

Fuel Management System. Natural gas fuel system components that control or contribute to engine air fuel mixing and metering and the ignition and combustion of a given air-fuel mixture. The fuel management system would include, but is not limited to, reducer/regulator valves, fuel metering equipment (e.g. carburetor, injectors), sensors (e.g. O₂ sensor, MAP sensor), spark and coil components, and air control devices (e.g. main throttle, wastegate).

Ambient Temperature. The temperature of the surrounding air. For testing purposes, ambient temperature must be between + 16° C (+50°F) and +38°C (+100°F).

Burst Pressure. The highest pressure reached in a container during a burst test.

Capacity (fuel container). The water volume of a container in gallons (liters).

CNG Cylinder. A container constructed, inspected, and maintained in accordance with U.S. Department of Transportation or Transport Canada regulations or ANSI/IAS NGV2, Basic Requirements for Compressed Natural Gas Vehicle (NGV) Fuel Containers, or CSA B51, Boiler, Pressure Vessel and Pressure Piping Code.

CNG Cylinder Types:

Type 1: Metal

Type 2: Resin impregnated continuous filament with metal liner with a minimum burst pressure of 125% of service pressure. The cylinder may be either hoop-wrapped or full-wrapped (Hoop Wrapped: Reinforcement by a composite material applied in a substantially circumferential pattern over the cylindrical portion of the liner so that the filament does not transmit any significant stresses in a direction parallel to the container/cylinders longitudinal axis. Full Wrapped: the reinforcement by a composite material applied over the entire liner including the domes).

Type 3: Resin impregnated continuous filament with metal liner. The container may be either hoop-wrapped or full-wrapped.

Type 4: Resin impregnated continuous filament with a nonmetallic liner.

Code. A legal requirement.

Combination Gas Relief Device. A relief device that is activated by a combination of high pressures or high temperatures, acting either independently or together.

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Composite Container for CNG. A container fabricated of two or more materials that interact to facilitate the container design criteria.

Compressed Natural Gas (CNG). Mixtures of hydrocarbon gases and vapors consisting principally of methane in gaseous form that has been compressed for use as a vehicular fuel.

Container. A pressure vessel, cylinder, or cylinders permanently manifolded together used to store CNG.

Container Appurtenances. Devices connected to container openings for safety, control, or operating purposes.

Container Valve. A valve connected directly to a container outlet.

Defueling. The process of removing fuel from a CNG vehicle.

Defueling Port. Device which allows for, or point at which a vehicle is defueled.

Destroyed. Physically made permanently unusable.

Fill Pressure for CNG. The pressure attained at the actual time of filling. Fill pressure varies according to the gas temperatures in the container, which are dependent on the charging parameters and the ambient conditions. The maximum dispensed pressure should not exceed 125 percent of service pressure.

Flow Capacity. For natural gas flow, this is the capacity in volume per unit time (normal cubic meters/minute or standard cubic feet per minute) discharged at the required flow rating pressure.

Fuel Line. The pipe, tubing, or hose on a vehicle, including all related fittings, through which natural gas passes.

Fusible Material. A metal, alloy, or other material capable of being melted by heat.

High Pressure. Those portions of the CNG fuel system that see full container or cylinder pressure.

Intermediate Pressure. The portion of a CNG system after the first pressure regulator, but before the engine pressure regulator. Intermediate pressure on a CNG vehicle is generally from 3.5 to 0.5 Mpa (510 -70 psi).

Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Leakage. Release of contents through a defect or crack, see "Rupture".

Liner. Inner gas tight container or gas container to which the overwrap is applied.

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Lower Explosive Limit. The lowest concentration of gas where, given an ignition source, combustion is possible.

Maximum Service Temperature. The maximum temperature to which a container/cylinder will be subjected in normal service.

Metallic Hose. A hose whose strength depends primarily on the strength of its metallic parts; it can have metallic liners or covers, or both.

Metering Valve. A valve intended to control the rate of flow of natural gas.

Operating Pressure. The varying pressure which is developed in a container during service.

Pressure Activated Gas Relief Device. A pressure and/or temperature activated device used to vent the container/cylinder contents, and thereby prevent rupture of a NGV fuel container/cylinder when subjected to a standard fire test as required by fuel container/cylinder standards.

NOTE: Since this is a pressure activated device, it may not protect against rupture of the container when the application of heat weakens the container to the point where its rupture pressure is less than the rated burst pressure of the relief device, particularly if the container is partially full.

Rejectable Damage. In terms of NGV fuel containers/cylinders, this is damage as outlined in CGA C-6.4, Methods for External Visual Inspection of natural Gas Vehicle Fuel Containers and Their Installations and in agreement with the manufacturer's recommendations.

Rupture. Sudden and unstable damage propagation in the structural components of the container resulting in a loss of contents, see "Leakage".

Specification. A particular or detailed statement, account, or listing of the various elements, materials, dimensions etc. involved in the manufacturing and construction of a product.

Service Pressure. The settled pressure at a uniform gas temperature of 21°C (70°F) and full gas content. It is the pressure for which the equipment has been constructed, under normal conditions. Also referred to as the nominal service pressure or working pressure.

Settled Pressure. The gas pressure when a given settled temperature, usually 21°C (70°F), is reached.

Settled Temperature. The uniform gas temperature after any change in temperature caused by filling has dissipated.

Standard. A firm guideline from a consensus group.

Stress Loops. The "pig-tails" commonly used to absorb flexing in piping.

Sources of Ignition. Devices or equipment that, because of their modes of use or operation, are capable of providing sufficient thermal energy to ignite flammable compressed natural gas-air mixtures when introduced into such a mixture or when such a mixture comes into contact with them and that will permit propagation of flame away from them.

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Thermally Activated Gas Relief Device. A relief device that is activated by high temperatures, and generally contains a fusible material.

NOTE: Since this is a thermally activated device, it does not protect against overpressure from improper charging practices.

Agency. The company purchasing the vehicle.

ABBREVIATIONS

The following is a list of abbreviations used in Part 5: Technical Specifications.

(1)	ADA	Americans with Disabilities Act
(2)	ANSI	American National Standards Institute
(3)	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
(4)	ASTM	American Society for Testing and Materials
(5)	CAN/CGA	Canadian Gas Association
(6)	CFR	Code of Federal Regulations
(7)	CGA	Compressed Gas Association
(8)	CHP	California Highway Patrol
(9)	CNG	Compressed Natural Gas
(10)	DOE	U.S. Department of Energy
(11)	DOT	U.S. Department of Transportation
(12)	EMI	Electromagnetic Interference
(13)	EPA	Environmental Protection Agency
(14)	FMEA	Failure Modes and Effects Analysis
(15)	FMCSR	Federal Motor Carrier Safety Regulations
(16)	FMVSS	Federal Motor Vehicle Safety Standards
(17)	FTA	Federal Transit Administration
(18)	IAS	International Approval Services
(19)	I/O	Input/Output
(20)	ISO	International Organization for Standardization

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(21)	JIC	Joint Industrial Council
(22)	LED	Light Emitting Diode
(23)	LEL	Lower Explosive Limit
(24)	LNG	Liquefied Natural Gas
(25)	MAWP	Maximum Allowable Working Pressure
(26)	MPH	Miles Per Hour
(27)	NAFTP	National Alternative Fuel Training Program
(28)	NATEF/SAE	National Automotive Technicians Education Foundation/Automotive Service Excellence
(29)	NFPA	National Fire Protection Association
(30)	NGV	Natural Gas Vehicle
(31)	NHTSA	National Highway Traffic Safety Administration
(32)	OEM	Original Equipment Manufacturer
(33)	OSHA	Occupational Safety and Health Administration
(34)	PRD	Pressure Relief Device
(35)	RFI	Radio Frequency Interference
(36)	SAE	SAE International
(37)	SPI	Society of the Plastics Industry
(38)	TRC	Texas Railroad Commission
(39)	UL	Underwriters Laboratories
(40)	USDOT	United States Department of Transportation

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SPECIFICATIONS:

The contractor should ensure that the application and installation of major bus subcomponents and systems are compliant with all such subcomponent vendors’ requirements and recommendations. Components used in the vehicle should be of heavy-duty design and proven in transit service.

DIMENSIONS:

PHYSICAL SIZE

With the exceptions of exterior mirrors, marker and signal lights, bumpers, fender skirts, washers, wipers, ad frames and rub rails, the bus should have the following overall dimensions as shown in the figure “Transit Bus Exterior Dimensions” at static conditions and design height.

Thirty foot bus: Body Length: 30 feet \pm 6 inches

Thirty-five foot bus: Body Length: 35 feet \pm 6 inches.

Body Width: 102 inches (+0, -1 inch)

Maximum Overall Height: 140 inches, includes all rigid roof mounted items such as A/C, exhaust, Fuel system and cover, etc.

TRANSIT BUS EXTERIOR DIMENSIONS

UNDERBODY CLEARANCE

The bus should maintain the minimum clearance dimensions as shown in the figure “Transit Bus Minimum Road Clearance” and defined in SAE Standard J689, regardless of load up to the gross vehicle weight rating.

Ramp Clearances. Approach angle should be no less than 8.5 degrees. Break over angle should be no less than 8 degrees. Departure angle should be no less than 9 degrees.

The approach angle is the angle measured between a line tangent to the front tire static loaded radius arc and the initial point of structural interference forward of the front tire to the ground.

The departure angle is the angle measured between a line tangent to the rear tire static loaded radius arc and the initial point of structural interference rearward of the rear tire to the ground.

The breakover angle is the angle measured between two lines tangent to the front and rear tire static loaded radius and intersecting at a point on the underside of the vehicle that defines the largest ramp over which the vehicle can roll.

Ground Clearance. Ground clearance should be no less than 10 inches, except within the axle zone and wheel area.

Axle Clearance. Axle zone clearance, which is the projected area between tires and wheels on the same axial centerline, should be no less than 5½ inches.

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Wheel Area Clearance. Wheel area clearance, should be no less than 8 inches for parts fixed to the bus body and 6 inches for parts that move vertically with the axles.

FLOOR HEIGHT

Height of the floor above the street should be no more than 15 ½ inches measured at the centerline of the front and rear doorway. The floor may be inclined along the longitudinal axis of the bus, and the incline should be less than 3 ½ Deg. off the horizontal except locally at the doors where 20 slope toward the door is allowed. All floor measurements should be with the bus at the design running height and on a level surface and with the standard 305 tires.

INTERIOR HEADROOM

Headroom above the aisle and at the centerline of the aisle seats should be no less than 78 inches in the forward half of the bus tapering to no less than 74 inches forward of the rear settee. At the centerline of the window seats, headroom should be no lower than 65 inches. Headroom at the back of the rear bench seat may be reduced to a minimum of 56 inches, but it should increase to the ceiling height at the front of the seat cushion. In any area of the bus directly over the head of a seated passenger and positioned where a passenger entering or leaving the seat is prone to strike his/her head, padding should be provided on the overhead paneling.

WEIGHT

Curb weight of the bus, as defined in these Specifications, should not exceed 33,000 pounds.

CAPACITY

The vehicle should be designed to carry the Gross Vehicle Weight which should not exceed the bus GVWR.

SERVICE LIFE AND MAINTENANCE

Service Life

The bus should be designed to operate in transit service for at least 12 years or 500,000 miles. It should be capable of operating at least 40,000 miles per year including the twelfth year.

Maintenance and Inspection

Scheduled maintenance or inspection tasks as specified by the Contractor should require a skill level of 3M or less. Scheduled maintenance tasks should be related and should be grouped in maximum mileage intervals. Based upon the Design Operating routine scheduled maintenance actions, such as filter replacement and adjustments, should be in general at intervals of 6,000 miles (along with routine daily service performed during the fueling operations). Oil/filter change intervals may be extended, as indicated from a regular oil analysis program undertaken in cooperation with the engine manufacturer.

Any special tools required to maintain the bus should be provided in quantities as specified in Technical Specifications. Additional requirements for Maintenance and Inspection Equipment are also provided in these specifications.

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Test ports should be provided for commonly checked functions on the bus such as air intake, exhaust, hydraulic, pneumatic, charge-air and engine cooling systems.

The Contractor should provide a manual listing the times required for typical repair and service items on the bus.

CNG Cylinder Visual Inspection

A general visual inspection of all cylinders should occur during routine maintenance or as specified in the agency safety plan. The purpose of this general inspection is to look for signs of gross external damage or abuse to the cylinders. This cursory inspection can be performed by a skill level of 3M or less.

A detailed visual inspection of all cylinders should occur every 3 years (NGV2) or every 3 years or 36,000 miles (FMVSS 304). This detailed visual inspection should be performed by an experienced third party or a trained in-house individual following criteria established by CGA pamphlet C-6.4 (Methods for External Visual Inspection of Natural Gas Vehicle Fuel Containers and their Installations). If a question arises the respective coach manufacturer and cylinder manufacturer should be consulted.

Accessibility

All systems or components subject to periodic maintenance or that are subject to periodic failures should be readily accessible for service and inspection. To the extent practicable, removal or physical movement of components unrelated to the specific maintenance and/or repair tasks involved should be unnecessary.

As a goal, relative accessibility of components, measured in time required to gain access, should be inversely proportional to frequency of maintenance and repair of the components.

The location of CNG cylinders should allow access for routine external surface cylinder cleaning and inspections. CNG cylinder labels should be readily viewable without requiring cylinder rotation or the removal of any components with the exception of cylinder protection devices (shields), CNG cylinder manual shut-off valves (if equipped) should be easily accessible to allow for CNG fuel system shut-off or CNG cylinder isolation. Non-skid roof surfaces/walkways should be incorporated on buses when roof-top CNG cylinder access is provided.

Interchangeability

Components with identical functions should be interchangeable to the extent practicable. These components should include, but not limited to, passenger window hardware, interior trim, lamps, lamp lenses, and seat assemblies. Components with non-identical functions should not be, or appear to be, interchangeable. A component should not be used in an application for which it was neither designed nor intended.

Any one component or unit used in the construction of these buses should be an exact duplicate in design, manufacture, and assembly for each bus in each order group in this Contract.

Durable labels should be displayed in the engine compartment, fuel storage compartment(s) and on other fuel system component compartments stating that CNG fuel system components may not be interchangeable within a vehicle or between vehicles. In recognition that fuel system components may

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not be fully interchangeable, the issue of fuel system component interchangeability must be addressed in the vehicle maintenance manual.

OPERATING ENVIRONMENT

The bus should achieve normal operation in ambient temperature ranges of -10 to 115 F, at relative humidity between 5 percent and 100 percent, and at altitudes up to 3,000 feet above sea level. Degradation of performance due to atmospheric conditions should be minimized at temperatures below -10 F, above 115 F, or at altitudes above 3,000 feet. Altitude requirements above 3,000 ft. will need separate discussions with the engine manufacturer to ensure performance requirements are not compromised.

Special equipment or procedures may be employed to start the bus after being exposed for more than 4 hours to temperatures less than 30

☐ F without the engine

acceleration performance requirements should be met at, or corrected to, 77F, 29.31 inches Hg, dry air per SAE J1995.

NOISE

Interior Noise

The combination of inner and outer panels and any material used between them should provide sufficient sound insulation so that a sound source with a level of 80 dBA measured at the outside skin of the bus should have a sound level of 65 dBA or less at any point inside the bus. These conditions should prevail with all openings, including doors and windows, closed and with the engine and accessories switched off.

The bus-generated noise level experienced by a passenger at any seat location in the bus should not exceed 83 dBA and the operator should not experience a noise level of more than 75 dBA under the following test conditions. The bus should be empty except for test personnel, not to exceed 4 persons, and the test equipment. All openings should be closed and all accessories should be operating during the test. The bus should accelerate at full throttle from a standstill to 35 mph on level commercial asphalt or concrete pavement in an area free of large reflecting surfaces within 50 feet of the bus path. During the test, the ambient noise level in the test area should be at least 10 dBA lower than the bus under test. Instrumentation and other general requirements should conform to SAE Standard J366

Exterior Noise

Airborne noise generated by the bus and measured from either side should not exceed 83 dBA under full power acceleration when operated at or below 35 mph at curb weight and just prior to transmission upshift. The maximum noise level generated by the bus pulling away from a stop at full power should not exceed 83 dBA. The bus-generated noise at curb idle should not exceed 65 dBA. All noise readings should be taken 50 feet from, and perpendicular to, the centerline of the bus with all accessories operating. Instrumentation, test sites, and other general requirements should be in accordance with SAE Standard J366. The pull away test should begin with the front bumper even with the microphone. The curb idle test should be conducted with the rear bumper even with the microphone.

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FIRE SAFETY

The bus should be designed and manufactured in accordance with all applicable fire safety and smoke emission regulations. These provisions should include the use of fire-retardant/low-smoke materials, fire detection systems, firewalls, and facilitation of passenger evacuation.

All materials used in the construction of the Passenger Compartment of the bus should be in accordance with the Recommended Fire Safety Practices defined in FTA Docket 90, dated October 20, 1993. Materials entirely enclosed from the passenger compartment, such as insulation within the sidewalls, need not comply. In addition, smaller components and items, such as seat grabrails, switch knobs and small light lenses, should be exempt from this requirement.

Fire sensing and suppression systems as required in in this document should be provided.

ELDERLY AND DISABLED PASSENGERS

The contractor should comply with all applicable Federal requirements defined in the Americans with Disabilities Act, 49 CFR Part 38, and all state and local regulations regarding mobility-impaired persons. Local regulations are defined as those below the state level.

PROPULSION SYSTEM

VEHICLE PERFORMANCE

POWER REQUIREMENTS

Propulsion system and drive train should provide power to enable the bus to meet the defined acceleration, top speed, and gradability requirements, and operate all propulsion-driven accessories. Power requirements are based on heavy heavy-duty gas (HHDG) engines certified for use in all 50 states using actual road test results or computerized vehicle performance data.

TOP SPEED

The bus should be capable of a top speed of 68 mph. on a straight, level road at GVWR with all accessories operating.

GRADABILITY

Gradability requirements should be met on grades with a dry commercial asphalt or concrete pavement at GVWR with all accessories operating. The propulsion system and drive train should enable the bus to achieve and maintain a speed of 40 mph on a 2-1/2 percent ascending grade and 7 mph on a 16 percent ascending grade.

ACCELERATION

The acceleration should meet the requirements below and should be sufficiently gradual and smooth to prevent throwing standing passengers off-balance. Acceleration measurement should commence when the accelerator is depressed (Idle Start.)

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MAXIMUM IDLE START ACCELERATION TIMES ON A LEVEL SURFACE

(Vehicle weight = GVWR, 50-State Power Plant)

SPEED (MPH)	TIME (SEC)
10	5.6
20	11.0
30	20.0
40	31.0

OPERATING RANGE

The operating range of the coach when run on the transit coach duty cycle should be at least 350 miles with an initial gas settled pressure of 3,600 psi (US) at 70 F.

DRIVETRAIN

POWER PLANT

Engine

Cummins ISL G 8.9L CNG or approved equal.

The HDDG engine should be designed to operate for not less than 300,000 miles without major failure or significant deterioration. Components of the fuel management and/or control system should be designed to operate for not less than 150,000 miles without replacement or major service. Exception: Spark plugs and wires, spark coil, oxygen sensor.

The engine should meet all requirements of Technical Specifications, when operating on fuel equal to CARB Specifications for Compressed Natural Gas #2292.5. The four predominant characteristics that must be met are Methane, Ethane, Butane and Propane.

The engine should be equipped with an electronically controlled fuel management system, compatible with multiplex wiring systems and either 12 or 24 volt electrical systems. The engine control system should be capable of receiving electronic inputs from the engine and other vehicle systems.

Communication between these electronic systems should be made using the SAE J1939 Recommended Practice communication link. The engine's electronic management system should monitor operating conditions and provide instantaneous adjustments to optimize both engine and bus performance. The system should be programmable to allow optimization of engine performance.

In order to avoid potential warranty disputes during the engine warranty period, initial performance settings should only be changed with the authorization from the bus and engine manufacturers.

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The engine should have onboard diagnostic capabilities, able to monitor vital functions, store out of parameter conditions in memory, and communicate faults and vital conditions to service personnel. Diagnostic reader device connector ports, suitably protected against dirt and moisture, should be provided in operator’s area and near or inside engine compartment. The onboard diagnostic system should inform the operator via visual and/or audible alarms when out of parameter conditions exist for vital engine functions.

The engine starter should be protected by an interlock that prevents its engagement when the engine is running. Special equipment or procedures may be employed to start the engine when exposed to temperatures less than 30° F for a minimum of four hours without the engine in operation. All cold weather starting aids, engine heating devices and procedures should be of the type recommended by the engine manufacturer and approved by the Central Oklahoma Transportation and Parking Authority.

The engine should be equipped with an operator-controlled fast idle device. The fast idle control should be a two-way toggle mounted on the dash or side console and should activate only with the transmission in neutral and the parking brake applied. This device may be used to help meet the requirements of bus cool down.

The engine control system should protect the engine against progressive damage. The system should monitor conditions critical for safe operation and automatically reduce power and/or speed and initiate engine shutdown as needed. The on-board diagnostic system should trigger a visual and audible alarm to the operator when the engine control unit detects a malfunction and the engine protection system is activated. Automatic shutdown should only occur when parameters established for the functions below are exceeded:

Coolant Level

Coolant Temperature

Exhaust Temperature

Oil Pressure

A control should be available to the operator, which when constantly depressed, will allow the drive to delay the engine shutdown, but not the FSS System activation and alarm system

Cooling Systems

The cooling systems should be of sufficient size to maintain all engine and transmission fluids and engine intake air at safe, continuous operating temperatures during the most severe operations possible and in accordance with engine and transmission manufacturers’ cooling system requirements. The cooling system fan/fans control should sense the temperatures of the operating fluids and the intake air and if either is above safe operating conditions the cooling fan should be engaged. The fan control system should be designed with a fail-safe mode of “fan on.” The cooling system in new condition should have an ambient capacity of at least 110° F with water as coolant and sea level operation.

Engine Cooling

The engine should be cooled by a water-based, pressure type, cooling system that does not permit boiling or coolant loss during the operations described above. Engine thermostats should be easily

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accessible for replacement. Shutoff valves should allow filter replacement without coolant loss. Valves should permit complete shutoff of lines for the heating and defroster units, and water booster pumps. The water boost pump should be a magnetically coupled, brushless design. All low points in the water-based cooling system should be equipped with drain cocks. Air vent valves should be fitted at high points in the cooling system unless it can be demonstrated that the system is self-purging.

A sight glass to determine satisfactory engine coolant level should be provided and should be accessible by opening one of the engine compartment's access doors. A spring-loaded, push button type valve to safely release pressure or vacuum in the cooling system should be provided with both it and the water filler no more than 60 inches above the ground and both should be accessible through the same access door.

The radiator, and charge air cooler if integrated, should be of durable corrosion-resistant construction with bolted-on removable tanks. The radiator should be designed so a 2M mechanic can gain access to a substantial portion of the side facing the engine for the purpose of cleaning the radiator in five minutes or less.

Radiators with a fin density greater than 12 fins per inch, and louvered/slit designs, are more susceptible to clogging and deteriorating cooling performance over time and should not be used.

The radiator and charge air cooler should be designed to withstand thermal fatigue and vibration associated with the installed configuration.

The engine cooling system should be equipped with a properly sized water filter with a spin-on element and an automatic system for releasing supplemental coolant additives as needed to replenish and maintain protection properties

The cooling fan should be temperature controlled, allowing the engine to reach operating temperature quickly. The temperature-controlled fan should not be driven when the coolant temperature falls below the minimum level recommended by the engine manufacturer.

Charge Air Cooling

The charge air cooling system, also referred to as aftercoolers or intercoolers, should provide maximum air intake temperature reduction with minimal pressure loss. The charge air radiator should be sized and positioned to meet engine manufacturer's requirements. The charge air radiator should not be stacked ahead or behind the engine radiator and should be positioned as close to the engine as possible unless integrated with the radiator. Air ducting and fittings should be protected against heat sources, and should be configured to minimize restrictions and maintain sealing integrity.

Transmission Cooling

The transmission should be cooled by a separate heat exchanger sized to maintain operating fluid within the transmission manufacturer's recommended parameters of flow, pressure and temperature. The transmission cooling system should be matched to retarder and engine cooling systems to ensure that all operating fluids remain within recommended temperature limits established by each component manufacturer.

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Transmission

The transmission should be multiple speed, automatic shift with torque converter, retarder and electronic controls. Gross input power, gross input torque and rated input speed should be compatible with the engine. A 3M mechanic, with optional assistance, should be able to remove and replace the transmission assembly for service in less than 16 total combined man-hours. The transmission should be designed to operate for not less than 300,000 miles on the design operating profile without replacement or major service.

The electronic controls should be compatible with multiplex wiring systems, capable of receiving inputs from the throttle, shift selector, engine, and transmission. Communication between the transmission and other electronically controlled vehicle systems should be made using the SAE J1939 Recommended Practice communication link. Electronic controls should be compatible with either 12 or 24 volt systems, provide consistent shift quality, and compensate for changing conditions such as variations in vehicle weight and engine power. A brake pedal application of 15 to 20 psi should be required by the operator to engage forward or reverse range from the neutral position.

The electronically controlled transmission should have on-board diagnostic capabilities, able to monitor functions, store out-of-parameter conditions in memory, and communicate faults and vital conditions to service personnel. A diagnostic reader device connector port, suitably protected against dirt and moisture, should be provided in the operator's area. The on-board diagnostic system should trigger a visual alarm to the operator when the electronic control unit detects a malfunction. The transmission should contain built-in protection software to guard against severe damage.

An electronic transmission fluid level monitoring and protection system should be provided. This system should allow a 2M or 3M mechanic to accurately determine transmission fluid levels during checking or oil change and should be in addition to the manual dipstick. This system should also provide protection against any damage resulting from improper fluid level conditions.

The transmission should have an auto neutral feature that should cause it to automatically and immediately shift to “Neutral” whenever the transmission is left in gear and the parking brake is applied. This system should also automatically shift the transmission to “Neutral,” after a 5-minute delay, whenever the exit door brake interlock is applied.

Retarder

The transmission should be equipped with an integral hydraulic retarder designed to extend brake lining service life. The application of the retarder should cause a smooth blending of both retarder and service brake functions without exceeding jerk requirements. Brake lights should illuminate when the retarder is activated.

The retarder should become partially engaged (approximately 1/4 to 1/3 of its total application, with a resulting deceleration of no greater than 0.03 g) when the throttle is completely released (e.g., zero throttle). Maximum retarder should be achieved when brake pedal is depressed prior to engagement of service brakes with a maximum resulting deceleration of approximately 0.13 g. The resulting decelerations specified include the effects of engine braking, wind resistance and rolling resistance.

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The thermostatically controlled cooling fan should be activated when the retarder is engaged and the coolant temperature exceeds the maximum limit established by the engine and transmission manufacturers.

Jerk

Jerk, the rate of change of acceleration measured at the centerline, floor level of the bus should be minimized throughout the shifting of each transmission range and retarder application and should be no greater than 0.3 g/sec. for a duration of a quarter-second or more.

MOUNTING

The power plant should be mounted in a compartment in the rear of the bus. All power plant mounting should be mechanically isolated to minimize transfer of vibration to the body. Mounts should control movement of the power plant so as not to affect performance of belt driven accessories or cause strain in piping and wiring connections to the power plant.

Service

The power plant should be arranged so that accessibility for all routine maintenance is assured. No special tools, other than dollies and hoists, should be required to remove the power plant. Two 3M mechanics should be able to remove and replace the engine and transmission assembly in less than 12 total combined man-hours. The muffler, exhaust system, air cleaner, air compressor, starter, alternator, radiator, all accessories, and any other component requiring service or replacement should be easily removable and independent of the engine and transmission removal. An engine oil pressure gauge and coolant temperature gauge should be provided in the engine compartment. These gauges should be easily read during service and mounted in an area where they should not be damaged during minor or major repairs.

Engine oil and the radiator filler caps should be hinged to the filler neck and closed with spring pressure or positive locks. All fluid fill locations should be properly labeled to help ensure correct fluid is added and all fillers should be easily accessible with standard funnels, pour spouts, and automatic dispensing equipment. All lubricant sumps should be fitted with magnetic-type, external, hex head, drain plugs.

The engine and transmission should be equipped with sufficient heavy-duty fuel and oil filters for efficient operation and to protect the engine and transmission between scheduled filter changes. To the extent practicable, the filters should be of the spin-on, disposable type or integral with the engine and transmission. All filters should be easily accessible and the filter bases should be plumbed to assure correct reinstallation.

An oil sampling and fill provision compatible with standard should be included in the engine compartment.

An air cleaner with a dry filter element and a graduated air filter restriction indicator should be provided. The filter should be removable by a 3M mechanic in 10 minutes or less. The location of the air intake system should be designed to minimize the entry of dust and debris and maximize the life of the air filter. The engine air duct should be designed to minimize the entry of water into the air intake system. Drainage provisions should be included to allow any water/moisture to drain prior to entry into air filter.

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Accessories

Engine-driven accessories should be mounted for quick removal and repair. Accessory drive systems should operate without unscheduled adjustment for not less than 50,000 miles on the design operating profile. These accessories should be driven at speeds sufficient to assure adequate system performance during extended periods of idle operation and low route speed portion of the design operating profile. Belt guards should be provided as required for safety and should be sturdy in design and installation and readily removable.

Hydraulic Systems

Any accessory may be driven hydraulically. The hydraulic system should demonstrate a mean time between repairs in excess of 50,000 miles. Hydraulic system service tasks should be minimized and scheduled no more frequently than those of other major coach systems. All elements of the hydraulic system should be easily accessible for service or unit replacement. Critical points in the hydraulic system should be fitted with service ports so that portable diagnostic equipment may be connected or sensors for an off-board diagnostic system permanently attached to monitor system operation.

Hydraulic System Sensors

Sensors in the hydraulic system, excluding those in the power steering system, should indicate on the operator's on-board diagnostic panel conditions of low hydraulic fluid level. Specific systems for which low hydraulic fluid level sensors are required are included in attachments to Part 5: Technical Specifications.

Fluid Lines, Fittings and Clamps, and Charge Air Piping

All lines and piping should be supported to prevent chafing damage, fatigue failures, and tension strain. Lines passing through a panel, frame or bulkhead should be protected by grommets (or similar device) that fit snugly to both the line and the perimeter of the hole that the line passes through to prevent chafing and/or wear.

Lines should be as short as practicable and should be routed or shielded so that failure of a line should not allow the contents to spray or drain onto any component operable above the auto-ignition temperature of the fluid.

Compression fittings should be standardized as much as practicable to prevent the intermixing of components. Compression fitting components from more than one manufacturer should not be mixed even if the components are known to be interchangeable.

Radiator

Radiator piping should be stainless steel or brass tubing and, if practicable, hoses should be eliminated. Necessary hoses should be a premium, silicone rubber type that is impervious to all bus fluids. All hoses should be as short as practicable. All hoses should be secured with premium, stainless steel clamps that provide a complete 360° seal. The clamp and contracting with the hose in response to temperature changes and aging of the hose material.

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Oil & Hydraulic Lines

Oil and hydraulic lines should be compatible with the substances they carry. The lines should be designed and intended for use in the environment which they are installed, i.e., high temperatures in engine compartment, road salts, oils, etc. Lines should be capable of withstanding maximum system pressures. Lines within the engine compartment should be composed of steel tubing where practicable except in locations where flexible lines are specifically required by in attachments to Part 5: Technical Specifications.

Hydraulic lines of the same size and with the same fittings as those on other piping systems of the bus, but not interchangeable, should be tagged or marked for use on the hydraulic system only.

Fuel Lines

This section was written to be in compliance with NFPA-52 for U.S. buses and CAN/CGA-B149.4-M91 for Canadian buses. All tubing should be a minimum of seamless Type 304 stainless steel [ASTM A269 or equivalent]. Fuel lines and fittings should not be fabricated from cast iron, galvanized pipe, aluminum, plastic, or copper alloy with content exceeding 70 percent copper. Piping fittings, and hoses should be clear and free from cuttings, burrs, or scale. Pipe thread joining material that is impervious to CNG should be utilized as required.

Fuel lines should be securely mounted, braced, and supported every 24 inches, or as designed by the bus manufacturer to minimize vibration and should be protected against damage, corrosion, or breakage due to strain or wear.

Manifolds connecting fuel containers should be designed and fabricated to minimize vibration and should be installed in a protected location(s) to prevent line or manifold damage from unsecured objects or road debris.

Fuel hose and hose connections, where permitted, should be less than 48 inches in length, made from materials resistant to corrosion and action of natural gas, and protected from fretting and high heat.

High pressure CNG lines should be pressure tested to a minimum of 125% of system working pressure prior to fueling. CNG or Nitrogen should be used to pressure test the lines/assembly. The bus manufacturer should have a documented procedure of testing the high pressure line assembly.

Charge Air Piping

Charge air piping and fittings should be designed to minimize air restrictions and leaks. Piping should be as short as possible and the number of bends should be minimized. Bend radii should be maximized to meet the pressure drop and temperature rise requirements of the engine manufacturer. The cross section of all charge air piping should not be less than the cross section of the intake manifold inlet. Any change in pipe diameter should be gradual to ensure a smooth passage of air and to minimize restrictions. Piping should be routed away from exhaust manifolds and other heat sources, and shielded as required to meet the temperature rise requirements of the engine manufacturer.

Charge air piping should be constructed of stainless steel, aluminized steel or anodized aluminum, except between the air filter and turbocharger inlet where piping may be constructed of fiberglass. Connections between all charge air piping sections should be sealed with a short section of reinforced

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FUEL SYSTEM

NOTE: CNG fueling and defueling station characteristics relating to the design and construction of the CNG bus fuel system will be provided as detailed this document.

Fuel Containers – Cylinders

Operating Range

The operating range of the coach, when run on the transit coach duty cycle, should be at least 350 miles with a gas settled pressure of 3600 psi (US) at 70 F.

Fuel Capacity

Should be sufficient to meet the required Operating Range stated without exceeding the estimated curb weight of this bus configuration/Specification.

Design and Construction

CNG fuel containers/cylinders must be designed, constructed manufactured and tested in accordance with at least one of the following:

- US applications;

- NFPA 52-Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems

- FMVSS 304

- any local standard(s) specifically intended for CNG fuel containers Installation

Fuel cylinders should be installed in accordance with ANSI/IAS NGV2 – 1998, Basic Requirements for Compressed Natural Gas Vehicles (NGV) Fuel Containers and NFPA 52, Compressed Natural Gas (CNG) Vehicular Fuel Systems Code, 1998 edition Section 3-3. In the case of a low floor transit bus, the placement of tanks should be limited to the roof of the vehicle or in the compartment above the engine of the vehicle.

Fuel cylinders, attached valves, pressure relief devices and mounting brackets should be installed and protected so that their operation is not affected by bus washers and environmental agents such as rain, snow, ice or mud. These components should be protected from significant damage caused by road debris or collision.

Labeling

CNG fuel systems should be labeled in accordance with NFPA 52, Compressed Natural Gas (CNG) Vehicular Fuel Systems Code, 1998 edition.

Pressure Relief Devices

PRD's must be designed constructed, manufactured and tested in accordance with ANIS/IAS PRD1 – 1998, Pressure Relief Devices for Natural Gas Vehicle (NGV) Fuel Containers and ANSI/IAS NGV2-1998,

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Basic Requirements for Compressed Natural Gas Vehicle (NGV) Fuel Containers. All natural gas fuel system piping, including the PRD vent line, should be stainless steel.

Valves

Valves must be installed in accordance with ANIS/IAS NGV2 – 1998, Basic Requirements for Compressed Natural Gas Vehicle (NGV) Fuel Containers and NFPA 52, Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems.

Fuel Filler

The fuel filler should be located 7 to 38 feet behind the centerline of the front door on the curbside of the bus. The filler cap should be retained to prevent loss and should be recessed into the body.

Fuel system should be capable of being filled (for 350 mile range) from 500 psi to a settled pressure of 3600 psi in a maximum of five minutes.

CNG Fueling System

The CNG fueling port receptacle should be an ANSI/AGA NGV1 certified receptacle. The coach should be capable of being fueled by a nozzle (insert procuring agencies standard fueling nozzle). The fueling port receptacle location should be such that connection by fueling personnel can be performed without physical strain or interference. A Dust Cap should be permanently “tethered” to the fueling port receptacle. The fueling port receptacle access door should be equipped with an interlock sensor which disables the engine starting system when the access door is open, to prevent drive-away. The interlock should be of the type such that if the sensor fails the coach will not start.

Fueling port receptacle should be located on the curbside of the vehicle between the rear axle and the rear of the bus.

CNG De-Fueling System

The CNG de-fueling port should be an ANSI/AGA NGV1 certified receptacle. The CNG de-fueling port should be located on the curbside of the coach, in a location that is compatible with standard de-fueling station operations. The de-fueling system should incorporate the following characteristics:

- Dust Cap permanently “tethered” to the de-fueling port
- Device(s) to prevent inadvertent defueling. Specifications to be provided by procuring agency
- Location/method of attaching CNG fuel system to earth ground
- Components compatible with procuring Agency’s de-fueling operation

FINAL DRIVE

The bus should be driven by a single heavy-duty axle at the rear with a load rating sufficient for the bus loaded to GVWR. Transfer of gear noise to the bus interior should be minimized. The drive axle should be designed to operate for not less than 300,000 miles on the design operating profile without replacement or major repairs. The lubricant drain plug should be magnetic type, external hex head. If a planetary gear design is employed, the oil level in the planetary gears should be easily checked through

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the plug or sight gauge. The drive shaft should be guarded to prevent it striking the floor of the coach or the ground in the event of a tube or universal joint failure.

EMISSIONS/EXHAUST

Exhaust Emissions

The engine should meet all applicable emission standards.

Exhaust System

Exhaust gases and waste heat should be discharged from the roadside rear corner of the roof. The exhaust pipe should be of sufficient height to prevent exhaust gases and waste heat from discoloring or causing heat deformation to the bus. The entire exhaust system should be adequately shielded to prevent heat damage to any bus component. The exhaust outlet should be designed to minimize rain, snow or water generated from high-pressure washing systems from entering into the exhaust pipe and causing damage to the catalyst.

CHASSIS

SUSPENSION

GENERAL REQUIREMENTS

Both the front and rear suspensions should be pneumatic type. The basic suspension system should last the service life of the bus without major overhaul or replacement. Normal replacement items, such as one suspension bushing, shock absorbers, or air spring should be replaceable by a 3M mechanic in 30 minutes or less. Adjustment points should be minimized and should not be subject to a loss of adjustment in service. Necessary adjustments should be easily accomplished without removing or disconnecting the components.

SPRINGS AND SHOCK ABSORBERS

Travel

The suspension system should permit a minimum wheel travel of 3 inches jounce-upward travel of a wheel when the bus hits a bump (higher than street surface), and 3 inches rebound-downward travel when the bus comes off a bump and the wheels fall relative to the body. Elastomeric bumpers should be provided at the limit of jounce travel. Rebound travel may be limited by elastomeric bumpers or hydraulically within the shock absorbers. Suspensions should incorporate appropriate devices for automatic height control so that regardless of load the bus height relative to the centerline of the wheels does not change more than 1/2 inch at any point from the height required.

Damping

Vertical damping of the suspension system should be accomplished by hydraulic shock absorbers mounted to the suspension arms or axles and attached to an appropriate location on the chassis. Damping should be sufficient to control coach motion to 3 cycles or less after hitting road perturbations. Shock absorbers should maintain their effectiveness for at least 50,000 miles of the service life of the bus. Each unit should be replaceable by a 2M mechanic in less than 15 minutes. The shock absorber bushing should be made of elastomeric material that will last the life of the shock absorber.

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Lubrication

All elements of steering, suspension, and drive systems requiring scheduled lubrication should be provided with grease fittings conforming to SAE Standard J534. These fittings should be located for ease of inspection, and should be accessible with a standard grease gun without flexible hose end from a pit or with the bus on a hoist. Each element requiring lubrication should have its own grease fitting with a relief path. Lubricant specified should be standard for all elements on the bus serviced by standard fittings.

Kneeling

A kneeling system should lower the entrance(s) of the bus a minimum of 2.5 inches during loading or unloading operations regardless of load up to GVWR, measured at the longitudinal centerline of the entrance door(s), by the driver using a three position, spring loaded to center switch. Downward direction will lower the bus. Release of switch at any time will completely stop lowering motion and hold height of the bus at that position. Upward direction of the switch will allow the system to go to floor height without the driver having to hold the switch up.

Brake and Throttle interlock should prevent movement when the bus is kneeled. The kneel control should be disabled when the bus is in motion. The bus should kneel at a maximum rate of 1.25 inches per second at essentially a constant rate. After kneeling, the bus should rise within 2 seconds to a height permitting the bus to resume service and should rise to the correct operating height within 7 seconds regardless of load up to GVWR. During the lowering and raising operation, the maximum acceleration should not exceed 0.2g and the jerk should not exceed 0.3g/sec.

An indicator visible to the driver should be illuminated until the bus is raised to a height adequate for safe street travel. An audible warning alarm will sound simultaneously with the operation of the kneeler to alert passengers and bystanders. A warning light mounted near the curbside of the front door, minimum 3" diameter, amber lens should be provided that will blink when kneel feature activated. Kneeling should not be operational while the wheelchair ramp is deployed or in operation.

WHEELS AND TIRES

Wheels

Wheels and rims should be hub-piloted with polished aluminum rims and should resist rim flange wear. All wheels should be interchangeable and should be removable without a puller. Wheels should be compatible with tires in size and load-carrying capacity. Front wheels and tires should be balanced as an assembly per SAE J1986.

Tires

Tires should be suitable for the conditions of transit service and sustained operation at the maximum speed capability of the bus. Load on any tire at GVWR should not exceed the tire supplier's rating

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STEERING

FRONT AXLE

The front axle should be solid beam, non-driving with a load rating sufficient for the bus loaded to GVWR and should be equipped with grease type front wheel bearings and seals.

All friction points on the front axle should be equipped with replaceable bushings or inserts and lubrication fittings easily accessible from a pit or hoist.

STRENGTH

Fatigue life of all steering components should exceed 1,000,000 miles. No element of the steering system should sustain a Class I failure when one of the tires hits a curb or strikes a severe road hazard.

TURNING RADIUS

Outside body corner turning radius for a standard configuration. The 35-foot long bus should have a turning radius not to exceed 39 feet and the 30-foot long bus should have a turning radius not to exceed 34 feet.

TURNING EFFORT

The steering wheel should be no less than 19 inches in diameter and should be shaped for firm grip with comfort for long periods of time. The steering wheel should be removable with a standard or universal puller. The steering column should have full tilt and telescoping capability allowing the operator to easily adjust the location of the steering wheel.

Hydraulically assisted power steering should be provided. The steering gear should be an integral type with flexible lines eliminated or the number and length minimized. Steering torque applied by the driver should not exceed 10 foot pounds with the front wheels straight ahead to turned 10 degrees. Steering torque may increase to 70 foot pounds when the wheels are approaching the steering stops. Steering effort should be measured with the bus at GVWR, stopped with the brakes released and the engine at normal idling speed on clean, dry, level, commercial asphalt pavement and the tires inflated to recommended pressure. Power steering failure should not result in loss of steering control. With the bus in operation the steering effort should not exceed 55 pounds at the steering wheel rim and perceived free play in the steering system should not materially increase as a result of power assist failure. Gearing should require no more than seven turns of the steering wheel lock to lock.

Caster angle should be selected to provide a tendency for the return of the front wheels to the straight position with minimal assistance from the driver.

BRAKES

SERVICE BRAKE

Actuation

Service brakes should be controlled and actuated by a compressed air system. Force to activate the brake pedal control should be an essentially linear function of the bus deceleration rate and should not exceed 50 pounds at a point 7 inches above the heel point of the pedal to achieve maximum braking.

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The heel point is the location of the driver's heel when foot is rested flat on the pedal and the heel is touching the floor or heel pad of the pedal. A microprocessor controlled Automatic Braking System (ABS) should be provided. The microprocessor for the ABS system should be protected yet in an accessible location to allow for ease of service. The total braking effort should be distributed between all wheels in such a ratio as to ensure equal friction material wear rate at all wheel locations

Actuation of ABS should override the operation of the brake retarder.

Friction Material

The entire service brake system, including friction material, should have a minimum overhaul or replacement life of 30,000 miles with a brake retarder on the design operating profile. Brakes should be self-adjusting throughout this period. Visible stroke indicators should be provided to allow service personnel to easily identify when the brakes are not in correct adjustment. The brake linings should be made of non-asbestos material. In order to aid maintenance personnel in determining extent of wear, a provision such as a scribe line or chamfer indicating the thickness at which replacement becomes necessary, should be provided on each brake lining.

Hubs and Drums

Replaceable wheel bearing seals should run on replaceable wear surfaces or be of an integral wear surface sealed design. Wheel bearing and hub seals should not leak or weep lubricant for 100,000 miles when running on the design operating profile.

The bus should be equipped with brake drums. Brake drums should allow machining to ¼ inch oversize.

The brake system material and design should be selected to absorb and dissipate heat quickly so the heat generated during braking operation does not glaze brake linings. The heat generated should not increase the temperature of tire beads and wheel contact area to more than that allowed by the tire manufacturer.

PARKING /EMERGENCY BRAKE

The parking brake should be a spring-operated system, actuated by a valve that exhausts compressed air to apply the brakes. The parking brake may be manually enabled when the air pressure is at the operating level per FMVSS 121. An emergency brake release should be provided to release the brakes in the event of automatic emergency brake application. The parking brake valve button will pop out when air pressure drops below requirements of FMVSS 121. The driver should be able to manually depress and hold down the emergency brake release valve to release the brakes and maneuver the bus to safety. Once the operator releases the emergency brake release valve, the brakes should engage to hold the bus in place.

PNEUMATIC SYSTEM

GENERAL

The bus air system should operate the air-powered accessories and the braking system with reserve capacity. New buses should not leak down more than 5 psi as indicted on the instrument panel mounted air gauges, within 15 minutes from the point of governor cut-off.

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Provision should be made to apply shop air to the bus air systems using a standard tire inflation type valve. A quick disconnect fitting specified in attachments to Part 5: Technical Specifications, should be easily accessible and located in the engine compartment and near the front bumper area for towing. Retained caps should be installed to protect fitting against dirt and moisture when not in use.

Air for the compressor should be filtered through the main engine air cleaner system. The air system should be protected by a pressure relief valve set at 150 psi and should be equipped with check valve and pressure protection valves to assure partial operation in case of line failures.

AIR COMPRESSOR

The engine-driven air compressor should be sized to charge the air system from 40 psi to the governor cutoff pressure in less than 3 minutes while not exceeding the fast idle speed setting of the engine.

AIR LINES AND FITTINGS

Air lines, except necessary flexible lines, should conform to the installation and material requirements of SAE Standard J1149 for copper tubing with standard, brass, flared or ball sleeve fittings, or SAE Standard J844 for nylon tubing if not subject to temperatures over 200 degrees F. Nylon tubing should be installed in accordance with the following color-coding standards:

Green. Indicates primary brakes and supply

Red. Indicates secondary brakes

Brown. Indicates parking brake

Yellow. Indicates compressor governor signal

Black. Indicates accessories

Line supports should prevent movement, flexing, tension strain, and vibration. Copper lines should be supported to prevent the lines from touching one another or any component of the bus. To the extent practicable and before installation, the lines should be pre-bent on a fixture that prevents tube flattening or excessive local strain. Copper lines should be bent only once at any point, including pre-bending and installation. Rigid lines should be supported at no more than 5-foot intervals. Nylon lines may be grouped and should be supported at 2-foot intervals or less.

The compressor discharge line between power plant and body-mounted equipment should be flexible convoluted copper or stainless steel line, or may be flexible Teflon hose with a braided stainless steel jacket. Other lines necessary to maintain system reliability should be flexible Teflon hose with a braided stainless steel jacket. End fittings should be standard SAE or JIC brass or steel, flanged, swivel type fittings. Flexible hoses should be as short as practicable and individually supported. They should not touch one another or any part of the bus except for the supporting grommets. Flexible lines should be supported at 2-foot intervals or less.

Air lines should be clean before installation and should be installed to minimize air leaks. All air lines should be sloped toward a reservoir and routed to prevent water traps. Grommets or insulated clamps should protect the air lines at all points where they pass through understructure components.

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AIR RESERVOIRS

All air reservoirs should meet the requirements of FMVSS Standard 121 and SAE Standard J10 and should be equipped with clean-out plugs and guarded or flush type drain valves. Major structural members should protect these valves and any automatic moisture ejector valves from road hazards. Reservoirs should be sloped toward the drain valve. All air reservoirs should have brass drain valves which discharge below floor level with lines routed to eliminate the possibility of water traps and/or freezing in the drain line.

AIR SYSTEM DRYER

An air dryer should prevent accumulation of moisture and oil in the air system. The air dryer system should include a replaceable desiccant bed, electrically heated drain, and activation device. A 2M/3M mechanic should replace the desiccant in less than 15 minutes.

A provision should be included to collect/remove oil from the air system to prevent affecting function and/or damaging pneumatic system components.

BODY

GENERAL

DESIGN

The exterior and body features, including grilles and louvers, should be shaped to facilitate cleaning by automatic bus washers without snagging washer brushes. Water and dirt should not be retained in or on any body feature to freeze or bleed out onto the bus after leaving the washer. The body and windows should be sealed to prevent leaking of air, dust, or water under normal operating conditions and during cleaning in automatic bus washers for the service life of the bus. Exterior panels should be sufficiently stiff to minimize vibration, drumming or flexing while the bus is in service. When panels are lapped, the upper and forward panels should act as a watershed. However if entry of moisture into interior of vehicle is prevented by other means, then rear cap panels may be lapped otherwise. The windows, hatches, and doors should be able to be sealed. Accumulation on any window of the bus of spray and splash generated by the bus' wheels on a wet road should be minimized.

CRASHWORTHINESS

The bus body and roof structure should withstand a static load equal to 150 percent of the curb weight evenly distributed on the roof with no more than a 6-inch reduction in any interior dimension. Windows should remain in place and should not open under such a load. These requirements must be met without the roof mounted CNG cylinders installed.

The bus should withstand a 25-mph impact by a 4,000-pound automobile at any point, excluding doorways, along either side of the bus with no more than 3 inches of permanent structural deformation at seated passenger hip height. This impact should not result in sharp edges or protrusions in the bus interior.

Exterior panels below 35 inches from ground level should withstand a static load of 2,000 pounds applied perpendicular to the bus by a pad no larger than 5 inches square. This load should not result in

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deformation that prevents installation of new exterior panels to restore the original appearance of the bus.

In addition to the above requirements, NFPA-52 and local regulations must be met.

MATERIALS

Body materials should be selected and the body fabricated to reduce maintenance, extend durability, and provide consistency of appearance throughout the service life of the bus. Detailing should be kept simple; add-on devices and trim, where necessary, should be minimized and integrated into the basic design.

CORROSION

The bus flooring, sides, roof, understructure, axle suspension components should resist corrosion or deterioration from atmospheric conditions and road salts for a period of 12 years or 500,000 miles whichever comes first. It should maintain structural integrity and nearly maintain original appearance throughout its service life, provided that it is maintained by the agency in accordance with the procedures specified in the Contractor’s service manual. With the exception of periodically inspecting the visible coatings applied to prevent corrosion and reapplying these coatings in limited spots, the Contractor should not require the complete reapplication of corrosion compounds over the life of the bus.

All exposed surfaces and the interior surfaces of tubing and other enclosed members below lower window line should be corrosion resistant.

All materials that are not inherently corrosion resistant should be protected with corrosion-resistant coatings. All joints and connections of dissimilar metals should be corrosion-resistant and should be protected from galvanic corrosion. Representative samples of all materials and connections should withstand a 2-week (336-hour) salt spray test in accordance with ASTM Procedure B-117 with no structural detrimental effects to normally visible surfaces, and no weight loss of over 1 percent.

RESONANCE AND VIBRATION

All structure, body, and panel-bending mode frequencies, including vertical, lateral, and torsional modes, should be sufficiently removed from all primary excitation frequencies to minimize audible, visible, or sensible resonant vibrations during normal service.

FIRE PROTECTION

The passenger and engine compartments should be separated by a bulkhead(s) that should, by incorporation of fireproof materials in its construction, be a firewall. The engine compartment should include areas where the engine and exhaust system are housed including the muffler, if mounted above the horizontal shelf. This firewall should preclude or retard propagation of an engine compartment fire into the passenger compartment and should be in accordance with the Recommended Fire Safety Practices defined in FTA Docket 90, dated October 20, 1993. Only necessary openings should be allowed in the firewall, and these should be fireproofed. Any passageways for the climate control system air should be separated from the engine compartment by fireproof material. Piping through the bulkhead should have copper, brass, or fireproof fittings sealed at the firewall with copper or steel piping on the

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forward side. Wiring may pass through the bulkhead only if connectors or other means are provided to prevent or retard fire propagation through the firewall. Engine access panels in the firewall should be fabricated of fireproof material and secured with fireproof fasteners. These panels, their fasteners, and the firewall should be constructed and reinforced to minimize warping of the panels during a fire that will compromise the integrity of the firewall.

DISTORTION

The bus, loaded to GVWR and under static conditions, should not exhibit deflection or deformation that impairs the operation of the steering mechanism, doors, windows, passenger escape mechanisms and service doors. Static conditions should include the vehicle at rest with any one wheel or dual set of wheels on a 6-inch curb or in a 6-inch deep hole.

STRUCTURE

GENERAL

Design

The structure of the bus should be designed to withstand the transit service conditions typical of an urban duty cycle throughout its service life.

Altoona Testing

Prior to acceptance of first bus, the structure of the bus should have undergone appropriate structural testing and/or analysis, including FTA required Altoona testing, to ensure adequacy of design for the urban transit service. Any items that required repeated repairs or replacement must undergo the corrective action with supporting test and analysis. A report clearly describing and explaining the failures and corrective actions taken to ensure any and all such failures will not occur should be submitted to the agency.

TOWING

Towing devices should be provided on each end of the bus. Towing devices should accommodate flat-bedding or flat-towing. Each towing device should withstand, without permanent deformation, tension loads up to 1.2 times the curb weight of the bus within 20 degrees of the longitudinal axis of the bus. The rear towing device(s) should not provide a toehold for unauthorized riders.

The front towing devices should allow attachment of adapters for a rigid tow bar and should permit lifting and towing of the bus, at curb weight, until the front wheels are clear off the ground.

The rear towing devices should permit lifting and towing of the bus for a short distance, such as in cases of an emergency, to allow access to provisions for front towing of a bus. Each towing device should accommodate a crane hook with a 1-inch throat.

JACKING

It should be possible to safely jack up the bus, at curb weight, with a common 10-ton floor jack with or without special adapter, when a tire or dual set is completely flat and the bus is on a level, hard surface, without crawling under any portion of the bus. Jacking from a single point should permit raising the bus sufficiently high to remove and reinstall a wheel and tire assembly. Jacking pads located on the axle or

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suspension near the wheels should permit easy and safe jacking with the flat tire or dual set on a 6 inch high run up block not wider than a single tire. Jacking and changing any one tire should be completed by a 2M mechanic helper in less than 30 minutes from the time the bus is approached. The bus should withstand such jacking at any one or any combination of wheel locations without permanent deformation or damage.

Jacking pads should be painted safety yellow or orange for ease of identification.

HOISTING

The bus axles or jacking plates should accommodate the lifting pads of a 2 post hoist system. Jacking plates, if used as hoisting pads, should be designed to prevent the bus from falling off the hoist. Other pads or the bus structure should support the bus on jack stands independent of the hoist.

FLOOR

Design

The floor should be essentially a continuous flat plane, except at the wheel housings and platforms. The floor height as specified to eliminate steps and facilitate boarding and de-boarding of passengers.

The floor design should consist of two levels (bi-level construction). Aft of the rear door extending to the rear settee riser, the floor height may be raised to a height approximately 18 inches above the lower level. An increase slope should be allowed on the upper level not to exceed $3\frac{1}{2}^{\circ}$ off the horizontal.

Where the floor meets the walls of the bus, as well as other vertical surfaces, such as, platform risers, the surface edges should be blended with a circular section of radius not less than 1 inch. Similarly, a molding or cove should prevent debris accumulation between the floor and wheel housings. The vehicle floor in the area of the entrance and exit doors should have a lateral slope not exceeding 2deg to allow for drainage.

Strength

The floor deck may be integral with the basic structure or mounted on the structure securely to prevent chafing or horizontal movement and designed to last the life of the bus. Sheet metal screws should not be used to retain the floor and all floor fasteners should be serviceable from one side only. The use of adhesives to secure the floor to the structure should be allowed only in combination with the use of bolt or screw fasteners and its effectiveness should last throughout life of the coach. Tapping plates, if used for the floor fasteners, should be no less than the same thickness as a standard nut and all floor fasteners should be secured and protected from corrosion for the service life of the bus. The floor deck should be reinforced as needed to support passenger loads. At GVWR, the floor should have an elastic deflection of no more than 0.60 inches from the normal plane. The floor should withstand the application of 2.5 times gross load weight without permanent detrimental deformation. Floor, with coverings applied, should withstand a static load of at least 150 pounds applied through the flat end of a $\frac{1}{2}$ -inch-diameter rod, with $\frac{1}{32}$ -inch radius, without permanent visible deformation.

Construction

The floor should consist of the subfloor and the floor covering (See 5.4.4.5 Floor Covering). The floor, as assembled, including the sealer, attachments and covering should be waterproof, nonhygroscopic, and

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resistant to mold growth. The subfloor should be resistant to the effects of moisture, including decay (dry rot). It should be impervious to wood destroying insects such as termites.

If plywood is used, it should be certified at the time of manufacturing by an industry approved third-party inspection agency such as APA- The Engineered Wood Association (formerly the American Plywood Association). Plywood should be of a thickness adequate to support the design loads, manufactured with exterior glue, satisfy the requirements of a Group I Western panel as defined in PS 1-95 (Voluntary Product Standard PS 1-95, Construction and Industrial Plywood) and be of a grade that is manufactured with a solid face and back. Plywood should be installed with the highest-grade veneer up. Plywood should be pressure-treated with a preservative chemical that prevents decay and damage by insects. Preservative treatments should utilize no EPA listed hazardous chemicals. The concentration of preservative chemical should be equal to or greater than required for an above ground level application. Treated plywood will be certified for preservative penetration and retention by a third party inspection agency. Pressure-preservative treated plywood should have a moisture content at or below fifteen percent. A barrier should be installed to prevent contact by road salt with the plywood panels.

PLATFORMS

General

Platform height should not exceed 12 inches. Trim should be provided along top edges of platforms unless integral nosing is provided. Except where otherwise indicated, covering of platform surfaces and risers should be same material as specified for floor covering.

Trim installed along edges of platforms should be constructed of stainless steel.

Other raised areas such as for providing space for underfloor installation of components, should be limited. Such raised areas should be constructed in accordance to these specifications.

Operator’s Platform

The operator's platform should be of a height to render the position of the operator with respect to the road surface the same as on standard floor buses. If the height of the operator's platform exceeds 12 inches, a step should be provided to allow for ease in boarding. A warning decal or sign should be provided to alert operator to the change in floor level.

Farebox

If the driver’s platform is higher than 12 inches, then the farebox is to be mounted on platform of suitable height to provide this accessibility for operator without compromising passenger’s access.

Intermediate Platform

If the vehicle is of a bi-level floor design, an intermediate platform should be provided along the center aisle of the bus to facilitate passenger traffic between the upper and lower floor levels. This intermediate platform should be cut into the rear platform and should be approximately the aisle width, 18 inches deep and approximately one half the height of the upper level relative to the lower level. The horizontal surface of this platform should be covered with yellow Hypalon ribbed rubber or skid-resistant material and should be sloped slightly for drainage. A warning decal or sign should be provided at the immediate platform area to alert passengers to the change in floor level.

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WHEEL HOUSING

Design

Sufficient clearance and air circulation should be provided around the tires, wheels, and brakes to preclude overheating when the bus is operating on the design operating profile.

Interference between the tires and any portion of the bus should not be possible in maneuvers up to the limit of tire adhesion with weights from curb weight to GVWR. Wheel housings should be adequately reinforced where seat pedestals are installed. Wheel housings should have sufficient sound insulation to minimize tire and road noise.

Design and construction of front wheel housings should allow for the installation of radio/electronic equipment storage compartment on interior top surface or its use as a luggage rack.

The exterior finish of the front wheel housings should be scratch-resistant, Interior Panels and Finishes, and complement interior finishes of the bus to minimize the visual impact of the wheel housing. If fiberglass wheel housings are provided, then they should be color-impregnated to match interior finishes. The lower portion extending to approximately 12 inches above floor should be equipped with additional mar-resistant coating or stainless steel trim.

Construction

Wheel housings should be constructed of corrosion-resistant, fire-resistant material. Wheel housings, as installed and trimmed, should withstand impacts of a 2-inch steel ball with at least 200 foot-pounds of energy without penetration.

EXTERIOR PANELS AND FINISHES

PEDESTRIAN SAFETY

Exterior protrusions greater than ½ inch and within 80 inches of the ground should have a radius no less than the amount of the protrusion. The exterior rearview mirrors and required lights and reflectors are exempt from the protrusion requirement. Advertising frames should protrude no more than ¾ inch from the body surface and should have the exposed edges and corners rounded to the extent practicable. Grilles, doors, bumpers and other features on the sides and rear of the bus should be designed to minimize the ability of unauthorized riders to secure toeholds or handholds.

REPAIR AND REPLACEMENT

Exterior panels below the lower daylight opening and within 35 inches above ground level should be divided into sections that are repairable or replaceable by a 3M mechanic in less than 30 minutes for a section up to 5 feet long (excludes painting).

Rain gutters should be provided to prevent water flowing from the roof onto the passenger doors, operator's side window, and exterior mirrors. When the bus is decelerated, the gutters should not drain onto the windshield, or operator's side window, or into the door boarding area. Cross sections of the gutters should be adequate for proper operation.

Rain gutter should also be provided above passenger side windows.

RUBRAILS

Rubrails composed of flexible, resilient material should be provided to protect both sides of the bus body from damage caused by minor sideswipe accidents with automobiles. Rubrails should have vertical dimensions of no less than 2 inches or 50 mm with the centerline no higher than 35 inches above the ground between the wheelwells. The rubrails should withstand impacts of 200 foot-pounds of energy from a steel-faced spherical missile no less than 9 inches in diameter and of a 500-pound load applied anywhere along their length by a rigid plate 1 foot in length, wider than the rubrail, and with 1/4-inch end radii, with no visible damage to the rubrail, retainer, or supporting structure. The rubrail may be discontinued at doorways and wheelwells. A damaged portion of the rubrail should be replaceable without requiring removal or replacement of the entire rubrail.

FENDER SKIRTS

Features to minimize water spray from the bus in wet conditions should be included in wheel housing design. Any fender skirts should be easily replaceable. They should be flexible if they extend beyond the allowable body width. Wheels and tires should be removable with the fender skirts in place.

SPLASH APRONS

Splash aprons, composed of 1/4-inch-minimum composition or rubberized fabric, should be installed behind and/or in front of wheels as needed to reduce road splash and protect underfloor components. The splash aprons should extend downward to within 4 inches of the road surface at static conditions. Apron widths should be no less than tire widths, except for the front apron which should extend across the width of the bus. Splash aprons should be bolted to the bus understructure. Splash aprons and their attachments should be inherently weaker than the structure to which they are attached. The flexible portions of the splash aprons should not be included in the road clearance measurements. Other splash aprons should be installed where necessary to protect bus equipment.

SERVICE COMPARTMENTS AND ACCESS DOORS

ACCESS DOORS

Conventional or pantograph hinged doors should be used for the engine compartment and for all auxiliary equipment compartments including doors for checking the quantity and adding to the engine coolant, engine lubricant and transmission fluid. Access openings should be sized for easy performance of tasks within the compartment including tool operating space. Access doors should be of rugged construction and should maintain mechanical integrity and function under normal operations throughout the service life of the bus. They should close flush with the body surface. All doors should be hinged at the top or on the forward edge and should be prevented from coming loose or opening during transit service or in bus washing operations. Doors with top hinges should have safety props stored behind the door or on the doorframe. All access doors should be retained in the open position by props or counterbalancing with over-center or gas-filled springs and should be easily operable by one person. Springs and hinges should be corrosion resistant. Latch handles should be flush with, or recessed behind, the body contour and should be sized to provide an adequate grip for opening. Access doors, when opened, should not restrict access for servicing other components or systems.

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Access doors larger in area than 100 square inches should be equipped with corrosion resistant flush-mounted locks. All such access door locks which require tool to open should be standardized throughout the vehicle and will require a nominal 5/16 inch square male tool to open or lock.

The battery compartment or enclosure should be vented and self-draining. It should be accessible only from outside the bus. All components within the battery compartment, and the compartment itself, should be protected from damage or corrosion from the electrolyte and gases emitted by the battery. The inside surface of the battery compartment's access door should be electrically insulated, as required, to prevent the battery terminals from shorting on the door if the door is damaged in an accident or if a battery comes loose.

SERVICE AREA LIGHTING

Lights should be provided in the engine and all other compartments, where service may be required, to generally illuminate the area for night emergency repairs or adjustments. Sealed lamp assemblies should be provided in the engine compartment and should be controlled by a switch located near the rear start controls in the engine compartment. Necessary lights, located in other service compartments, should be provided with switches on the light fixture or convenient to the light.

BUMPERS

LOCATION

Bumpers should provide impact protection for the front and rear of the bus with the top of the bumper being 28 +/- 2 inches above the ground. Bumper height should be such that when one bus is parked behind another, a portion of the bumper faces will contact each other.

FRONT BUMPER

No part of the bus, including the bumper, should be damaged as a result of a 5-mph impact of the bus at curb weight with a fixed, flat barrier perpendicular to the bus' longitudinal centerline. The bumper should return to its pre-impact shape within 10 minutes of the impact. The bumper should protect the bus from damage as a result of 6.5 mph impacts at any point by the Common Carriage with Contoured Impact Surface defined in Figure 2 of FMVSS 301 loaded to 4,000 pounds parallel to the longitudinal centerline of the bus and 5.5-mph impacts into the corners at a 30

□ angle to the lo

of the bus. The energy absorption system of the bumper should be independent of every power system of the bus and should not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length by no more than 7 inches.

REAR BUMPER

No part of the bus, including the bumper, should be damaged as a result of a 2-mph impact with a fixed, flat barrier perpendicular to the longitudinal centerline of the bus. The bumper should return to its pre-impact shape within 10 minutes of the impact. When using a yard tug with a smooth, flat plate bumper 2 feet wide contacting the horizontal centerline of the rear bumper, the bumper should provide protection at speeds up to 5 mph, over pavement discontinuities up to 1 inch high, and at accelerations up to 2 mph/sec. The rear bumper should protect the bus, when impacted anywhere along its width by the Common Carriage with Contoured Impact Surface defined in Figure 2 of FMVSS 301 loaded to 4,000 pounds, at 4 mph parallel to, or up to a 30

□ angle to, the long

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bumper should be shaped to preclude unauthorized riders standing on the bumper. The bumper should be independent of all power systems of the bus and should not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length by no more than 7 inches.

BUMPER MATERIAL

Bumper material should be corrosion-resistant and withstand repeated impacts of the specified loads without sustaining damage. Visible surfaces should be black or color -coordinated with the bus exterior. The bumper qualities should be sustained throughout the service life of the bus.

FINISH AND COLOR

All exterior surfaces should be smooth and free of wrinkles and dents. Exterior surfaces to be painted should be properly prepared as required by the paint system supplier, prior to application of paint to assure a proper bond between the basic surface and successive coats of original paint for the service life of the bus. Drilled holes and cutouts in exterior surfaces should be made prior to cleaning, priming and painting to prevent corrosion. The bus should be completely painted prior to installation of exterior lights, windows, mirrors and other items which are applied to the exterior of the bus. Body filler materials may be used for surface dressing, but not for repair of damaged or improperly fitted panels.

Paint should be applied smoothly and evenly with the finished surface free of dirt and the following other imperfections:

- A. Blisters or bubbles appearing in the topcoat film.
- B. Chips, scratches, or gouges of the surface finish.
- C. Cracks in the paint film.
- D. Craters where paint failed to cover due to surface contamination.
- E. Overspray.
- F. Peeling
- G. Runs or sags from excessive flow and failure to adhere uniformly to the surface.
- H. Chemical stains and water spots.

To the degree consistent with industry standards for commercial vehicle finishes, painted surfaces should have gloss and orange peel should be minimized. All exterior finished surfaces should be impervious to diesel fuel, gasoline and commercial cleaning agents. Finished surfaces should resist damage by controlled applications of commonly used graffiti-removing chemicals. Colors and paint schemes should be in accordance with the attachments to Part 5: Technical Specifications.

NUMBERING AND SIGNING

Monograms, numbers and other special signing specified by the agency should be applied to the inside and outside of the bus as required. Signs should be durable and fade-chip , and peel-resistant; they may be painted signs, decals, or pressure-sensitive appliques. All decals should be sealed with clear,

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waterproof sealant around all exposed edges if required by the decal supplier. Signs should be provided in compliance with the ADA requirements defined in 49 CFR Part, Subpart B, 38.27. The exact wording, size, color, and locations for these signs are found with requirements for other special signs in attachments to Part 5: Technical Specifications.

EXTERIOR LIGHTING

All exterior lights should be designed to prevent entry and accumulation of moisture or dust, and each lamp should be replaceable in less than 5 minutes by a 2M mechanic helper. Commercially available LED (Light Emitting Diode)-type lamps should be used unless approved by the agency, excluding applications where white lights are used, such as for headlights. Lights mounted on the engine compartment doors should be protected from the impact shock of door opening and closing. Lamps, lenses and fixtures should be interchangeable to the extent practicable. Two hazard lamps at the rear of the bus should be visible from behind when the engine service doors are opened. Light lenses should be designed and located to prevent damage when running the vehicle through an automatic bus washer. Lights located on the roof and sides (directionals) of the bus should have protective shields or be of the flush mount type to protect the lens against minor impacts.

Visible and audible warning should inform following vehicles or pedestrians of reverse operation. Visible reverse operation warning should conform to SAE Standard J593. Audible reverse operation warning should conform to SAE Recommended Practice J994 Type C or D.

Lamps at the front and rear passenger doorways should comply with ADA requirements and should activate only when the doors open. These lamps should illuminate the street surface to a level of no less than 1 foot-candle for a distance of 3 feet outward from the outboard edge of the door threshold. The lights may be positioned above or below the lower daylight opening of the windows and should be shielded to protect passengers' eyes from glare.

INTERIOR PANELS AND FINISHES

GENERAL

Materials should be selected on the basis of maintenance, durability, appearance, safety, flammability, and tactile qualities. Trim and attachment details should be kept simple and unobtrusive. Materials should be strong enough to resist everyday abuse and vandalism; they should be resistant to scratches and markings. Interior trim should be secured to avoid resonant vibrations under normal operational conditions.

Interior surfaces more than 10 inches below the lower edge of the side windows or windshield should be shaped so that objects placed on them fall to the floor when the coach is parked on a level surface. The entire interior should be cleanable with a hose, using a liquid soap attachment. Water and soap should not normally be sprayed directly on the instrument and switch panels.

FRONT END

The entire front end of the bus should be sealed to prevent debris accumulation behind the dash and to prevent the operator's feet from kicking or fouling wiring and other equipment. The front end should be free of protrusions that are hazardous to passengers standing or walking in the front of the bus during rapid decelerations. Paneling across the front of the bus and any trim around the operator's

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compartment should be formed metal or plastic material. Formed metal dash panels should be painted and finished or may be carpeted or vinyl covered. Plastic dash panels should be reinforced, as necessary, vandal-resistant, and replaceable. All colored, painted, and plated parts forward of the operator's barrier should be finished with a dull matte surface to reduce glare.

REAR END

The rear bulkhead and rear interior surfaces should be material suitable for exterior skin, painted and finished to exterior quality, or paneled with melamine-type material, plastic, or carpeting and trimmed with stainless steel, aluminum, or plastic.

INTERIOR PANELS

GENERAL

Interior side trim panels and operator's barrier should be textured stainless steel, anodized aluminum, plastic, melamine-type material, or carpeting. Panels should be easily replaceable and tamper-resistant. They should be reinforced, as necessary, to resist vandalism and other rigors of transit bus service. Individual trim panels and parts should be interchangeable to the extent practicable. All materials should comply with the Recommended Fire Safety Practices defined in FTA Docket 90, dated October 20, 1993.

OPERATOR BARRIER

A barrier or bulkhead between the operator and the street-side front passenger seat should be provided. The barrier should minimize glare and reflections in the windshield directly in front of the barrier from interior lighting during night operation.

The barrier should extend from the floor or wheel housing to the ceiling and should fit the bus side windows, wall, and ceiling panels to effectively close off driver's area and prevent passengers from reaching the operator or the operator's personal effects.

MODESTY PANELS

Sturdy divider panels constructed of durable, unpainted, corrosion-resistant material complementing the interior trim should be provided to act as both a physical and visual barrier for seated passengers. Modesty panels should be located at doorways to protect passengers on adjacent seats, and along front edge of rear upper level. Design and installation of modesty panels located in front of forward facing seats should include a handhold/grabhandle along its top edge. These dividers should be mounted on the sidewall and should project toward the aisle no farther than passenger knee projection in longitudinal seats or the aisle side of the transverse seats. Modesty panels should extend no higher than the lower daylight opening of the side windows and those forward of transverse seats should extend downward to a level between 1-1/2 and 1 inches above the floor. Panels forward of longitudinal seats should extend to below the level of the seat cushion. Dividers positioned at the doorways should provide no less than a 2-1/2-inch clearance between the modesty panel and the opened door to protect passengers from being pinched. Modesty panels installed at doorways should be equipped with grab rails. The modesty panel and its mounting should withstand a static force of 250 pounds applied to a four-inch by four-inch area in the center of the panel without permanent visible deformation.

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REAR BULKHEAD

The rear bulkhead paneling should be contoured to fit the ceiling, side walls, and seat backs so that any litter, such as a cigarette package or newspaper, will tend to fall to the floor or seating surface when the bus is on a level surface. Any air vents in this area should be louvered to reduce airflow noise and to reduce the probability of trash or litter being thrown or drawn through the grille. If it is necessary to remove the panel to service components located on the rear bulkhead, the panel should be hinged or should be able to be removed and replaced by a 3M mechanic in 5 minutes. Grilles where access to or adjustment of equipment is required should be heavy duty and designed to minimize damage.

HEADLINING

Ceiling panels should be textured stainless steel, anodized aluminum, melamine-type material, carpeting, or material suitable for exterior skin painted and finished to exterior quality. Headlining should be supported to prevent buckling, drumming, or flexing and should be secured without loose edges. Headlining materials should be treated or insulated to prevent marks due to condensation where panels are in contact with metal members. Moldings and trim strips, as required to make the edges tamperproof, should be stainless steel, aluminum, or plastic, colored to complement the ceiling material. Headlining panels covering operational equipment that is mounted above the ceiling should be on hinges for ease of service but retained to prevent inadvertent opening.

FASTENING

Interior panels should be attached so that there are no exposed unfinished or rough edges or rough surfaces. Panels and fasteners should not be easily removable by passengers. Interior trim fasteners, where required, should be rivets or cross-recessed head screws.

INSULATION

Any insulation material used between the inner and outer panels should be sealed or self-sealing to minimize entry and/or retention of moisture. Insulation properties should be unimpaired during the service life of the bus. Any insulation material used inside the engine compartment should not absorb or retain oils or water and should be designed to prevent casual damage that may occur during maintenance operations. All insulation materials should comply with the Recommended Fire Safety Practices defined in FTA Docket 90, dated October 20, 1993.

The combination of inner and outer panels on the sides, roof, wheelwells and ends of the bus, and any material used between these panels should provide a thermal insulation sufficient to meet the interior temperature requirements of Part 5: Technical Specifications. The bus body should be thoroughly sealed so that the operator or passengers cannot feel drafts during normal operations with the passenger doors closed.

FLOOR COVERING

The floor covering should have a non-skid walking surface that remains effective in all weather conditions and complies with all ADA requirements. The floor covering, as well as transitions of flooring material to the main floor and to the entrance and exit area, should be smooth and present no tripping hazards. The standee line should be at least 2 inches wide and should extend across the bus aisle. This

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line should be the same color as the outboard edge of the entrance/exit areas. Color/pattern should be consistent throughout the floor covering.

Any areas on floor, which are not intended for standees, such as areas “swept” during passenger door operation, should be clearly and permanently marked.

The floor in the operator's compartment should be easily cleaned and should be arranged to minimize debris accumulation.

A one-piece center strip should extend from the vertical wall of the rear settee between the aisle sides of transverse seats to the standee line. If the floor is of a bi-level construction, then center strip should be one-piece at each level. The covering between the center strip and the wheel housings may be separate pieces. At the rear door, however, a separate strip as wide as the door should extend from the center strip to the outboard edge of the rear/exit area.

The floor under the seats should be covered with smooth surface flooring material. The floor covering should closely fit the sidewall cove or extend to the top of the cove.

PASSENGER INTERIOR LIGHTING

The interior LED lighting system should provide a minimum 15 foot-candle illumination on a 1 square foot plane at an angle of 45 degrees from horizontal, centered 33 inches above the floor and 24 inches in front of the seat back at each seat position. Allowable average light level for the rear bench seats should be 7 foot-candles. Floor surface in the aisles should be a minimum of 10 foot-candles, vestibule area a minimum of 4 foot-candles with the front doors open and a minimum of 2 foot-candles with the front doors closed. The front entrance area and curb lights should illuminate when the front door is open and master run switch is in the “Lights” positions. Rear exit area and curb lights should illuminate when rear door is unlocked.

Step lighting for the intermediate platform between lower and upper floor levels should be provided and should illuminate in all engine run positions. The step lighting should be low-profile to minimize tripping and snagging hazard for passengers and should be shielded as necessary to protect passenger's eyes from glare.

The light source should be located to minimize windshield glare with distribution of the light focused primarily on the passengers' reading plane while casting sufficient light onto the advertising display. Fluorescent tubes should be a maximum 6-foot length, single-pin, T 12 type. (with an exception granted for extinguishing or dimming fixtures as noted)

Lens material should be clear polycarbonate. Lens should be designed to effectively "mask" the fluorescent tube. Lens should be sealed to inhibit incursion of dust and insects yet are easily removable for service. If threaded fasteners are used they must be held captive in the lens. Access panels should be provided to allow servicing of components located behind light panels. If necessary, the entire light fixture should be hinged.

When the master switch is in the RUN or NITE/RUN mode, the first light module on each side of the coach should automatically extinguish or dim when the front door is in the closed position and illuminate when the door is opened. This should be accomplished through use of a ballast specifically designed for this type application without diminishing the life of the fluorescent tubes.

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The light system may be designed to form part or the entire air distribution duct.

A light fixture should be mounted in the ceiling above the farebox location. The fixture should be capable of projecting a concentrated beam of light on the farebox. This light will automatically come on whenever the front doors are opened and the run switch is in the “night run” or “night park” position.

FARE COLLECTION

Space, as far forward as practicable, and structural provisions should be made for installation of currently available fare collection device(s). Location of the fare collection device should not restrict traffic in the vestibule, including wheelchairs if a front door loading device is used, and should allow the operator to easily reach the farebox controls and to view the fare register. The fare box should not restrict access to the operator area, should not restrict operation of operator controls and should not restrict operator’s field of view per SAE Recommended Practice. Location and mounting of fare collection device should allow use, without restriction, by passengers. Fare box location should permit accessibility to the vault for easy manual removal or attachment of suction devices. Meters and counters on the fare box should be readable on a daily basis. A 15-amp minimum, 12 -volt, DC, protected circuit should be available to power the fare box and a 15 amp 24-volt protected circuit should be available for transfer equipment. This power service should include a grounded lead with both wires enclosed in a flexible conduit. The floor under the fare box should be reinforced, as necessary, to provide a sturdy mounting platform and to prevent shaking of the fare box. The fare box, including make, model, mounting provisions, size, weight, and meter locations.

Transfer mounting, cutting, and punching equipment should be located in a position convenient to the operator. This equipment is defined in attachments to Part 5: Technical Specifications.

ACCESS PANELS AND DOORS - INTERIOR

Access for maintenance and replacement of equipment should be provided by panels and doors that appear to be an integral part of the interior. Access doors should be hinged with gas props or over-center springs, where practical, to hold the doors out of the mechanic's way. Panel fasteners should be standardized so that only one tool is required to service all special fasteners within the bus.

Access doors for the door actuator compartments should be secured with locks, and should prevent entry of mechanism lubricant into the bus interior. The locks should be standardized so that only one tool is required to open access doors on the bus. All fasteners that retain access panels should be captive in the cover.

Access openings in the floor should be sealed to prevent entry of fumes and water into the bus interior. Flooring material should be flush with the floor and should be edge-bound with stainless steel, or other material that is acceptable with approval, to prevent the edges from coming loose. Access openings should be asymmetrical so that reinstalled flooring should be properly aligned. Fasteners should tighten flush with the floor.

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PASSENGER ACCOMMODATIONS

PASSENGER SEATING

ARRANGEMENTS AND SEAT STYLE

The passenger seating arrangement in the bus should be such that seating capacity is maximized and in compliance to the following requirements. The agency recognizes that ramp location, foot room, hip-to-knee room, doorway type and width, seat construction, floor level type, seat spacing requirements, etc. ultimately affect seating capacity and layout.

Passenger seats should be arranged in a transverse, forward facing configuration, except at the wheel housings where aisle-facing seats may be arranged as appropriate with due regard for passenger access and comfort. Other areas where aisle-facing seats may be provided are at wheelchair securement areas and platforms (such as for fuel tank storage space).

The passenger seats should be fully cushioned throughout the bus. Note that all applicable seat dimensions specified below should be measured with cushion fully depressed.

Hip-to-knee room measured from the front of one seat back horizontally across the highest part of the seat to the seat or panel immediately in front, should be no less than 28 inches. At all seating positions in paired transverse seats immediately behind other seating positions hip-to-knee room should be no less than 28 inches.

In order to maximize seating capacity without unduly affecting passenger comfort, minor variations in the required hip-to-knee room will be allowed in limited areas. All such areas should be identified to the agency prior to bid for approval.

Foot room, measured at the floor forward from a point vertically below the front of the seat cushion, should be no less than 14 inches. Seats immediately behind the wheel housings and modesty panels may have foot room reduced, provided the wheelhouse is shaped so that it may be used as a footrest or the design of modesty panel effectively allows for foot room.

Thickness of the transverse seat backs should be minimized at the bottom to increase passenger knee room and passenger capacity. The area between the longitudinal seat backs and the attachment to the bus sidewalls should be designed to prevent debris accumulation.

The aisle between the seats should be no less than 20 inches wide at seated passenger hip height. Seat backs should be shaped to increase this dimension to no less than 24 inches at standing passenger hip height.

Raised platforms for passenger seats should not be allowed without Procuring Agency's approval. If vehicle is of a sloped floor design, then raised platforms for passenger seats may be provided in the rear sloped section.

Dimensions

Seat dimensions for the various seating arrangements should have the dimensions as follows (refer to the figure above):

The width, W, of the seat should be 35 inches.

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The length, L, should be 17 ± 1 inches.

The seat back height, B, should be a minimum of 15 inches.

The seat height, H, should be 17 ± 1 inches. For the rear lounge (or settee) and longitudinal seats, and seats located above raised areas for storage of under floor components, a cushion height of up to 18 ± 2 inches will be allowed. This should also be allowed for limited transverse seats, but only with expressed approval of the agency.

The seat cushion slope, S, should be between 5° to 11° .

The seat back slope, C, should be between 8° to 17° .

The pitch, P, is shown as reference only.

Structure and Design

The passenger seat frame and its supporting structure should be constructed and mounted so that space under the seat is maximized to increase wheelchair maneuvering room and is completely free of obstructions to facilitate cleaning.

The transverse seat structure should be fully cantilevered from the sidewall with sufficient strength for the intended service. The lowest part of the seat assembly that is within 12 inches of the aisle should be at least 10 inches above the floor. Folding seats used in wheelchair securement areas, as well as, transverse seats mounted in locations at which cantilevered installation is precluded by design and/or structure, need not be cantilevered.

The underside of the seat and the sidewall should be configured to prevent debris accumulation and the transition from the seat underside to the bus sidewall to the floor cove radius should be smooth. All transverse objects, including seat backs, modesty panels, and longitudinal seats, in front of forward facing seats should not impart a compressive load in excess of 1,000 pounds onto the femur of passengers ranging in size from a 5th-percentile female of a 95th-percentile male during a 10g deceleration of the bus. This deceleration should peak at .05 seconds from initiation of deceleration. The deformation of the seat resulting from two 95th-percentile males striking the seat back during this 10g deceleration should not exceed 2 inches, measured at the aisle side of the seat frame at height H. Seat back should not deflect more than 14 inches, measured at the top of the seat back, in a controlled manner to minimize passenger injury. Structural failure of any part of the seat or sidewall should not introduce a laceration hazard.

The seat assembly should withstand static vertical forces of 500 pounds applied to the top of the seat cushion in each seating position with less than 1/4-inch permanent deformation in the seat or its mountings. The seat assembly should withstand static horizontal forces of 500 pounds evenly distributed along the top of the seat back with less than 1/4-inch permanent deformation in the seat or its mountings. The seat backs at the aisle position and at the window position should withstand repeated impacts of two 40-pound sandbags without visible deterioration. One sandbag should strike the front 40,000 times and the other sandbag should strike the rear 40,000 times. Each sandbag should be suspended on a 36-inch pendulum and should strike the seat back 10,000 times each from distances of 6, 8, 10, and 12 inches. Seats at both seating positions should withstand 4,000 vertical drops of a 40-pound sandbag without visible deterioration. The sandbag should be dropped 1,000 times each from

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heights of 6, 8, 10, and 12 inches. Seat cushions should withstand 100,000 randomly positioned 3-1/2-inch drops of a squirming, 150-pound, smooth-surfaced, buttocks-shape striker with only minimal wear on the seat covering and no failures to seat structure or cushion suspension components.

The back of each transverse seat should incorporate a handhold no less than 7/8 inch in diameter for standees and seat access/egress. The handhold should not be a safety hazard during severe decelerations. The handhold should extend above the seat back near the aisle so that standees should have a convenient vertical assist, no less than 4 inches long that may be grasped with the full hand. This handhold should not cause a standee using this assist to interfere with a seated 50th-percentile male passenger. The handhold should also be usable by a 5th-percentile female, as well as by larger passengers, to assist with seat access/egress for either transverse seating position. The upper rear portion of the seat back and the seat back handhold immediately forward of transverse seats should be padded and/or constructed of energy absorbing materials. During a 10g deceleration of the bus, the HIC number (as defined by SAE Standard J211a) should not exceed 400 for passengers ranging in size from a 5th percentile female through a 95th percentile male. The seat back handhold may be deleted from seats that do not have another transverse seat directly behind and where vertical assist is. Armrests should not be included in the design of transverse seats.

Longitudinal seats should be the same general design as transverse seats but without seat back handholds. Longitudinal seats may be mounted on the wheelhouses. Armrests should be included on the ends of each set of longitudinal seats except on the forward end of a seat set that is immediately to the rear of a transverse seat, the operator's barrier, or a modesty panel and these fixtures perform the function of restraining passengers from sliding forward off the seat. Armrests are not required on longitudinal seats located in the wheelchair parking area that fold up when the armrest on the adjacent fixed longitudinal seat is within 1-1/2 to 3-1/2 inches of the end of the seat cushion. Armrests should be located from 7 to 9 inches above the seat cushion surface. The area between the armrest and the seat cushion should be closed by a barrier or panel. The top and sides of the armrests should have a minimum width of 1 inch and should be free from sharp protrusions that form a safety hazard.

Seat back handhold and armrests should withstand static horizontal and vertical forces of 250 pounds applied anywhere along their length with less than 1/4-inch permanent deformation. Seat back handhold and armrests should withstand 25,000 impacts in each direction of a horizontal force of 125 pounds with less than 1/4-inch permanent deformation and without visible deterioration.

A test report should be provided by the Contractor fully documenting compliance with all the requirements defined above upon request. The test report should contain a record of all testing activities, test diagrams, testing equipment, as well as test data related to loads, deflections and permanent deformation of the seat assembly.

Construction and Materials

Seat should be constructed with materials which comply with the physical test. Selected materials should minimize damage from vandalism and should reduce cleaning time. The seats should be attached to the frame with tamperproof fasteners. Coloring should be consistent throughout the seat material, with no visually exposed portion painted. All visually exposed metal of the standard seat structure including mounting brackets and other components should be aluminum or stainless steel. The seat,

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pads and cushions should be contoured for individuality, lateral support, and maximum comfort and should fit the framework to reduce exposed edges.

Seating and interior trim should have features to maximize passenger comfort. The seat cushion should be supported by springs. The seat cushion and back should be padded with, a cellular foam product that complies with the physical test requirements cited in this document and is no less than 2 inches thick in areas contacted and loaded by passengers in the normal seated position and should be upholstered with vinyl and/or fabric materials.

Armrests should be padded with material that is the same as, or similar to, the seat back padding and handhold. Seats, back cushions and other pads should be securely attached and should be detachable by means of a simple release mechanism employing a special tool so that they are easily removable by maintenance personnel but not by passengers. To the extent practicable, seat cushions and pads should be interchangeable throughout the coach bus. Materials should have high resistance to tearing, flexing, and wetting.

The minimum radius of any part of the seat back, handhold, or modesty panel in the head or chest impact zone should be a nominal 1/4-inch. Seat covering materials should be selected on the basis of durability, ease of maintenance, and pleasing texture and appearance. The seat back and seat back handhold immediately forward of transverse seats should be constructed of energy absorbing materials to provide passenger protection and, in a severe crash, allow the passenger to deform the seating materials in the impact areas in accordance with the Knee Impact and Head Impact Criteria. Complete seat assemblies should be interchangeable to the extent practicable. Additional construction details, color of the seat material and optional safety padding are defined in attachments to Part 5: Technical Specifications.

PASSENGER ASSISTS

General

Passenger assists in the form of full grip, vertical stanchions or handholds should be provided for the safety of standees and for ingress/egress. Passenger assists should be convenient in location, shape, and size for both the 95th-percentile male and the 5th-percentile female standee. Starting from the entrance door and moving anywhere in the bus and out the exit door, a vertical assist should be provided either as the vertical portion of seat back assist or as a separate item so that a 5th-percentile female passenger may easily move from one assist to another using one hand and the other without losing support. All handholds and stanchions at front doorway, around farebox, and at interior steps for bi-level designs should be powder-coated in high contrast yellow color. The forward-most vertical stanchions on either side of the aisle immediately behind the driver's area, should be plain stainless steel finish to match the rest of vehicle.

Excluding those mounted on the seats and doors, the assists should have a cross-sectional diameter between 1-1/4 and 1-1/2 inches or should provide an equivalent gripping surface with no corner radii less than 1/4 inch. All passenger assists should permit a full hand grip with no less than 1-1/2 inches of knuckle clearance around the assist. Passenger assists should be designed to minimize catching or snagging of clothes or personal items and should be capable of passing the NHTSA Drawstring Test.

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Any joints in the assist structure should be underneath supporting brackets and securely clamped to prevent passengers from moving or twisting the assists. Passenger assists should be designed to minimize glare in the Operator’s area to the extent possible. With the exception of seat and door handholds, all areas of the passenger assists that are handled by passengers including functional components used as passenger assists should be of anodized aluminum or stainless steel. Seat handholds may be of the same construction and finish as the seat frame. Door mounted passenger assists should be of anodized aluminum, stainless steel, or powder coated metal. Connecting tees and angles may be powder coated metal castings. Assists should withstand a force of 300 pounds applied over a 12-inch lineal dimension in any direction normal to the assist without permanent visible deformation. All passenger assist components, including brackets, clamps, screw heads, and other fasteners used on the passenger assists should be designed to eliminate pinching, snagging and cutting hazards and free from burrs or rough edges.

Front Doorway

Front doors, or the entry area, should be fitted with ADA compliant assists. Assists should be as far outward as practicable, but should be located on farther inboard than 6 inches from the outside edge of the entrance step and should be easily grasped by a 5th-percentile female boarding from street level. Door assists should be functionally continuous with the horizontal front passenger assist and the vertical assist and the assists on the wheel housing or on the front modesty panel.

Vestibule

The aisle side of the operator's barrier, the wheel housings, and when applicable the modesty panels should be fitted with vertical passenger assists that are functionally continuous with the overhead assist and that extend to within 36 inches of the floor. These assists should have sufficient clearance from the barrier to prevent inadvertent wedging of a passenger's arm.

A horizontal passenger assist should be located across the front of the bus and should prevent passengers from sustaining injuries on the fare collection device or windshield in the event of a sudden deceleration. Without restricting the vestibule space, the assist should provide support for a boarding passenger from the front door through the fare collection procedure. Passengers should be able to lean against the assist for security while paying fares. The assist should be no less than 36 inches above the floor. The assists at the front of the bus should be arranged to permit a 5th-percentile female passenger to easily reach from the door assist, to the front assist, to vertical assists on the operator's barrier, wheel housings, or front modesty panel.

Rear Doorway

Vertical assists that are functionally continuous with the overhead assist should be provided at the aisle side of the transverse seat immediately forward of the rear door and on the aisle side of the rear door modesty panel(s). Passenger assists should be provided on modesty panels that are functionally continuous with the rear door assists. Rear doors, or the exit area, should be fitted with assists no less than 3/4 inch in width and should provide at least 1-1/2 inches of knuckle clearance between the assists and their mounting. The assists should be designed to permit a 5th-percentile female to easily move from one assist to another during the entire exiting process. The assists should be located no farther inboard than 6 inches from the outside edge of the rear doorway.

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Overhead

Except forward of the standee line and at the rear door, a continuous, full grip, overhead assist should be provided. This assist should be convenient to standees anywhere in the bus and should be located over the center of the aisle seating position of the transverse seats. The assist should be no less than 70 inches above the floor.

Overhead assists should simultaneously support 150 pounds on any 12-inch length. No more than 5 percent of the full grip feature should be lost due to assist supports.

Longitudinal Seats

Longitudinal seats should have vertical assists located between every other designated seating position, except for seats that fold/flip up to accommodate wheelchair securement. Assists should extend from near the leading edge of the seat and should be functionally continuous with the overhead assist. Assists should be staggered across the aisle from each other where practicable and should be no more than 52 inches apart or functionally continuous for a 5th percentile female passenger.

Wheel Housing Barriers/Assists

Unless passenger seating is provided on top of wheel housing, passenger assists should be mounted around the exposed sides of the wheel housings (and propulsion compartments if applicable) which should also be designed to prevent passengers from sitting on wheel housings. Such passenger assists should also effectively retain items, such as bags and luggage, placed on top of wheel housing.

PASSENGER DOORS

General

Two doorways should be provided in the curbside of the bus for passenger ingress and egress. The front doorway should be forward of the front wheels and located so that the operator will be able to collect or monitor the collection of fares. Passenger doors and doorways should comply with ADA requirements.

The rear doorway centerline should be rearward of the point midway between the front door centerline and the rearmost seat back. Rear doors should be operated by passenger push-to-exit.

Materials and Construction

Structure of the doors, their attachments, inside and outside trim panels, and any mechanism exposed to the elements should be corrosion-resistant. Door panel construction should be of corrosion-resistant metal or reinforced non-metallic composite materials. The doors, when fully opened, should provide a firm support and should not be damaged if used as an assist by passengers during ingress or egress. The front leaves of the passenger doors should overlap the rear leaves.

Dimensions

Front door clear width should be no less than 31.75 inches with the doors fully opened.

When open, the doors should leave an opening no less than 76 inches in height.

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Door Glazing

The upper section of both front and rear doors should be glazed for no less than 45 percent of the respective door opening area of each section. The lower section of the front door should be glazed for no less than 25 percent of the door opening area of the section.

The front door panel glazing material should have a nominal ¼ inch or 6 mm thick laminated safety glass conforming to the requirements of ANSI Z26.1 Test Grouping 2 and the Recommended Practices defined in SAE J673.

Glazing material in the rear doorway door panels should be the same material, thickness and color as the side windows defined in Section 5.4.7.4.2.

Door Projection

Exterior projection of the doors should be minimized and should not exceed 13 inches during the opening or closing cycles or when doors are fully opened. Projection inside the bus should not exceed 21 inches. The closing edge of each door panel should have no less than 2 inches of soft weather stripping. The doors, when closed, should be effectively sealed and the hard surfaces of the doors should be at least 4 inches apart.

Door Height Above Pavement

It should be possible to open and close either passenger door when the bus loaded to GVWR is not knelt and parked with the tires touching an 8-inch-high curb on a street sloping toward the curb so that the street side wheels are 5 inches higher than the right side wheels.

Closing Force

Closing door edge speed should not exceed 19 inches per second. Power close rear doors should be equipped with a sensitive edge or other obstruction sensing system such that if an obstruction is struck by a closing door edge, the doors will stop and/or reverse direction prior to imparting a 10-pound force on 1 square inch of that obstruction. Doors closed by return spring or counterweight-type device need not be equipped with an obstruction sensing device but should be capable of being pushed to the point where the door starts to open with a force not to exceed 20 pounds applied to the center edge of the forward door panel. Whether or not the obstruction sensing system is present or functional it should be possible to withdraw a 1-1/2 inch diameter cylinder from between the center edges of a closed and locked door with an outward force not greater than 35 pounds.

Actuators

Door actuators should be adjustable so that the door opening and closing speeds can be independently adjustable. Actuators and the complex door mechanism should be concealed from passengers but should be easily accessible for servicing. The door actuators should be rebuild-able. If powered by compressed air, exhaust from the door system should be routed below the floor of the bus to prevent accumulation of any oil which may be present in air system and to muffle sound.

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Emergency Operation

In the event of an emergency, it should be possible to open the doors manually from inside the bus using a force of no more than 25 pounds after actuating an unlocking device at each door. The unlocking devices should be clearly marked as an emergency-only device and should require two distinct actions to actuate. The respective door emergency unlocking device should be accessible from the entrance and exit areas. When the rear emergency device is actuated, the door interlock throttle system should return the engine to idle and the door interlock brake system should apply to stop the bus. When the front door emergency device is actuated only the door interlock throttle system should be actuated. Locked doors should require a force of more than 100 pounds to open manually. When the locked doors are manually forced to open, damage should be limited to the bending of minor door linkage with no resulting damage to the doors, engines, and complex mechanism.

ACCESSIBILITY PROVISIONS

General

The design and construction of the bus should be in accordance with all requirements defined in 49 CFR, Part 38, Subpart B: ADA Accessibility Specifications for Transportation Vehicles - Buses, Vans and Systems. Space and body structural provisions should be provided at the front or rear door of the bus to accommodate the wheelchair loading system. Specific requirements, including the number of wheelchairs to be accommodated, the tiedown and securement devices, and fold-down seats, are provided in attachments to Part 5: Technical Specifications. Prior to submission of bid, the Contractor should provide a plan, including layout drawings for entry, maneuvering, parking, and exiting of wheelchair passengers, to show compliance with ADA regulations.

Loading System

An automatically-controlled, power-operated ramp system compliant to requirements defined in 49 CFR Part 38, Subpart B, §38.23c should provide ingress and egress quickly, safely, and comfortably, both in forward and rearward directions for a passenger in a wheelchair from a level street or curb.

The wheelchair loading system should be located at the rear door.

The ramp should be of a simple hinged, flip-out type design.

When the system is not in use, the passageway should appear normal. In the stored position of the ramp, no tripping hazards should be presented and any resulting gaps should be minimized. The controls should be simple to operate with no complex phasing operations required, and the loading system operation should be under the surveillance and complete control of the operator. If the loading system and controls are at the rear doors, a switch should be provided in the operator's area to disable the loading system. The bus should be prevented from moving during the loading or unloading cycle by a throttle and brake interlock system. The wheelchair loading system should not present a hazard, nor inconvenience any passenger. The loading system should be inhibited from retracting or folding when a passenger is on the ramp/platform. A passenger departing or boarding via the ramp should be able to easily obtain support by grasping the passenger assist located on the doors or other assists provided for this purpose. The platform should be designed to protect the ramp from damage and persons on the sidewalk from injury during the extension/retraction or lowering/raising phases of operation. The

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loading platform should be covered with a replaceable or renewable, nonskid material and should be fitted with devices to prevent the wheelchair from rolling off the sides during loading or unloading. Deployment or storage of the ramp should require no more than 15 seconds. The device should function without failure or adjustment for 500 cycles or 5,000 miles in all weather conditions on the design operating profile when activated once during the idle phase. A manual override system should permit unloading a wheelchair and storing the device in the event of a primary power failure. The manual operation of the ramp should not require more than 20 lbs. of force. The ramp assembly components should be replaceable within 30 minutes by 3M mechanic.

Wheelchair Accommodations

Two forward-facing locations, as close to the wheelchair loading system as practical, should provide parking space and securement system compliant with ADA requirements for a passenger in a wheelchair.

Additional equipment, including passenger restraint seat belts, shoulder harnesses and wheelchair securement devices should be provided for each wheelchair passenger. All belt assemblies must stow up and out of the way when not in use. Q'Straint Slide and Click or approved equal should be used to secure the wheelchair.

Interior Circulation

Maneuvering room inside the bus should accommodate easy travel for a passenger in a wheelchair from the loading device through the bus to the designated parking area, and back out. No portion of the wheelchair or its occupant should protrude into the normal aisle of the bus when parked in the designated parking space(s). As a guide, no width dimension should be less than 34 inches. Areas requiring 90-degree turns of wheelchairs should have a clearance arc dimension no less than 45 inches and in the parking area where 180-degree turns are expected, space should be clear in a full 60-inch-diameter circle. A vertical clearance of 12 inches above the floor surface should be provided on the outside of turning areas for wheelchair footrest.

Passenger Information

ADA priority seating signs as required and defined by 49 CFR, Part 38.27 should be provided to identify the seats designated for passengers with disabilities.

Requirements for a public information system in accordance with 49 CFR, Part 38.35 should be provided.

Requirements for a stop-request passenger signal in accordance with 49 CFR, Part 38.37 should be provided.

Requirements for exterior destination signs in accordance with 49 CFR, Part 38.39 should be provided as required.

OPERATOR PROVISIONS

OPERATOR'S AREA

General

The operator's work area should be designed to minimize glare to the extent possible. Objects within and adjacent to this area should be matte black or dark gray in color wherever possible to reduce the reflection of light onto the windshield. The use of polished metal and light-colored surfaces within and adjacent to the operator's area should be avoided. Such objects include dash panels, switches and controls, cowlings, windshield wipers and arms, barriers and modesty panels, fare stanchions, access panels and doors, fasteners, flooring, ventilation and heating ducting, window and door frames, and visors. Interior lighting located ahead of the standee line should be controlled by the operator.

Visors

An adjustable roller type sunscreen should be provided over the operator's windshield and the operator's side window. The sunscreen should be capable of being lowered to the midpoint of the operator's window. To secure and stabilize the screen, it should be attached to thin metal rods on each side of the window. Once lowered, the screen should remain in the lowered position until returned to the stowed position by the operator.

Operator's Controls

All switches and controls necessary for the operation of the bus should be conveniently located in the operator's area and should provide for ease of operation. Switches and controls should be essentially within the hand reach envelope described in SAE Recommended Practice, J287, Driver Hand Control Reach. Controls should be located so that boarding passengers may not easily tamper with control settings.

Accelerator and brake pedals should be designed for ankle motion. Foot surfaces of the pedals should be faced with wear-resistant, nonskid, replaceable material.

Controls for engine operation should be closely grouped within the operator's compartment. These controls should include separate master run switch and start switch or button. The run switch should be a four-position rotary switch with the following functions:

OFF - All electrical systems off, except power available for the passenger interior lighting, stoplights, turn lights, hazard lights, radio, silent alarm, horn, fare box, fire detection equipment, engine compartment lights, auxiliary heater if provided and electronic equipment that require continuous energizing. If the bus is not operated for a period of 3 days, the total electric load due to devices that require continuous energizing should not cause the battery to be discharged below the level necessary to start the engine. Electrical loads resulting from the Procurement Agency's devices such as fare box, GPS, radio, etc., should not exceed 1.5 amps with the master run switch in the OFF position.

CL/ID - All electrical systems off, except those listed in OFF and power to destination signs, interior lights, and marker lights.

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RUN - All electrical systems and engine on, except the headlights, parking lights and marker lights. Daytime running lights (DRL), if provided, should be on.

NITE/RUN - All electrical systems and engine on.

The door control, kneel control, windshield wiper/washer controls, and run switch should be in the most convenient operator locations. They should be identifiable by shape, touch, and permanent markings. Doors should be operated by a single control, conveniently located and operable in a horizontal plane by the operator's left hand. The setting of this control should be easily determined by position and touch. Turn signal controls should be floor-mounted, foot-controlled, waterproof, heavy-duty, momentary contact switches.

All panel-mounted switches and controls should be marked with easily read identifiers and should be replaceable, and the wiring at these controls should be serviceable from the vestibule or the operator's seat. Switches, controls, and instruments should be dust- and water-resistant

Door Control

Doors should open or close completely in not more than 3.5 seconds from the time of control actuation and should be subject to a safe closing force as to not cause injury. The door control should be a lever that rotates around a vertical staff. The lever should be located on the street side of the operator's area approximately 16 inches to the street side of the operator's seat centerline, forward of the seat, and approximately 23 inches above the floor in the operator's area. The front door should remain in commanded state position even if power is removed or lost.

Operation of, and power to, the passenger doors should be ultimately controlled by the operator. Passenger push-to-exit is an acceptable option.

A control or valve in the operator's compartment should shut off the power to, and/or dump the power from, the front door mechanism to permit manual operation of the front door with the bus shut down. A master door switch which is not within reach of the seated operator when set in the "Off" position should close the doors, deactivate the door control system, release the interlocks, and permit only manual operation of the doors.

To preclude movement of the bus, an accelerator interlock should lock the accelerator in the closed position and a brake interlock should engage the service brake system when the rear door control is activated. The braking effort should be adjustable with hand tools. Rear doors should not open until bus speed is below 2 m.p.h.

An accelerator interlock should lock the accelerator in the closed position whenever front doors are open.

Instrumentation

The speedometer, air pressure gauge(s), and certain indicator lights should be located on the front cowl immediately ahead of the steering wheel. The steering wheel spokes or rim should not obstruct the operator's vision of the instruments when the steering wheel is in the straight-ahead position. Illumination of the instruments should be simultaneous with the marker lamps. Glare or reflection in the windshield, side window, or front door windows from the instruments, indicators, or other controls

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should be minimized. Instruments and indicators should be easily readable in direct sunlight. Indicator lights immediately in front of the operator are identified in the following table.

<u>Visual Indicator</u>	<u>Audible Alarm</u>	<u>Condition</u>
Back-Up	Back-Up Alarm	Reverse Gear is Selected
Hazard	Click	Four-Way Flashers Activated
DRL	None	Daytime Running Lights
High Beam	None	Headlamp High Beams Activated
Left Turn Signal	Click	Left Turn Signal Activated
Parking Brake	None	Parking Brake is Activated
Rear Door	None	Rear Passenger Door is not Closed and Locked
Rear Turn Signal	Click	Right Turn Signal Activated
Stop Lights	None	Brake Lights Operational
Stop Request	Chime	Passenger Stop Request has been Activated
Wheelchair Request	Double Chime	Passenger Wheelchair Stop Request has been Activated

The instrument panel should include an electronic speedometer indicating no more than 80 mph and calibrated in maximum increments of 5 mph. The speedometer should be a rotating pointer type, with a dial deflection of 220 to 270 degrees and 40 mph near the top of the dial. The speedometer should be sized and accurate in accordance with SAE Recommended Practice J678.

The speedometer should be equipped with an odometer with a capacity reading no less than 999,999 miles.

The instrument panel should also include air brake reservoir pressure gauge(s) with indicators for primary and secondary air tanks and voltmeter(s) to indicate the operating voltage across the bus batteries. The instrument panel and wiring should be easily accessible for service from the operator's seat or top of the panel. Wiring should have sufficient length and be routed to permit service without stretching or chafing the wires.

On-Board Diagnostics

The bus should be equipped with an on-board diagnostic system that will indicate conditions that require immediate action by the operator to avoid an unsafe condition or prevent further damage to the bus. This diagnostic system should have visual and audible indicators. The diagnostic indicator lamp panel should be located in clear sight of the operator but need not be immediately in front of him. The intensity of indicator lamps should permit easy determination of on/off status in bright sunlight but should not cause a distraction or visibility problem at night. All indicators should have a method of momentarily testing the operation of the lamp. The audible alarm should be tamper resistant and should have an outlet level between 80 and 83 dBA when measured at the location of the operator's ear. Wherever possible, sensors should be of the closed circuit type, so that failure of the circuit and/or sensor should activate the malfunction indicator. Malfunction and other indicators listed in the following table should be supplied on all buses.

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Space should be provided on the panel for future installation of 5 additional indicators as the capability of on-board diagnostic systems improves.

<u>Visual Indicator</u>	<u>Audible Alarm</u>	<u>Condition</u>
ABS	None	ABS System Malfunction
A/C Stop	None	Compressor stopped due to High/Low Pressure or Loss of Refrigerant
Check Engine	None	Engine Electronic Control Unit detects a Malfunction
Check Transmission	None	Transmission Electronic Control Unit detects a Malfunction
Fire	Bell	Over-Temperature Condition in Engine Compartment
Generator Stop	None	Loss of Generator Output
Hot Engine	Buzzer	Excessive Engine Coolant Temperature
Low Air	Buzzer	Insufficient Air Pressure in either Primary or Secondary Reservoirs
Low Oil	Buzzer	Insufficient Engine Oil Pressure
Low Coolant	Buzzer	Insufficient Engine Coolant Level
Wheelchair Ramp	Beeper	Wheelchair Ramp is not Stowed and Disabled
Methane Gas Detection	Bell	Significant Level of Methane Gas Detected
Low Fuel	None	Less than 500 psi Fuel Pressure

WINDSHIELD WIPERS

The bus should be equipped with a variable speed windshield wiper for each half of the windshield, with separate controls for each side. If powered by compressed air, exhaust from the wiper motors should be muffled or piped under the floor of the bus. No part of the windshield wiper mechanism should be damaged by manual manipulation of the arms. At 60 mph, no more than 10 percent of the wiped area should be lost due to windshield wiper lift. Both wipers should park along the edges of the windshield glass. Windshield wiper motors and mechanisms should be easily accessible for repairs or service from inside or outside the bus and should be removable as complete units. The fastener that secures the wiper arm to the drive mechanism should be corrosion resistant.

WINDSHIELD WASHERS

The windshield washer system should deposit washing fluid on the windshield and, when used with the wipers, should evenly and completely wet the entire wiped area. If powered by compressed air, all fluid should be purged from the lines after each use of the washers.

The windshield washer system should have a minimum 3-gallon reservoir, located for easy refilling from outside of the bus and protected from freezing. Reservoir pumps, lines, and fittings should be corrosion-resistant, and the reservoir itself should be translucent for easy determination of fluid level.

OPERATOR'S LIGHTING

The operator's area should have a light to provide general illumination and it should illuminate the half of the steering wheel nearest the operator to a level of 10 to 15 foot-candles. This light should be operator controlled through a switch on the front or side console.

OPERATOR'S SEAT

Dimensions

The operator's seat should be comfortable and adjustable so that persons ranging in size from the 95th-percentile male to the 5th-percentile female may operate the bus. The operator's seat cushion should have a minimum width of 18 inches, a length of 16 to 18 inches, and rearward slope of 0 to 10 degrees (non-adjustable.) The operator's seat back height, measured from the point of intersection of the uncompressed seat cushion with the seat back to the top of the back, should be 20 inches. The seat back formed between the seat back and the seat cushion should be adjustable in the range of 95 to 110 degrees. Height of the seat should be adjustable so that the distance between the top of the uncompressed seat cushion and the floor may vary between 17 and 21 inches. The seat should be adjustable forward and rearward for a minimum travel of 7.5 inches. While seated, the operator should be able to make all of these adjustments by hand without complexity, excessive effort, or being pinched. Adjustment mechanisms should hold the adjustments and should not be subject to inadvertent changes.

□2 inches. The

Structure and Materials

The operator's seat should be contoured to provide maximum comfort for extended period of time. Cushions should be fully padded with at least 3 inches of neoprene foam, or material with equal properties, in the seating areas at the bottom and back. Upholstery should be ventilated, transportation grade vinyl.

The operator's seat should be cushioned supplementally by an air cylinder or air diaphragm. These devices may also provide the seat height adjustments. Damping should be provided as required.

All visually exposed metal on the operator's seat, including the pedestal, should be unpainted aluminum or stainless steel.

Seat belts should be provided across the operator's lap and diagonally across the operator's chest. The operator should be able to use both belts by connecting a single buckle on the right side of the seat cushion. The belts should be fastened to the seat and/or the bus structure so that the operator may adjust the seat without resetting the seat belt. Seat belts should be stored in automatic retractors.

Seat belts should be extended length to accommodate operators of all sizes.

The seat and seatbelt assemblies as installed in the bus should withstand static horizontal forces as required in FMVSS 207 and 210. The seat should withstand 10,000 impacts of a 40-pound sandbags dropped from a height of 12 inches without visible deterioration. The seat should be tested in the lowest vertical position and repeated with the seat in the top vertical position.

Two 40-pound sandbags should be suspended on a 36-inch pendulum and should strike the seat back 10,000 times each from distances of 6, 8, 10, and 12 inches. Seat cushions should withstand 100,000

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randomly positioned 3-1/2-inch drops of a squirming, 150-pound, smooth-surfaced, buttocks-shape striker with only minimal wear on the seat covering.

The Contractor should provide a certified test report fully documenting compliance with all the requirements defined above upon request. The test report should contain a record of all testing activities, test diagrams, testing equipment, as well as test data related to loads, deflections and permanent deformation of the seat assembly.

MIRRORS

Exterior Mirrors

The bus should be equipped with a corrosion-resistant, outside rearview mirror on each side of the bus. Mirrors should permit the operator to view the highway along both sides of the bus, including the rear wheels. The curbside rearview mirror should be mounted so that its lower edge is no less than 80 inches above the street surface.

The operator should be able to adjust the curb-side mirror remotely while seated in the driving position. The control for remote positioning of the mirror should be a single switch or device.

All exterior mirrors should be electrically heated. The heaters should be energized whenever the operator’s heater and/or defroster is activated.

Mirrors should be firmly attached to the bus to prevent vibration and loss of adjustment, but not so firmly attached that the bus or its structure is damaged when the mirror is struck in an accident. Mirrors should retract or fold sufficiently to allow bus washing operations.

Additional details on external mirrors, including size, location and mounting, are contained in Attachments to Part 5: Technical Specifications.

Interior Mirrors

Mirrors should be provided for the operator to observe passengers throughout the bus without leaving his seat and without shoulder movement. With a full standee-load, including standees in the vestibule, the operator should be able to observe passengers in the front/entrance and rear/exit areas, anywhere in the aisle, and in the rear seats. Inside mirrors should not be in the line of sight to the right outside mirror.

Additional details on external mirrors, including size, location and mounting, are contained in Attachments to Part 5: Technical Specifications.

Radio

AM/FM/CD/AUX radio shall be provided and configured in a manner that does not transmit to the passenger compartment speakers, only the speakers in the driver’s area should be connected to this system.

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WINDOWS

GENERAL

Buses that are 30 foot in length should have a minimum of 6,000 square inches of window area, including driver’s and door windows, should be required on each side of the standard configuration bus.

Buses that are 35 foot in length should have a minimum of 8,000 square inches of window area, including driver’s and door windows, should be required on each side of the standard configuration bus.

WINDSHIELD

The windshield should permit an operator's field of view as referenced in SAE Recommended Practice J1050. The vertically upward view should be a minimum of 15 degrees, measured above the horizontal and excluding any shaded band. The vertically downward view should permit detection of an object 3-1/2 feet high no more than 2 feet in front of the bus. The horizontal view should be a minimum of 90 degrees above the line of sight. Any binocular obscuration due to a center divider may be ignored when determining the 90-degree requirement, provided that the divider does not exceed a 3-degree angle in the operator's field of view. Windshield pillars should not exceed 10 degrees of binocular obscuration. The windshield should be designed and installed to minimize external glare as well as reflections from inside the bus.

The windshield should be easily replaceable by removing zip-locks from the windshield retaining moldings. Bonded-in-place windshield should not be used. The windshield glazing material should have a 1/4-inch or 6-mm nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1 Test Grouping 1A and the Recommended Practices defined in SAE J673. The glazing material should have single density tint. The upper portion of the windshield above the operator's field of view should have a dark, shaded band with a minimum luminous transmittance of 6 percent when tested in accordance to ASTM D-1003.

OPERATOR’S SIDE WINDOW

The operator's side window should open sufficiently to permit the seated operator to easily adjust the street side outside rearview mirror. This window section should slide rearward in tracks or channels designed to last the service life of the bus. The operator's side window should not be bonded in place and should be easily replaceable. The glazing material should have a single density tint.

The operator’s side window glazing material should have a 1/4-inch nominal thickness laminated safety glass conforming with the requirements of ANSI Z26.1 Test Grouping 2 and the Recommended Practices defined in SAE J673.

SIDE WINDOWS

Configuration

All side windows, except windows in passenger doors and those smaller than 500 square inches, should have window panels that are openable by passengers. Openable window panels should be equipped with latches that secure the window in the fully open and fully closed positions. The requirements for stops limiting the window opening travel and the window opening area are defined in Attachment to Part 5: Technical Specifications.

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Each openable side window should consist of two full-height horizontally sliding panels.

All side windows should be easily replaceable without disturbing adjacent windows and should be mounted so that flexing or vibration from engine operation or normal road excitation is not apparent.

The windows should be designed and constructed to enable a 3M mechanic to remove and replace two windows in less than 10 minutes.

Materials

Side windows glazing material should have a 1/4-inch nominal thickness tempered safety glass. The material should conform to the requirements of ANSI Z26.1 Test Grouping 2 and the Recommended Practices defined in SAE J673

Windows on the bus sides and in the rear door should be tinted a neutral color, complementary to the bus exterior. The maximum solar energy transmittance should not exceed 37 percent, as measured by ASTM E-424, and the luminous transmittance should be no less than 16 percent as measured by ASTM D-1003. Windows over the destination signs should not be tinted.

HEATING VENTILATING AND AIR CONDITIONING

CAPACITY AND PERFORMANCE

The Heating, Ventilation and Air Conditioning (HVAC) climate control system should be capable of maintaining the interior of the bus at the temperature and humidity levels defined in the following paragraphs.

The HVAC unit may either be roof- or rear-mounted.

Accessibility and serviceability of components should be provided without requiring maintenance personnel to climb-up on the roof of the bus.

With the bus running at the design operating profile with corresponding door opening cycle, and carrying a number of passengers equal to 150 percent of the seated load, the HVAC system should maintain an average passenger compartment temperature within a range between 65o and 80o F, while controlling the relative humidity to a value of 50 percent or less. The system should maintain these conditions while subjected to any outside ambient temperatures within a range of 10o to 95o F and at any ambient relative humidity levels between 5 and 50 percent.

When the bus is operated in outside ambient temperatures of 95o to 115o F, the interior temperature of the bus should be permitted to rise one degree for each degree of exterior temperature in excess of 95o.

When bus is operated in outside ambient temperatures in the range of -10o to +10o F, the interior temperature of the bus should not fall below 55o F while bus is running on the Design Operating Profile.

System capacity testing, including pulldown/warm-up, stabilization and profile, should be conducted in accordance to the APTA Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System. Temperature measurements should be made in accordance to this document with the following modifications:

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The three primary locations used for temperature probes are (1) 6 inches aft of front wheelhousing, (2) centered between the two axles and (3) 6 inches aft of rear wheelhousing. At each primary location, the nine (9) temperature sensing devices should be (A) 72 inches above floor level, (B) 6 inches above top surface of seat cushion and (C) 6 inches above floor.

The recommended locations of temperature probes are only guidelines and may require slight modifications to address actual bus design. Care must be taken to avoid placement of sensing devices in immediate path of air duct outlet. In general, the locations are intended to accurately represent the interior passenger area.

Additional testing should be performed as necessary to ensure compliance to performance requirements stated herein.

The test procedure as described in Section 8 of the APTA document, “Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System” should be used for the purposes of the following pulldown requirements. The air conditioning portion of the HVAC system should be capable of reducing the passenger compartment temperature as defined in the referenced test procedure from 110° to 70°F \pm 3° F in less than 30 minutes after start-up of A/C system. A greater variance may be allowed for the sensor closest to the return air vent.

During the cool-down period the refrigerant pressure should not exceed safe high-side pressures and the condenser discharge air temperature, measured 6 inches from the surface of the coil, should be less than 45 F above the condenser inlet air temperature. No simulated solar load should be used. There should be no passengers on board, and the doors and windows should be closed.

Additional HVAC system and performance requirements are contained in Attachments to Part 5: Technical Specification. The air conditioning system should meet these performance requirements using HFC R134a.

The climate control blower motors and fan should be designed such that their operation complies with the interior noise level requirements as specified in this document.

CONTROLS AND TEMPERATURE UNIFORMITY

The HVAC system excluding the driver’s heater/defroster should be centrally controlled with an advanced electronic/diagnostic control system with provisions for extracting/reading data.

After manual selection and/or activation of climate control system operation mode, all interior climate control system requirements for the selected mode should be attained automatically to within ± 2 F of specified temperature control set-point.

The climate control system should have the provision to allow driver to adjust the temperature control set-point at a minimum of between 68 and 72F. From then on, all interior climate control system requirements should be attained automatically, unless re-adjusted by driver.

The operator should have full control over the defroster and operator's heater. The driver should be able to adjust the temperature in his area through air distribution and fans. The interior climate control system should switch automatically to the ventilating mode if the refrigerant compressor or condenser fan fails.

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Interior temperature distribution should be uniform to the extent practicable to prevent hot and/or cold spots. After stabilization, the temperatures between any two points in the passenger compartment same vertical plane, and 6 inches to 72 inches above the floor, should not vary by more than 5 F with doors closed. The interior temperatures, measured at the same height above the floor, should not vary more than $\pm 5\text{oF}$, from the front to the rear, from the average temperature determined in accordance to APTA Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System. Variations of greater than $\pm 5\text{oF}$ will be allowed for limited, localized areas provided the majority of the measured temperatures fall within the specified requirement.

AIR FLOW

Passenger Area

The cooling mode of the interior climate control system should introduce air into the bus at or near the ceiling height at a minimum rate of 25 cubic feet per minute (cfm) per passenger based on the standard configuration bus carrying a number of passengers equal to 150 percent of the seated load. Airflow should be evenly distributed throughout the bus with air velocity not exceeding 100 feet per minute on any passenger. The ventilating mode should provide air at a minimum flow rate of 20 cfm per passenger.

Airflow may be reduced to 15 cfm per passenger (150 percent of seated load) when operating in the heating mode. The fans should not activate until the heating element has warmed sufficiently to assure at least 70oF air outlet temperature. The heating air outlet temperature should not exceed 120oF under any normal operating conditions.

Operator’s Area

The bus interior climate control system should deliver at least 100 cfm of air to the operator's area when operating in the ventilating and cooling modes. Adjustable nozzles should permit variable distribution or shutdown of the airflow. Airflow in the heating mode should be reduced proportionally to the reduction of airflow into the passenger area. The windshield defroster unit should meet the requirements of SAE Recommended Practice J382, Windshield Defrosting Systems Performance Requirements, and should have the capability of diverting heated air to the operator's feet and legs. The defroster or interior climate control system should maintain visibility through the operator's side window.

AIR FILTRATION

Air should be filtered before discharge into the passenger compartment. The filter should meet the ASHRAE requirement for 5 percent or better atmospheric dust spot efficiency, 50 percent weight arrestance, and a minimum dust holding capacity of 120 gram per 1,000 cfm cell. More efficient air filtration may be provided to maintain efficient heater and/or evaporator operation. Air filters should be easily removable for service.

Air filters should be of disposable type.

ROOF VENTILATORS

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Two roof ventilators should be provided in the roof of the bus, one approximately over or just forward of the front axle and the other, approximately over the rear axle.

Each ventilator should be easily opened and closed manually by a 50th percentile female. If roof ventilator(s) cannot be reached by a 50th percentile female, then a tool should be provided to allow this. When open with the bus in motion, this ventilator should provide fresh air inside the bus. Ventilator should cover an opening area no less than 425 square inches and should be capable of being positioned as a scoop with either the leading or trailing edge open no less than 4 inches, or with all four edges raised simultaneously to a height of no less than 3-1/2 inches. An escape hatch should be incorporated into the roof ventilator. Roof ventilator(s) should be sealed to prevent entry of water when closed.

MAINTAINABILITY

Manually controlled shutoff valves in the refrigerant lines should allow isolation of the compressor and dehydrator filter for service. To the extent practicable, self-sealing couplings utilizing O-ring seals should be used to break and seal the refrigerant lines during removal of major components, such as the refrigerant compressor. Shut-off valves may be provided in lieu of self-sealing couplings. The condenser should be located to efficiently transfer heat to the atmosphere, and should not ingest air warmed above the ambient temperature by the bus mechanical equipment, or to discharge air into any other system of the bus. The location of the condenser should preclude its obstruction by wheel splash, road dirt or debris. HVAC components located within 6 inches of floor level should be constructed to resist damage and corrosion.

ENTRANCE/EXIT AREA HEATING

Heat should be supplied to the entrance and exit areas to prevent accumulation of snow, ice, or slush with bus operating under design profile and corresponding to door opening cycle.

FLOOR LEVEL HEATING

Sufficient floor level heaters should be provided that evenly supply heated forced air through floor ducts across the length of bus. Floor ducts may be discontinued at the upper level but additional provisions to prevent cold floor and ensure temperature uniformity should be included. Control of the floor level heating should be through the main heating system electronic control.

SIGNAGE AND COMMUNICATION

EXTERIOR ROUTE DISPLAYS

Destination Signs

An automatic electronic destination sign system shall be furnished on the front and on the right side near the front door. Display areas of destination signs should be clearly visible in direct sunlight and/or at night. The sign system should provide optimum visibility of the message display units for passengers and should meet applicable ADA requirements defined in 49 CFR, Part 38.39. Destination signs should be installed in such a manner as to facilitate easy access for replacement of the entire sign assembly, or components such as fluorescent lamps/LED's and electronic control modules, from inside the bus within 30 minutes by a 3M mechanic. Lamps and associated parts should be commercially available.

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Destination messages, route designations, and public relations messages should be independently selectable via a single Operator's Control Panel (OCP) which should include a display monitor. The rear route number sign should be controlled by the same OCP that operates the destination signs. The OCP display monitor readout should show the exact information displayed on the destination signs and route number sign. The OCP should be conveniently located for the bus operator and mounted in such a manner that will not pose any safety hazard. The OCP should utilize a durable weatherproof keypad with tactile feel for destination message control functions.

The destination sign system should be capable of programming 10,000 message lines. The number of public relations messages should be limited only by the remaining number of message lines not used for destination purposes. Sign displays should have alternating message capability with programmable blanking time between message lines as may be required. Variable blanking times should be programmable between 0.5 to 25 seconds in duration. Each line message or blanking time for each message should be individually programmable. The message display units should incorporate an automatic blanking feature that will cause the display area to blank within 30 seconds of the bus master power switch being turned off.

An emergency message should be initiated by the closure, or opening, of a dry contact switch or relay. The emergency message should be displayed on the exterior of the bus only. The OCP should not display the emergency message. The destination sign should automatically resume normal operation when the remote emergency switch is returned to its normal position.

Destination Sign Programming: The electronic sign system should be programmable via an integral connector located in the front destination sign area. Software should be furnished for programming the sign system via an IBM-compatible, laptop computer. Software should be capable of providing a high degree of flexibility to create, or select preprogrammed, fonts and graphic displays. The sign should have the capability of being programmed in the field using a PC or field programmer. Message program information should be transferable to and/or from the field programmer device as specified by the agency in attachments to Part 5: Technical Specifications.

The front destination sign should be full color and have no less than 1,792 LED dot pixels, 16 rows by 112 columns, with a message display area of not less than 8 inches high by not less than 56 inches wide.

The side destination sign should be full color and have no less than 648 LED dot pixels, having at least 9 rows and 72 columns with a message display area of not less than 2.7 inches high by not less than 36 inches wide.

The bus "Master Run" switch should control power to the sign system. The sign system should be operable in all switch positions except "Off".

The destination sign compartments should be designed to prevent condensation and entry of moisture and dirt. Additional provisions should be included, if necessary, to prevent fogging of both destination sign compartment window and glazing on unit itself. Access should be provided to allow cleaning of inside of destination sign compartment window and unit glazing.

A complete listing of destination sign readings for initial sign programming by the manufacturer are provided at a later date.

PASSENGER INFORMATION AND ADVERTISING

Interior Displays

Provisions should be made on the rear of the operator's barrier for a frame to retain information that is sized 11 inches wide and 17 inches high, such as routes and schedules. Advertising media 11 inches high and 0.09 inches thick should be retained near the juncture of the bus ceiling and sidewall. The retainers may be concave and should support the media without adhesives. The media should be illuminated by the interior fluorescent light system.

PASSENGER STOP REQUEST/EXIT SIGNAL

A passenger "Stop Requested" signal system that complies with applicable ADA requirements defined in 49 CFR, Part 38.37 should be provided. The system should consist of a heavy-duty pull cable, chime, and interior sign message. The pull cable should be located the full length of the bus on the sidewalls, at the level where the transom is located. If no transom window is required, height of pull cable should approximate this transom level and should be no greater than 63 inches as measured from floor surface. It should be easily accessible to all passengers, seated or standing. Pull cable(s) should activate a solid state or magnetic proximity switch(es). At each wheelchair parking position and priority seating positions additional provision should be included to allow a passenger in a mobility aid to easily activate "Stop Requested" signal.

An auxiliary passenger "Stop Requested" signal should be installed at the rear door to provide passengers standing in the rear door/exit area convenient means of activating the signal system. The signal should be a heavy-duty push button type located above rear door on the rear door actuator compartment access panel. Button should be clearly identified as "Passenger Signal."

A heavy-duty "Stop Request" signal button should be installed on modesty panel stanchion immediately forward of rear door and clearly identified as "Passenger Signal."

Exit signals located in the wheelchair parking area should be no higher than 4 feet above the floor. Instructions should be provided to clearly indicate function and operation of these signals

A single "Stop Requested" chime should sound when the system is first activated. A double chime should sound when the system is first activated from wheelchair passenger areas.

A "Stop Requested" message in red letters should be illuminated when the passenger "Stop Requested" signal system is activated. The "Stop Requested" message should remain visible until one or both passenger doors are opened. The message should be visible to the seated operator and seated passengers. The operator should be able to deactivate the signal system from the operator's area. A green light should be mounted above the rear door, approximately on center of the rear door actuator compartment access panel, to indicate when the rear doors have been unlocked.

RADIO COMMUNICATION SYSTEM

Motorola XPR2500 or approved equivalent should be installed at a location convenient to the operator. The location should conform to SAE Recommended Practice J287 "Driver Hand Control Reach." Provisions for attaching an antenna to the roof and routing an antenna lead to the radio compartment should include a 3/4-inch inside diameter conduit with a pull wire. The antenna mounting and lead

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termination should be accessible from the bus interior. A compartment should be provided to accommodate a communication system. It should be located within 8 feet of the operator's seat and should be connected to the operator's area by waterproof, 2-1/4 inch inside diameter, metallic conduit. The radio area should be supplied with a 30-amp, 12-volt, DC, protected service with positive and negative leads.

PUBLIC ADDRESS SYSTEM

A public address system should be provided that complies with the ADA requirements of 49 CFR, Part 38.35 and enables the operator to address passengers either inside or outside the bus. Inside speakers should broadcast, in a clear tone, announcements that are clearly perceived from all seat positions at approximately the same volume level. A speaker should be provided so announcements can be clearly heard by passengers standing outside the bus near the front door. An operator-controlled switch should select inside or outside announcements. A separate volume control should be provided for the outside system if volume adjustment would otherwise be necessary when switching from inside to outside. The system should be muted when not in use. The microphone should be vandal resistant, mounted on a heavy-duty, flexible gooseneck, which is secured with tamper-proof fasteners and will allow the operator to comfortably speak into it without using his hands. A provision should be provided to secure the microphone in a stored position when not in use. An input jack and mounting clip should be provided in the operator's area for a hand held microphone.

SECURITY CAMERAS

The bus should be equipped with an 8 Channel DVR unit with 8 cameras, three exterior and 5 interior. The DVR should be Mobile DVR X11-8CH or approved equal.

ELECTRICAL SYSTEM

GENERAL REQUIREMENTS

The bus should be equipped with a programmable logic control system that is computer based and completely modular. The programmable logic control collects information received from input devices throughout the bus and then communicates with its system components or other output devices in remote areas of the bus through multiplex wiring system. The entire system will reduce the amount of wiring over a conventional wiring/harness electrical system. Versatility and future expansion should be provided for by expandable system architecture. The system components should be capable of operating in an environment of between -20°F and 170°F while encountering mobile shock and vibrations. The system should store and retrieve data for the mechanical and electrical functions of the bus. All components in the system will be interchangeable. The multiplex power source should be isolated to avoid any ground noise.

The electrical system should provide and distribute power to ensure satisfactory performance of all electrical components. The system should supply a nominal 12 and/or 24 volts of direct current (DC), and employ alternating current up to 220 volts that does not present an electrical shock hazard. Electrical power provided for the fare collection device and the radio compartment should be 12 and/or 24 volts DC as specified in attachments to Part 5: Technical Specifications. Precautions should be taken to minimize hazards to service personnel. Transient voltages above 220 volts may be used in the fluorescent lighting system. The power generating system should be rated sufficiently higher than the

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total possible electrical load to maintain the charge on the batteries at all operating conditions including the engine at idle. All circuits, except for those involved in propulsion system start-up, should be protected by circuit breakers or fuses. Fuses should be used only where it can be demonstrated that circuit breakers are not practicable, and they should be easily accessible for replacement.

Redundant grounds should be used for all electrical equipment, except where it can be demonstrated that redundant grounds are not feasible or practicable. One ground may be the bus body and framing. Grounds should not be carried through hinges, bolted joints (except those specifically designed as electrical connectors), or power plant mountings. Electrical equipment should not be located in an environment that will reduce the performance or shorten the life of the component or electrical system. To the extent practicable, wiring should not be located under the bus floor. Wiring and electrical equipment necessarily located under the bus should be insulated from water, heat, corrosion, and mechanical damage.

MODULAR DESIGN

Design of the electrical system should be modular so that each major component, apparatus panel, or wiring bundle is easily separable with standard hand tools or by means of connectors. Each module, except the main body wiring harness, should be removable and replaceable in less than 1 hour by a 3M mechanic. Power plant wiring should be an independent wiring module. Replacement of the engine compartment wiring module(s) should not require pulling wires through any bulkhead or removing any terminals from the wires.

WIRING AND TERMINALS

All wiring between electrical components and terminations, should have double electrical insulation, should be waterproof, and should conform to specification requirements of SAE Recommended Practice J1127 and J1128. Except as interrupted by the master battery disconnect switch, battery and starter wiring should be continuous cables, grouped, numbered, and/or color-coded with connections secured by bolted terminals; and should conform to specification requirements of SAE Standard J1127-Type SGT or SGX and SAE Recommended Practice J541. Wiring harnesses should not contain wires of different voltages unless all wires within the harness are sized to carry the current and insulated for the highest voltage wire in the harness.

Double insulation should be maintained as close to the terminals as possible. The requirement for double insulation should be met by wrapping harnesses with plastic electrical tape or by sheathing all wires and harnesses with non-conductive, rigid or flexible conduit. Strain-relief fittings should be provided at points where wiring enters all electrical components. Grommets of elastomeric material should be provided at points where wiring penetrates metal structures outside of electrical enclosures. Wiring supports should be protective and non-conductive at areas of wire contact and should not be damaged by heat, water, solvents, or chafing.

All wiring harnesses over 5 feet long and containing at least 5 wires should include 10 percent excess wires for spares that are the same size as the largest wire in the harness excluding the battery cables. This requirement for spare wires does not apply to data links and/or communication cables. Wiring length should allow end terminals to be replaced twice without pulling, stretching, or replacing the wire. Except for large wires such as battery cables, terminals should be crimped to the wiring and may be

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soldered only if the wire is not stiffened above the terminal and no flux residue remains on the terminal. Terminals should be corrosion-resistant and full ring type or interlocking lugs with insulating ferrules. T splices may be used when there is less than 25,000 circular mills of copper in the cross section and a mechanical clamp is used in addition to solder on the splice; the wire supports no mechanical load in the area of the splice; and the wire is supported to prevent flexing.

All cable connectors should be locking type, keyed, and watertight, unless enclosed in watertight cabinets. Pins should be removable, crimp contact type of the correct size and rating for the wire being terminated. Unused pin positions should be sealed with sealing plugs. Adjacent connectors should either use different inserts or different insert orientations to prevent incorrect connections.

JUNCTION BOXES

All relays, controllers, flashers, circuit breakers, and other electrical components should be grouped according to voltage; and mounted in easily accessible junction boxes. The boxes should be sealed to prevent moisture from normal sources, including engine compartment cleaning, from reaching the electrical components and should prevent fire that may occur inside the box from propagating outside the box. The components and circuits in each box should be identified and their location permanently recorded on a schematic drawing glued to or printed on the inside of the box cover or door. The drawing should be protected from oil, grease, fuel, and abrasion. The front junction box should be completely serviceable from the driver's seat, vestibule, or from outside. A rear start and run control box should be mounted in an accessible location in the engine compartment.

ELECTRICAL COMPONENTS

All electrical components, including switches, relays, flashers, and circuit breakers, should be heavy-duty designs. These components should be longest lasting, commercially available, and should be replaceable in less than 5 minutes by a 3M mechanic. Sockets of plug-in components should be polarized where required for proper function and the components should be positively retained. Any manually resettable circuit breakers critical to the operation of the bus should be mounted in a location convenient to the driver and provide visible indication of open circuits. All electric motors, except cranking motors, should be heavy-duty brushless type, with a constant duty rating of no less than 40,000 hours. Electric motors should be located for easy replacement and except for the cranking motor should be replaceable in less than 15 minutes by a 3M mechanic. Electronic circuit protection for the cranking motor should be provided to prevent engaging of the motor for more than 30 seconds at a time to prevent overheating.

MULTIPLEX WIRING SYSTEM

The components of the multiplex system should be of modular design, thereby providing for ease of replacement by maintenance personnel. The modules should be easily accessible for troubleshooting electrical failures and performing system maintenance. Each module should be shielded to prevent interference by EMI and RFI; and should utilize LEDs to indicate circuit integrity and assist in rapid circuit diagnostics and verification of the load and wiring integrity. In conjunction with relays if necessary, each circuit should be capable of providing a current load of up to 10 Amperes. The internal controls should be a solid state device, providing an extended service life. Wiring for data bus and node module power should consist of three, 22 gage or larger, UL approved, shielded, twisted pairs.

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Ten percent (10%) spare input and output should be provided at each I/O location. Wiring used for the multiplexing should be stamped with the address of the corresponding I/O location.

Protection to each individual circuit should be provided. An automatic test system, integral to the multiplexing, should be provided. The system should be hosted on an IBM-compatible personal computer as well as a hand held field diagnostic unit capable of reading the network data, control function and address data, or function code. The mechanic should be able to use either unit to check bus wire function.

BATTERIES

Batteries should be easily accessible for inspection and service from only the outside of the bus. The batteries should be securely mounted on a stainless steel tray that can accommodate the size and weight of the batteries. The battery tray should pull out easily and properly support the batteries while they are being serviced. The tray should allow each battery cell to be serviced and filled with either manual or automatic equipment. A positive lock should retain the battery tray in the stowed position.

Two 8D battery units conforming to SAE Standard J537 should be provided. Each battery should be fitted with threaded stud terminals and have a minimum of 1150 cold cranking amps. Each battery should have a purchase date no more than 60 days from date of release for shipment to the agency.

Positive and negative terminal ends should have different size studs to prevent incorrect installation. The battery terminal ends and cables should be color-coded with red for the primary positive, black for negative, and another color for any intermediate voltage cables. Battery terminals should be located for access in less than 30 seconds with jumper cables. Battery cables should be flexible and sufficiently long to reach the batteries with tray in the extended position without stretching or pulling on any connection and should not lie directly on top of the batteries. Battery cables must be of sufficient size to carry the load required by the starting motor.

A jump-start connector should be provided in the engine compartment equipped with dust cap and adequately protected from moisture, dirt and debris.

MASTER BATTERY SWITCH

A master switch on the battery positive (+) should be provided in the battery compartment near the batteries for complete disconnecting from all bus electrical systems except for safety devices such as fire suppression system and other systems as specified. The location of the master battery switch should be clearly identified on the access panel and be accessible in less than 10 seconds for activation. The master switch should be explosion proof and capable of carrying and interrupting the total circuit load. Any equipment that requires power without reference to the master battery switch should be listed in attachments to Part 5: Technical Specifications. Opening the master switch with the power plant operating should not damage any component of the electrical system. The location of the master battery switch should prevent corrosion from fumes and battery acid when the batteries are washed off.

FIRE SENSING AND SUPPRESSION SYSTEMS (FSS)

A Fire Sensing and Suppression System (FSS) should be provided to monitor the engine compartment and (optional) auxiliary area(s) where a significant fire hazard exists. Upon detection, the system will

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alert the operator with visual and audible signals and initiate automatic engine shutdown, fuel shut-off, and extinguisher discharge sequences.

FIRE DETECTION

Fire detectors can sense radiant or heat energy from a fire. Heat energy is detected thermally by immersion in hot air, such as in close proximity to a fire. Radiant energy is detected optically at some distance from the fire. Thermal fire detectors should be installed.

The thermal fire detectors should be spot (one-dimensional detection) or linear (two-dimensional detection) designed for use in engine compartments. Thermal fire detectors must be in close proximity to the fire in order to detect. Their mounting locations must be chosen per the installation instruction, certified by the manufacturer, and typically mounted so that airflow will act to move a fire in the protected area toward them. The thermal detector should respond to being immersed in a fire in less than thirty seconds. The thermal detection system in the engine compartment will be comprised of at least two each spot detectors or one linear detector of suitable length.

SYSTEM ACTION

The FSS will detect fires in the protected areas. Upon detection, the system will alert the operator with visual and audible signals and initiate automatic engine shutdown, fuel shut-off, and extinguisher discharge sequences.

Alarm Indication

Upon detection of a fire, the system will provide a visual and audible fire alarm to the operator.

System Status and Trouble Indication

The status of the FSS should be verified by inspection during maintenance.

Automatic Engine Shut-Down

After a fire is detected, the FSS should cause fuel flow to cease, and the engine to shut down.

Extinguisher Discharge

The system should provide a means for manually discharging the extinguisher with the control located in the driver's area. The installation should be certified by the manufacturer of the suppression system

Operator Over-Ride of Automatic Engine Shut-Down and Extinguisher Discharge

The FSS should offer provision for the operator to over-ride the automatic action of the system. The over-ride will prevent the engine shutdown from occurring. The over-ride delay should require active input from the operator.

System Reset

After a fire alarm and complete system sequence, the FSS should have provision to be reset after the system is reconfigured per the instructions provided by the manufacturer.

Section “T” – CNG Low Floor Bus

FIRE SUPPRESSION SYSTEM

The fire suppression system should be pre-engineered and designed for vehicle applications. The system should have a minimum capacity of 20 pounds of BC or ABC dry chemical agent. System cylinder should have a minimum service pressure of 350 psi and be DOT rated. Nozzles and distribution should be installed in accordance with the installation manual. Stored pressure type extinguishing units should be provided with a gauge that can be visually inspected for pressure condition.

METHANE DETECTION SYSTEM (MDS)

A Methane Detection System (MDS) should be provided to monitor the engine compartment, each separate fuel storage area(s), and other areas where a leak is possible or gas may accumulate. See below for Methane Detection System details

METHANE DETECTION

GENERAL

The sensing technology selected should be configured for use in the protected area, e.g. the engine compartment, and allow for the required maintenance schedule.

SYSTEM ACTION

The MDS will detect potentially dangerous gas leaks in the protected areas. Upon detection, the system will alert the operator with visual and audible signals. If required, the MDS should (optionally) initiate engine shutdown and fuel shutoff sequences.

Alarm Indications

The MDS should automatically activate visible and audible alarms in the operator area when a significant leak is detected. The significant leak threshold should correspond to a maximum of 50% Lower-Explosive Limit (LEL) of methane. Optionally, a trace (20%) or moderate (30%) leak should be indicated visually and/or audibly.

System Status and Trouble Indication

The MDS should provide an active visual indication of the system status. An immediate visual Trouble indication will be provided if a fault occurs in any portion of the MDS circuit. An Indicator Test function should be provided at the panel.

Methane Detection System (MDS) Calibration

Standard requirement for a MDS not requiring field calibration.

Engine Shut-Down From MDS

After a significant level gas leak is detected, the MDS should cause the fuel flow to cease, and the engine to shut down. An optional automatic delay between the gas leak alarm and engine shutdown should not exceed 30 seconds.

Section “T” – CNG Low Floor Bus

Operator Engine Shut-Down Override

When the system is configured so that engine shut-down occurs after a pre-set delay following a significant gas leak alarm, the MDS provides for the operator to over-ride the automatic action of the system, further delaying the engine shutdown. The override delay should require active input from the operator.

Reset

After a gas leak alarm and complete system sequence, the MDS should reset automatically once the gas level has returned to a normal level. Once activated, the engine shut-down feature must be manually reset by input by qualified personnel.

RADIO NOISE ATTENUATION

Proper suppression equipment should be provided in the electrical system to eliminate interference with radio and television transmission and reception. This equipment should not cause interference

SECTION "T"
CNG LOW FLOOR BUS
RESPONSE SHEET

BASE
VEHICLE

COST PER
UNIT

Transit Bus

\$_____ / ea.

Specify Overall Vehicle Length (outside of front bumper to outside of Rear bumper):_____

OPTIONAL ITEMS

COST

Please list available Optional Items for this vehicle. Price should include cost of installation.

1. \$_____ /ea.

2. \$_____ /ea.

3. \$_____ /ea.

4. \$_____ /ea.

5. \$_____ /ea.

1.0 GENERAL

1.1 SCOPE

These specifications, in terms of performance, represent a coach ideally suited to public commuter transit operations.

1.2 DEFINITIONS

The following are definitions of special terms used in Part II.

1. **DBA** - Decibels with reference to 0.0002 microbar as measured on the "A" scale.
2. **Audible Discrete Frequency** - An audible discrete frequency is determined to exist if the sound power level in any 1/3-octave band exceeds the average of the sound power levels of the two adjacent 1/3-octave bands by 4 decibels (dB) or more.
3. **Standee Line** - A line marked across the coach aisle in line with the driver's barrier to designate the forward area which passengers may not occupy when the coach is moving.
4. **Free Floor Space** - Floor area available to standees, excluding ingress/egress areas, area under seats, area occupied by feet of seated passengers, and the vestibule area.
5. **Curb Weight** - Weight of vehicle, including maximum fuel, oil, and coolant; and all equipment required for operation and required by this Specification, but without passengers or driver.
6. **Seated Load** - One hundred fifty (150) pounds (68 kg) for every designed passenger seating position and for the driver
7. **Gross Load** - Total of curb weight, seated load and standees at 150 pounds (68 kg) per individual passenger
8. **SLW (Seated Load Weight)** - Curb weight plus seated load.
9. **GVWR (Gross Vehicle Weight Rated)** - Curb weight plus the maximum vehicle weight to which the bus can be safely loaded.
10. **Driver's Eye Range** - The 95th-percentile ellipse defined in SAE Recommended Practice J941, except that the height of the ellipse shall be determined from the seat at its reference height.
11. **Fireproof** - Materials that will not burn or melt at temperatures less than 2,000 degrees F (1,093 C)
12. **Fire-Resistant** - Materials that comply with Federal motor Vehicle Safety Standard (FMVSS) 571.302 - Flammability of interior materials, or having a flame spread index less than 150 as measured in a radiant panel flame test per ASTM-E162-75.
13. **Human Dimensions** - The human dimensions used are defined in SAE Recommended Practice J833.

1.2.1 ABBREVIATIONS

The following is a list of abbreviations (acronyms) used in these specifications:

ASTM:	American Society of Testing and Materials.
SAE:	Society of Automotive Engineers
ANSI:	American National Standards Institute.
ASHRAE:	American Society of Heating, Refrigerating, and Air Conditioning.
SPI:	Society of the Plastics Industry.
USDHEW:	United States Department of Health, Education, and Welfare
JIC:	Joint Industrial Council.
BMCS:	Bureau of Motor Carrier Safety.
FMVSS:	Federal Motor Vehicle Safety Standards
ABS:	Antilock Braking System

1.3 CLASSES OF FAILURES - *Classes of failures are listed below:*

Class 1: Physical Safety. A failure that could lead directly to passenger or driver injury and represents a severe crash situation.

Class 2: Road Call. A failure resulting in an en route interruption of revenue service. Service is discontinued until the coach is replaced or repaired at the point of failure.

Class 3: Coach Change. A failure that requires removal of the coach from service during its assignments. The coach is operable to rendezvous point with a replacement coach.

Class 4: Bad Order. A failure that does not require removal of the coach from service during its assignments but does degrade coach operation. The failure shall be reported by driver, inspector, or hostler.

1.4 LEGAL REQUIREMENTS

The coach shall meet all applicable Federal Motor Vehicle Safety Standards and regulations as established by the U.S. Department of Transportation.

The manufacturer shall comply with all applicable Federal and State regulations. In event of any conflict between the requirements of this Specification and any applicable legal requirement, then the legal requirement shall prevail.

1.5 OVERALL REQUIREMENTS

1.5.1 DIMENSIONS

1.5.1.1 PHYSICAL SIZE

With the exceptions of exterior mirrors, marker and signal lights, bumpers, flexible portions of the bumper, fender skirts, and rub rail, the coach shall have the following overall dimensions.

Length: 45 feet, 0 inches (+0 / -1 in.) (14 m – +0 / - 25.4 mm)

Width: 8 feet, 6 inches (+0 / -1 in.) (2.6 m – +0 / - 25.4 mm)

Height: 137 inches – maximum loaded or unloaded. (3.5 m)

First Step Height: 15.5 inches – Maximum (394 mm)

1.5.1.2 UNDERBODY CLEARANCES

The coach provided shall meet the following underbody clearances:

Approach angle 9.50°

Breakover angle 7.20° (*measured per SAE J689*)

Departure angle 6.20°

Ground clearance .. 10.00 inches (254 mm)

Axle clearance (as measured) 6.50 inches (165 mm)

1.5.2 WEIGHT AND AXLE LOADING

Each vehicle, at a capacity load, shall not exceed the gross vehicle weights or maximum axle weights specified. In no case shall the axle weight exceed 22,500 pounds on any axle. In the interest of economy in construction and operation it shall be the goal to manufacture the coach as light as possible without degradation of structure, performance, appearance, comfort and reliability. Total vehicle weight shall not exceed the gross vehicle weight rating nor axle weight rating at ground as specified. GVWR shall not exceed 50,000 pounds for a 45-foot bus. Combined load capacity weight on the drive and tag axles shall not exceed 36,500 pounds.

1.5.3 CAPACITY

Rated passenger capacity of the coach shall be as outlined below. Provisions to secure two wheelchair passengers shall also be provided. The overall seating capacity may be reduced when the securement positions are being utilized.

45 foot/102 inch (14 m/2.6 m) bus 57 seats

45 foot/102 inch (14 m/2.6 m) bus w/optional lavatory 55 seats

1.5.4 SERVICE LIFE AND MAINTENANCE

1.5.4.1 SERVICE LIFE

The coach shall be designed to operate in commuter service for at least 12 years or 500,000 miles (804,672 km) of revenue service whichever comes first.

1.5.4.2 MAINTENANCE AND INSPECTION

Scheduled maintenance tasks shall be related and shall be grouped in maximum mileage intervals. Routine scheduled maintenance actions, such as filter replacement and adjustments, shall not be required at intervals of less than 6,000 miles (9,656 km), except for routine daily service performed during the fueling operations. Higher levels of scheduled maintenance tasks shall occur at even multiples of mileage for lower level tasks.

The manufacturer shall provide a preventive maintenance schedule covering all components upon delivery of the first production vehicle. Each schedule shall be complete and shall adhere to frequency intervals considered normal industry standards.

1.5.4.3 MEAN MILEAGE BETWEEN FAILURES

The following are design goals for mean mileage between failures by failure class, provided that all specified preventive maintenance procedures are followed:

Class 1: Physical Safety. Mean mileage shall be greater than 1,000,000 miles (1,609,344 km).

Class 2: Road Call. Mean mileage shall be greater than 20,000 miles (32,187 km). **Class 3:**

Coach Change. Mean mileage shall be greater than 16,000 miles (25,750 km). **Class 4:** Bad

Order. Mean mileage shall be greater than 10,000 miles (16,093 km).

1.5.4.4 ACCESSIBILITY

All systems or components serviced as part of periodic maintenance or whose failure may result in Class 1 or Class 2 failures shall be readily accessible for service and inspection. Removal or physical movement of components unrelated to the specific maintenance and/or repair tasks involved shall be minimized

1.5.4.5 INTERCHANGEABILITY

Components with identical functions shall be interchangeable with the exception of windows and baggage bay doors. Components with non-identical functions shall not be, or appear to be, interchangeable.

1.5.5 OPERATING ENVIRONMENT

The coach shall achieve normal operation in temperature ranges of -10 to 110 degrees F (-23° to 43° C), at relative humidity between 5 percent and 100 percent and at altitudes up to 5,000 feet (1,524 m) above sea level. Degradation of performance due to atmospheric conditions shall be minimized at temperatures below -10 degrees F (-23° C) and above 110 degrees F (+43° C) or at altitudes above 5,000 feet (1,524 m). Special equipment or procedures may be employed to start the coach after a 12 hour or more exposure to temperatures below +30 degrees F (-1° C) without the engine in operation.

Speed, gradability, and acceleration performance requirements shall be met at, or corrected to, 85 degrees F (29 C), 29.00 inches (737 mm) Hg, dry air. Performance degradation at conditions other than the test standard shall not exceed 1 % for each 3 degrees F/C and 4 % for 1,000 feet (305 m) of altitude above the standard.

1.5.6 MATERIALS AND CONSTRUCTION

For economy in maintenance, it is essential that parts and units be arranged so that rapid assembly and disassembly will be possible for the coach being provided. The dimensions of all parts, unless particularly specified, will be in accordance with current standards of the Society of Automotive Engineers, or the metric equivalents. All units or parts not specified shall be Manufacturer's standard units or parts and shall conform in material, design and workmanship to industry standards and shall meet or exceed all Federal and State motor vehicle safety standards. During the manufacturing of the coaches all parts shall be new and in no case will used, reconditioned or obsolete parts be accepted. No advantages shall be taken by the Manufacturer in the omission of any parts or details that make the coach complete and ready for service, even though such parts or details are not mentioned in these specifications.

Workmanship throughout shall conform to the high standard of commercially accepted practice for the class of work and shall result in a neat and finished appearance. All exposed surfaces and edges shall be smooth, free from burrs and other projections, and shall be neatly finished. Exposed metal surfaces, prior to paneling or covering shall be properly prepared and coated with protective material to insure against corrosion or deterioration.

All lubrication points, unless otherwise specified, shall be capable of accepting a high pressure grease gun operated on fittings that permit grease to travel into the lubrication point but does not permit the grease to escape and designed so that when the grease gun is withdrawn, there is a positive barrier preventing dirt from entering the fitting. These fittings shall be of one manufacture and shall be accessible for a grease gun while the vehicle is being serviced on either a lift or a pit.

2.0 BODY

2.1 DESIGN

The coach shall have a clean, smooth, simple design, primarily derived from coach performance requirements and passenger service criteria. Body construction shall not be of a body on chassis type. The exterior and body features, including grilles and louvers, shall be shaped to allow complete and easy cleaning by automatic bus washers without snagging washer brushes. The retention of water and dirt in or on any of the body features or the freezing or bleeding out of this dirt and water after leaving the washer shall be minimized. Body and windows shall be sealed to prevent leaking of air, dust, or water under normal operating conditions and during cleaning in automatic bus washers for the service life of the coach. Accumulation of spray and splash on any window of the coach generated by its wheels on a wet road shall be minimized. The undercarriage of the coach shall be sealed off to the maximum extent practicable to significantly reduce the intrusion of road spray.

2.2 MATERIALS

Body materials shall be selected and the body fabricated to reduce maintenance, extend durability, and provide consistency of appearance throughout the life of the coach. Detailing shall be kept simple; add-on devices and trim shall be minimized and, where necessary, integrated into the basic design.

2.3 FINISH AND COLOR

All exterior surfaces shall be smooth and free of wrinkles and dents. Exterior surfaces to be painted shall be properly cleaned and primed as appropriate for the paint used, prior to application of paint to assure a proper bond between the basic surface and successive coats of original paint for the service life of the coach.

Paint utilized shall be DuPont Imron Elite SS white N5793EA polyurethane enamel or approved equal, that exhibits excellent color and gloss retention, chip, abrasion, stain and mar resistance, chemical and solvent resistance and excellent cleaning characteristics per industrial standards. Paint shall be applied smoothly and evenly with the finished surface free of dirt, runs, sags, "orange peel" type pebbled surface, and other imperfections.

All exterior finished surfaces shall be impervious to diesel fuel, gasoline, and commercial cleaning agents such as soaps, detergents and degreasing compounds. Finished surfaces shall not be damaged by controlled applications of commonly used graffiti-removing chemicals.

2.4 NUMBERING AND SIGNING

Monograms, numbers and other signing shall be applied to the inside and outside of the coach as required. Signs shall be durable and fade, chip, and peel-resistant; they may be decals, or pressure-sensitive appliques. Emergency exit information shall be provided in both English and Spanish.

2.5 PEDESTRIAN SECURITY

Exterior protrusions greater than 0.250 inch (6.0 mm) and within 80 inches (203 cm) of the ground shall have a radius no less than the amount of the protrusion. The left and right side rear view mirrors, windshield washer nozzles and required lights and reflectors are exempt from the protrusion requirement. Grilles, doors, bumpers and other features on the sides and rear of the coach shall be designed to minimize the ability of unauthorized riders to secure footholds or handholds.

2.6 STRUCTURE

2.6.1 STRENGTH AND FATIGUE LIFE

The structure shall be of a sufficiently strong and efficient design to withstand the conditions of commuter service throughout the service life of the coach.

2.6.2 DISTORTION

The coach at GVWR and under static conditions, shall not exhibit deformation or deflection that impairs operation of doors, windows, or other mechanical elements. Static conditions include the vehicle at rest with any one wheel or dual set of wheels on a 6 inch (152 mm) curb or in a 6 inch (152 mm) deep hole.

2.6.3 RESONANCE

All structure, body, and panel-bending mode frequencies, including vertical, lateral, and torsion modes, shall be sufficiently removed from all primary excitation frequencies to minimize audible, visible, or sensible resonant vibrations during normal service.

2.6.4 MATERIAL

Reinforced fiberglass and plastic materials shall be excluded from structural body construction, except for replaceable panels or doors and for non-load bearing front and rear roof caps and the front lower panel below the windshield and the A-pillar covers and transom panels.

2.6.5 CORROSION

The coach shall resist corrosion from atmospheric conditions and road salts. It shall maintain structural integrity and nearly maintain original appearance throughout its service life, provided it is maintained in accordance with the procedures specified in the service manual. All exposed body panels above and below the floor line shall be aluminum or stainless steel except for the front end upper and lower panels, the rear end upper panels and the upper sidewall panel which are made of fiberglass or galvanized steel. Materials exposed to the elements and all joints and connections of dissimilar metals shall be corrosion-resistant and shall be protected from galvanic corrosion. All frame members below the passenger floor that are subject to road splash and are less than 0.06 inch (1.5 mm) shall be stainless steel for maximum corrosion protection. All other frame members exposed to splash are to be High Strength Low Alloy steel and are to be 0.06 inch (1.5 mm) thick minimum and shall be coated with Tectyl undercoating or approved equal, on all surfaces exposed to road splash for maximum corrosion protection.

Floor supports in the passenger and drivers area, the sidewall structures and roof structures that are not exposed to road spray shall be High Strength Low Alloy and primed prior to incorporation into the coach assembly.

Outer sidewall panels above the passenger floor and below the windows shall be galvanized steel, pre-primed. The roof panels shall be pre-primed aluminum both sides and the front and rear roof caps fiberglass.

The upper rear engine door and louvers may be fiberglass panels mounted to stainless steel frames with powder coated aluminum screens. The upper side corner panels may be fiberglass with powder coated aluminum screens.

The upper wheelchair lift door may be made of an aluminum frame or other acceptable lightweight material and aluminum exterior panel.

Non-structural underbody panels used for baggage bay floors and to retain insulation in other areas, shall be Tectyl or approved equal undercoated aluminum or stainless steel for maximum corrosion protection. In the wheel well areas, non-structural closeout panels shall be stainless steel.

Before assembling, all metal body parts must be given a thorough anti-corrosion treatment. Joints between dissimilar metals shall be properly insulated with an inert plastic tape to avoid corrosion due to electrolytic action. All nuts, bolts, clips, washers, clamps, and like parts shall be zinc plated, phosphate coated, black oxide coated, stainless steel, or nylon to prevent corrosion. All exterior joints and seams must be sealed.

Dissimilar metals must be separated by a non-conductive barrier.

Non-Conductive Barriers may consist of one of the following:

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- ☐ Black elastic compound tape
- ☐ Mylar tape
- ☐ Double-sided structural adhesive tape

Where tape barriers are not feasible an appropriate sealant shall be used to provide a protective barrier and a water tight seal. This sealer must be used on all panels and assemblies that are susceptible to water leaks.

2.6.6 TOWING

Towing devices shall be provided and be permanently mounted on the front and rear of the coach. The coach may be towed from the front only, but can be recovered from the rear. Recovery shall mean to move the bus into the clear so it can be hooked up and towed from the front. Lift and tow is not required.

Front towing device shall withstand, without permanent deformation, tension loads up to 1.2 times the curb weight of the coach within 20° of the longitudinal axis of the coach. Towing device shall accommodate a crane hook with a 1-inch throat. A minimum of two steel rear skid plates measuring approximately 15.2 x 3.3 inches (386 x 84 mm) shall be welded to the underside of the engine rails. Skid design shall be durable construction to adequately protect mechanical or other body components from damage due to the coach bottoming out.

2.6.7 JACKING & HOISTING

It shall be possible to safely jack up the bus, at curb weight, with an 8.5 inch (216 mm) high hydraulic hand jack or a 10-ton (9,072 kg) floor jack when a tire or dual set is completely flat and the bus is on a level hard surface. Jacking from a single point shall permit raising the bus sufficiently high enough to remove and reinstall any wheel and tire assembly. The bus shall be fitted with jacking pads for each tire/wheel locations and shall permit easy and safe jacking with the flat tire or dual set on a 3.5-inch (89 mm) high run-up block not wider than a single tire. The bus will withstand such jacking at any one or any combination of wheel locations without permanent deformation or damage. The bus axles or jacking plates shall accommodate the lifting pads of a post hoisting system. Jacking plates shall be approximately 2.00 inches (51 mm) square, with a turned- down flange not less than 0.5 inch (13 mm) deep on each side. Other pads shall be provided to support the bus on jack stands independent of the hoist.

2.6.8 FIRE SUPPRESSION

An Amerex or approved equal modular vehicle fire suppression and overheat warning system will be provided to detect and extinguish fires in the engine compartment. The system will be electrically controlled. A 25-lb. (11-kg) dry-chemical extinguisher cylinder will be installed in the #3 baggage compartment. Three thermostats and four extinguisher nozzles will be installed in the engine compartment in strategic locations. If the thermostats detect excessive heat, then the cylinder will discharge a dry chemical agent into the engine compartment. A button at the end of the left-hand console will trigger the extinguisher. A control panel above the driver will monitor the system. Normally a green LED indicating "System OK" will be illuminated on the front of the monitor. When a fire is detected a red LED and buzzer on the control panel will warn the driver. When the fire has been extinguished the green LED will light again.

The fire suppression system will be powered by the coach's electrical system, but an internal rechargeable back-up battery will be provided in case the coach's electrical system is interrupted.

2.6.9 FIRE PROTECTION

The passenger and engine compartments shall be separated by a bulkhead(s) which shall, by utilization of fire resistant materials in its construction, be a firewall. This firewall shall preclude or retard propagation of an engine compartment fire into the passenger compartment. Only necessary openings shall be allowed in the firewall, and these shall be fire resistant. Any passageways for climate control system air flow

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shall be separated from the engine compartment by fire resistant material. Piping through the center tunnel bulkhead shall be copper, steel, nylon air brake tubing (for air and fuel), PVC (closed conduit) or brass and shall be sealed with fire-resistant material at the firewall. Wiring may pass through the bulkhead only if connectors or other means are provided to prevent or retard fire propagation through the firewall. The conduit and bulkhead connectors shall be sealed with fire resistant material at the firewall. Engine access panels in the firewall shall be fabricated of fire resistant material and secured with fire resistant fasteners. These panels, their fasteners, and the firewall shall be constructed and reinforced to minimize warping of the panels

during a fire that will compromise the integrity of the firewall. The coach body shall be adequately sealed to prevent the intrusion of smoke, fuel, and fumes into the coach interior.

2.6.10 LEAK DETECTION SYSTEM

A mobile gas leak detection system manufactured by Amerex Corporation or approved equal shall be provided when applicable. Methane detection capability shall be provided in the follow areas:

Engine compartment one detector minimum
Fuel storage area - as required.

Detectors are to be designed to prevent vandalism or damage from external sources.

The AMGADS III system, or approval equal, shall detect and quantify airborne concentrations of methane from 0 % LEL to 100 % LEL and shall continue to give the indication of the presence of gas at concentrations above 100 % LEL.

The system shall be integrated with the engine stop override system to permit the operator more time, if required, to stop the vehicle. The system shall be powered through the battery insulation switch(es) and be in full time sampling mode any time the master control switch is in the "on" position. The system shall be self-restarting following power interruption or have backup batteries to prevent interruption of function.

The system shall be capable of operating normally without failure from -65 degrees F to +185 degrees F, and at relative humidity levels from 0% to 99 %. Components operating within the engine compartment shall operate in temperatures up to 250 degrees F. Any single failure of a detection device shall cause an indicator light on the control panel to illuminate.

The system shall operate at supply voltages from 9 to 30 VDC as produced by the coach electrical system, and be designed to withstand positive and negative voltages spikes of 500 VDC, and electrostatic discharge of 15000 volts without failure. Total current draw of the system under normal operating conditions shall not exceed 750 mA. System design shall comply with SAE J1211 criteria for automotive electronic equipment as a minimum.

2.6.10.1 ALARM LEVELS

The system shall generate audible and visual alarms at two non-adjustable concentration levels. The system shall also supply one user assignable auxiliary shift relay for such functions as alarms and signal light actuation, fuel valve shut off and ignition interruption. Alarms shall provide audible notification of detector activation inside the coach.

2.6.10.2 CALIBRATION REQUIREMENTS

The system shall register and report zero drift as a dangerous situation requiring attention. Drifts in calibration at other than the zero level shall either always be such as to produce a failsafe (false high) reading or shall give notification of a reading as a dangerous situation requiring attention (false low).

2.6.10.3 MONITOR PANEL

The system shall have a supervision monitoring panel located in the operator's area. The monitor panel shall indicate operational status of the sensors, harness, and calibration with visual indicators provided on the operators indicator panel.

2.6.11 EXTERIOR AND APPLIED PANELS

Roof Panels - Front roof cap and rear crown panels shall be nominal 0.13 inch (3.17 mm) thick fiberglass-reinforced, molded plastic incorporating molded indentations for the marker, clearance and identification lights. Main roof panels shall be 16 gauge, nominal 0.05 inch (1.29 mm), high tensile primed aluminum. Roof panels shall be bonded to the roof structure with adhesive.

Front Panels - The front body panel below the windshield shall be of one-piece molded fiberglass. A fiberglass trim fascia shall be provided under the windshield. It shall include molded housings for the headlamp, turn signal and clearance lamp assemblies.

2.6.11.1 STRENGTH AND INSTALLATION

Exterior panels above and below the rub rail may be structural components. Panels shall be secured to structural members and shall have a smooth finish with no sharp edges.

2.6.11.2 REPAIR AND REPLACEMENT

Exterior panels below the rub rail shall be divided into sections that are repairable or replaceable by a mechanic. Baggage doors shall be two part with the joint at or below the rub rail.

2.6.11.3 RAIN GUTTERS

Gutters shall be provided to minimize water flowing from the roof onto the side windows and passenger doors.

2.6.11.4 LICENSE PLATES

A recessed mounting area shall be provided to mount a standard size U.S. license plate on the rear of the coach. This provision shall recess the license plate so that automatic coach washing equipment brushes will not catch on the license plate. Four fasteners shall be utilized to retain the license plate. The license plate shall be mounted to the left of the coach center. Provision shall be made to illuminate the surface of the rear license plate.

2.6.11.5 RUBRAILS

Rub rails shall have a minimum height dimension of 2.50 inches (64 mm) and shall be composed of flexible, resilient material to protect both sides of the coach body from damage caused by minor sideswipe accidents. The rub rail may be discontinued at doorways and the condenser intake grille. A damaged portion of the rub rail shall be replaceable without requiring removal or replacement of the entire rub rail.

2.6.11.6 MOLDINGS

Sash Moldings – Painted aluminum sash moldings shall be installed along the bottom length of the passenger windows.

Belt Moldings – Painted aluminum belt moldings shall be installed along the left and right hand belt lines of the coach.

2.6.11.7 PARCEL RACKS

A minimum 10 module parcel rack without dividers and compartment doors shall be furnished over all two-passenger seating positions except in the wheelchair door area. Retention cords shall run the length of the rack housing except where air conditioning components are housed. These compartments will have dividers and locking doors. The parcel rack edge, running along the full length of the aisle, shall incorporate a handhold for use by standees. Passenger headroom measured from the rack end to the top of the seat headrest, shall be a minimum 17 Inches (432 mm). Interior window post caps shall be ABS,

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thermo formed plastic, off-white in color to provide a clean finished appearance. The interior of the rack shall be vinyl covered aluminum to complement the interior. Parcel racks shall be supported by polycarbonate glass filled hangers spaced approximately

40 inches (1,016 mm) apart. Total capacity shall be a minimum 109 ft.³ (3 m³) to allow for ample storage space for carry-on items.

Passenger service modules mounted on the underside of the parcel rack shall include individually controlled and adjustable LED passenger reading lights, and an exit signal push button, red in color and individual air distribution outlets receiving air from the parcel rack HVAC system. These outlets shall be adjustable from fully closed to full open position. A minimum of twenty-six speakers shall also be provided in the cluster panels for the driver controlled public address system. Speakers shall broadcast, in a clear tone, announcements that are clearly perceived from all seat positions at approximately the same volume level. Passengers utilizing the securement systems shall be provided identical amenities as provided for all other passengers except that the parcel rack shall be deleted in the area of the wheelchair lift door. Separate and independent notification will be provided on the dashboard indicator panel for stop request notification from securement positions.

2.6.11.8 UNDERFLOOR BAGGAGE COMPARTMENTS

Full width under floor baggage compartments shall be provided between the front and rear axles. Each compartment shall be separated by an aluminum panel except the front and rear bulkheads shall be stainless steel. The compartment doors shall be a two part with the joint at or below the rub rail, fully sealed vertical lift pantograph type. Each door shall include an aluminum or composite frame with an aluminum outer panel. Doors shall be spring counter balanced for ease of operation.

The no. 1 right hand, curbside baggage door shall have a key lock. All other baggage doors shall be equipped with air locks. Each baggage door shall have a 4.0 x 10 inch (102 x 254 mm) flush mounted breakaway type latch handle located with a center point approximately 38 inches (965 mm) off the ground.

Each under floor compartment shall be pressurized and illuminated with two LED lamps when the doors are opened. The lamp fixtures shall be sealed to preclude the intrusion of dust and moisture into the fixture. The floor of the baggage compartments shall be corrugated aluminum.

2.7 INTERIOR

2.7.1 HEADROOM

Headroom above the aisle shall be no less than 78 inches (1,981 mm). If an engine brake is to be provided, then a "hump" ahead of the rear cross seat will decrease headroom to approximately 74 Inches (1,880 mm).

2.7.2 DRIVER'S BARRIER

A barrier or bulkhead between the driver and street side front passenger seat shall be provided. The barrier shall eliminate glare and reflections from interior lighting in the windshield directly in front of the barrier during night operation.

The driver's barrier shall be constructed of opaque .472 inch (12 mm) thick acrylic glazing. The barrier shall be a shatter-proof acrylic sheet that meets AS standards AS-4 or AS-5. The glazing shall be indelibly marked with the manufacturer's name and type of material.

The drivers barrier shall extend from below the level of the passenger or driver seat cushion, whichever is lower, to above the level of the seated driver's head and shall fit within 1.5 inches (38 mm) from the coach side window/wall to prevent passengers from reaching the driver or his/her personal effects. The barrier design shall accommodate a minimum of 9.05 inch (230 mm) fore and aft travel of the specified operator's seat.

On the aisle side, the barrier shall be cut out from the vertical stanchions to permit passengers to use the stanchion as a handhold. Any panels above and below the glazing shall be complementary in color to the

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sidewall material.

All controls, including the driver's dimmer switch for first two rows of reading lights will be relocated to the LH Console and the RH. Console deleted.

2.7.3 MODESTY PANELS

Sturdy modesty panels constructed of durable, unpainted, corrosion-resistant material complementing the interior trim shall be provided at the rear of the step well. The modesty panel and its mounting shall withstand normal kicking, pushing, and pulling loads of 200-pound (91 kg) passengers without permanent visible deformation.

2.7.4 REAR BULKHEAD

The rear bulkhead paneling shall be contoured to fit the ceiling, side walls and seat.

2.7.5 CONSTRUCTION

Interior panels may be integral with, or applied to, the basic coach structure. They shall be decorated in accordance with and compliment the interior specified. Use of moldings and small pieces of trim shall be minimized, and all parts shall be functional. Panels shall be of backed melamine, vinyl-clad aluminum or vinyl-clad steel. Front and rear closures shall be fiberglass with color molded in, and there shall be no painted surfaces. The lower sidewall shall be Melamine covered panels or approved equal, sectionalized for ease of repair.

2.7.6 FASTENING

Interior panels shall be attached so that there are no exposed edges or rough surfaces. Panels and fasteners shall not be easily removable by passengers. Interior trim fasteners, where required, shall be rivets, Phillips, or tamper-proof screws.

2.7.7 FLOOR

2.7.7.1 STRENGTH

The floor deck may not be integral with the basic structure but shall be mounted on the structure securely to prevent chafing or horizontal movement. Sheet metal screws shall not be used to retain the floor. All floor fasteners shall be secured and protected from corrosion for the service life of the coach. The floor deck shall be reinforced as needed to support passenger loads. At GVWR, the floor shall have an elastic deflection of no more than 0.375 inches (10 mm) from the normal plane. The floor shall withstand the application of 3.0 times gross load weight without permanent detrimental deformation.

2.7.7.2 EDGES

The floor shall be essentially a continuous flat plane, except at the step well. Where the floor meets the walls of the coach, the surface edges shall be blended with a circular section of radius not less than .5 inch and a molding or cover shall prevent debris accumulation between the floor and wall. Interior flooring shall be flat throughout except for an 8 ft. (2.4 m) long welded ramp in the aisle section at the front which is sloped 5.35 degrees and has a 3 inch (76 mm) riser under the #1 RH and #1 LH passenger seats except for a "hump" in front of the rear cross seat (when engine brakes are provided). The floor is attached to the underframe with adhesive and rivets. Wheel housings may not extend above floor line.

Access openings in the floor shall be sealed to prevent entry of fumes and water into the coach interior. Flooring material shall be flush with the floor and shall be edge-bound with stainless steel to prevent the edges from coming loose. Access openings may be symmetrical if the fasteners are arranged to ensure alignment of the flooring. Fasteners shall be flush with the floor when secured.

Rubber flooring adhesion procedure includes butt cut type edges that are securely bonded to the plywood floor with a waterproof adhesive. Flooring areas which are edge-bound with stainless steel shall include the sidewall on each side, the ramp in the center aisle, the base of rear cross seat, the step up under the number 1 seat, the driver's modesty panel and the RH front passenger's modesty panel.

2.7.7.3 FLOOR PROTECTION

The floor, as assembled, including the sealer, attachments, and covering, shall be waterproof, non-hygroscopic, resistant to heat, dry rot, mold growth, and impervious to insects. Plywood shall be no less than one half-inch thick 5 ply water resistant Douglas Fir per CSA 0121-M1978 or PS1-95 (APA) and shall be installed with all edges sealed. The floor in the aisle shall be no less than an overall thickness of one half-inch water resistant Douglas Fir per CSA 0121-M1978 or PS1-95 (APA).

2.7.8 STEPS AND STEPWELL

2.7.8.1 STEPS

There shall be no more than 4 steps and no step shall be located between the vestibule and passenger compartment. A ramp shall be provided in this area with the rate of rise not to exceed 0.75 inch (19 mm) per foot with a maximum vertical rise of 9.0 inches (229 mm).

All step treads shall be of uniform depth no less than 11 inches (279 mm) and a uniform height of no less than 9.5 inches (241 mm). Except for the first step, the plane of the step treads shall be

parallel to the plane of the floor. Treads shall be covered with RCA flooring or approved equal that shall remain effective in all weather conditions. Color of the tread covering shall match the vestibule flooring. The edge of the vestibule floor shall have no overhang at the step riser. The edge of the vestibule floor and the edge of each of the step treads shall have a bright, contrasting white band, 2 inches (51 mm) wide, the width of the step. This band shall be uniform in width across the entire step and vestibule edge.

2.7.8.2 STEPWELL CONSTRUCTION

Step well shall be constructed entirely of stainless steel. The steps shall simultaneously support 300 pound (136 kg) loads evenly distributed over the center half of each step tread without permanent deformation and with elastic deflection of no more than 0.0625 inches (1.6 mm). Each step tread shall support a load of 500 pounds (227 kg) evenly distributed over the center half of the tread without permanent deformation. A minimum 1.0 inch (25.4 mm) thick Tuf-Coat or approved equal, self-adhesive insulation shall be provided behind the step well area for added control of interior temperature variances and to minimize road noise.

2.7.9 WHEEL HOUSING

2.7.9.1 CONSTRUCTION

Wheel housings shall be constructed of stainless steel. Wheel housing, as installed and trimmed, shall withstand impacts of a 2-inch (51 mm) steel ball with at least 200 foot-pounds (271 Nm) of energy without penetration.

2.7.9.2 CLEARANCE

Sufficient clearance and air circulation shall be provided around the tires, wheels, and brakes to preclude overheating. Interference between the tires and any portion of the coach shall not be possible in maneuvers up to the limit of tire adhesion with weights from wet to GVWR.

2.7.9.3 FENDER SKIRTS

Front and rear wheel wells shall be fully skirted with rubber to minimize spray and splash. The fender skirts shall be damage resistant and easily replaceable. They shall be flexible if they extend beyond the allowable body width. Wheels and tires shall be removable without disturbing the fender skirts.

2.7.12 SPLASH APRONS

Splash aprons, composed of 0.25 inch (6 mm) minimum composition or rubberized fabric or 0.188 inch (5 mm) nylon reinforced rubber, shall be installed behind all wheels and shall extend downward. Apron widths shall be no less than tire widths. Splash aprons shall be bolted to plates which are welded to the coach understructure. The plates shall support the splash apron across its entire width. Splash aprons and their attachments shall be inherently weaker than the structure to which they are attached. Splash aprons and their attachments shall not be included in the road clearance measurements. Other splash aprons

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shall be installed where necessary to protect coach equipment.

2.7.13 PASSENGER ENTRANCE DOOR

An electrically controlled, air-operated, power bi-fold door with keyed lock, will be located forward of the right front wheel. The non-symmetrical door will have a clear opening width of 30 inches (762 mm) up to a height of 44 inches (1117 mm). The clear door opening height will be 84.5 inches (2,146.3 mm).

The door shall be of composite material construction with a stainless steel kick panel for the lower portion. A molded fiberglass-reinforced panel shall be on the interior of the door. Upper and lower hinge assemblies shall be cast, with a stainless steel lower hinge pin pivoting inside a spherical bearing

An upper – primary and lower – secondary window shall be installed in the entrance door. The primary double-glazed window in the upper half of the door shall be of AS-2 laminated heat- absorbing safety glass. The secondary window, located in the lower section of the door, shall be of 0.5-inch (12.7 mm) acrylic.

Door control shall be provided by a momentary switch, located to the left of the steering wheel. An exterior remote external control switch shall also be located in a side-wall pocket by the entrance door,. The door shall have positive automatic air lock with overrule. The air lock will be automatically actuated by a micro switch when the door is in the closed position.

An entrance door key lock shall be provided on each coach along with two spare keys.

2.7.14 SERVICE COMPARTMENTS AND ACCESS DOORS

2.7.14.1 INTERIOR

Access for maintenance and replacement of equipment shall be provided by panels and doors that appear to be an integral part of the interior. Removal of fixtures or equipment unrelated to the repair task to gain access shall be minimized. Access doors, if hinged, shall be hinged with props, as necessary, to hold the doors up and out of the mechanic's way with the exception of the destination sign box door which hinges down and is held by straps in the open position. Panel fasteners shall be standardized so that only two tools are required to service all special fasteners within the coach. These fasteners shall be captive in the panel except for the engine compartment and antenna access hatches. Access doors for the door actuator compartments shall be secured with hand screws or latches, and shall be sealed to prevent entry of mechanism lubricant into the coach interior. All hinges and props must be designed to preclude accidental closure when the panels are opened.

2.7.14.2 EXTERIOR

Vertically hinged doors shall be used for the engine compartment and for all auxiliary equipment compartments including doors for checking the quantity and adding to the engine coolant, engine lubricant, transmission fluid and the windshield washer reservoir. The upper engine radiator/C.A.C. compartment door shall be vertically hinged with a locking latch located behind the engine compartment doors. Access to these compartments shall be from outside the coach. Access openings shall be sized for easy performance of tasks within the compartment including tool operating space. Access doors shall be of rugged construction and shall be capable of withstanding severe abuse throughout the life of the coach. They shall close flush with the body surface. All service/maintenance doors, excluding baggage compartment doors, shall be hinged at the top or on the forward edge and shall be prevented from coming loose or opening during transit service or in coach washing operations. Doors with top hinges shall have props stored behind the door or on the door frame. All access doors (except vertically hinged access doors) shall be sufficiently retained in the open position by props or counterbalancing, as with baggage compartment doors. Springs and hinges shall be corrosion-resistant and shall last throughout the service life of the coach. Latch handles shall be sized to provide an adequate grip for opening. Large access doors shall hinge up and out of the way or fold flat against the coach body and shall be easily operable by one person. These doors, when opened, shall not restrict access for servicing other components or systems. Retention devices utilized to hold the engine compartment access doors in the open position shall be heavy duty and designed to last the service life of the coach.

2.8 OPERATING COMPONENTS

2.8.1 DOORS

2.8.1.1 CONTROL

Operation of, and power to, the passenger door shall be completely controlled by a switch located in close proximity to the driver to the left of the steering wheel. A control or valve in the driver's compartment shall shut off the power to, and/or dump the air from the front door mechanism to permit manual operation of the front door with the coach shut down. A toggle switch on the exterior of the coach shall permit opening of the front door. The switch shall be concealed behind an unmarked flip up cover. The door switch cover shall be spring loaded so as to be held in the closed position and be located rearward of the entrance door.

2.8.1.2 ACTUATORS

The nominal door opening and closing speed shall be in the 3-5 second range. The maximum door opening and closing speeds will be regulated using fixed, maintenance free orifices and airline sizes. If required, door speeds can be decreased with the addition of a flow-restricting device. Actuators and the complete door mechanism shall be concealed from passengers, but shall be easily accessible for servicing.

2.8.1.3 MANUAL OPERATION

In the event of an emergency, it shall be possible to open the door manually from inside the coach after actuating an unlocking device. The nameplate for the entrance door air dump valve shall say: "Emergency Only – To manually open entrance door push knob." All references shall detail the "manual" operation of the door.

2.8.2 WINDSHIELD WIPERS AND WASHERS

2.8.2.1 WINDSHIELD WIPERS

The coach shall be equipped with three speed electric windshield wipers for each half of the windshield. Both wipers shall park along the center vertical edges of the windshield glass. Windshield wiper motors and mechanisms shall be easily accessible for repairs or service from outside the coach only and shall be removable as complete units. Mounting shall preclude cracking or damage to the windshield frame. Power supply to the wiper motors shall be provided through a dedicated circuit.

An intermittent operation feature for each wiper shall be provided with a variable time delay. After each pause, the wiper shall make one complete cycle across the windshield surface and return to the park position automatically.

2.8.2.2 WINDSHIELD WASHERS

The windshield washer system shall deposit washing fluid on the windshield and, when used with the wipers, shall evenly and completely wet the entire wiped area. Two separate washer pumps are to be provided.

The windshield washer system shall have a 3.9 gallon (15 liter) translucent reservoir, located for easy refilling. Reservoir pumps, lines and fittings shall be corrosion-resistant, and the reservoir itself shall be translucent for easy determination of fluid level. The windshield washer system shall be protected with an anti-freeze washer solution to -20°F (-29°C), regardless of season of delivery. The protected solution shall be tinted to provide easy visual indication that anti-freeze is present.

2.8.3 LIGHTING, CONTROLS, INSTRUMENTS

2.8.3.1 EXTERIOR LIGHTING

All exterior lighting systems shall be nominal 12V or 24V. The use of LED lamp assemblies shall be maximized to the extent practicable. All exterior lighting fixtures shall be sealed to prevent entry and accumulation of moisture or dust and each lamp shall be replaceable in less than 5 minutes by a mechanic.

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Lamps, lenses and fixtures shall be interchangeable to the extent practicable, and fixtures shall be corrosion resistant with sockets to be brass or stainless steel or plastic housings. Lamps at the rear of the coach, except the license plate lamp, shall be visible from behind when the engine service doors are opened. Sockets shall comply with SAE Standard J576C.

Visual and audible warnings shall inform following vehicles or pedestrians of reverse operation. Visual reverse operation warning shall conform to SAE Standard J593. Audible reverse operation warning shall conform to SAE Recommended Practice J994-Type C or D. Daytime running lights are to be provided.

Two light installation housings shall be located on each side of the coach front containing a single round halogen headlamp, a round LED daytime running light inboard of each headlight and an amber clearance/turn signal light located outboard of each headlight.

Amber colored turn signal lamps shall be provided on both the front and rear of the coach. All lighting shall meet Federal standards (including amended 49 CFR Part 571 effective December 26, 1984). The front right lamp shall be near the front wheel well, above the rub rail line and no higher than the wheel well. The front left side lamp shall be located at the same height and forward position as the right. The side signal lamps shall be of the armor protected type with unobstructed amber lens. The rear side signal lamps shall be generally located in the vicinity of the rear wheel well and shall have amber lenses.

LED roof marker lamps shall be provided at each end of the coach with amber front and red rear lens being provided. Intermediate LED marker lamps with amber lenses shall be provided on each side of the roof line at the center of coach.

Reflectors on the sides and rear of coach shall be provided. The front and center side reflectors shall be amber. The rear side and rear reflectors shall be red. The reflectors shall be permanently affixed to the coach; glue on or pressure sensitive mountings are not acceptable.

2.8.3.2 SERVICE AREA LIGHTING

Four lamps shall be provided in the engine compartment to generally illuminate the area for night emergency repairs or adjustments. The lamps shall be controlled by a switch located near the rear start controls in the engine compartment. These lamp assemblies shall be adequately sealed to prevent the intrusion of moisture or debris during coach operation or normal servicing operations such as steam cleaning. Necessary lights, also sealed, shall be located in other service compartments, and shall be provided with maintain contact switches on the light fixture or convenient to the light.

2.8.3.3 FLUSH MOUNTED CURB LIGHTS

Flush-mounted curb lights shall be installed on the right hand curbside of the coach. One light shall be installed in the no.1 baggage bay door, two shall be installed on the wheelchair lift door and one shall be mounted in the right hand rear engine service door.

The curb lights shall illuminate the curbside area the coach when the entrance door is opened, activated through the door control relay.

The lights shall extinguish automatically approximately 10 seconds after closing the entrance door. The curb light in the no. 1 baggage bay door shall extinguish when the baggage bay door is opened.

2.8.3.4 DRIVER'S LIGHTING

The driver's area shall have a lamp to provide general illumination of the driver's area and shall illuminate the half of the steering wheel nearest to the driver. This lamp shall be controlled by a switch that is conveniently located for access by the driver.

2.8.3.5 PASSENGER INTERIOR LIGHTING

Indirect interior illumination of the coach shall be provided by a minimum total of twenty-one (21) fluorescent tubes controlled by a switch on the driver's left hand control panel. Lighting intensity, measured at a vertical plane 24 inch (610 mm) above the seat cushion, shall be a minimum 15 foot- candles. LED lighting providing equivalent illumination may also be used.

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All passenger seats except for center seat of rear cross seat shall have a flush mounted adjustable LED light. A minimum of 6 candlepower will be provided by each reading light cluster to insure adequate visibility with a button for passenger control. A switch to test the function of the reading lamps shall be provided and be labeled "Test." This switch shall be wired so as to override the function of all passengers reading lamp switches and illuminate all reading lamps when it is moved to the test position.

A minimum of six blue LED aisle lights shall be provided on the underside of the street side passenger seats. These lamps shall be mounted in such a manner so as to prevent passengers from damaging the light's when they are illuminated.

Additional general lighting required to illuminate the interior for passenger exits and shall be interlocked to activate only when the passenger door is opened.

A step well lighting system shall be wired to illuminate when the front door is opened. The system shall provide no less than 2 foot-candles of illumination of the step treads with the doors open. These lights shall not glare in the passengers' eyes. Lamp fixtures shall be totally enclosed, splash- proof, designed to provide ease of cleaning as well as lamp and housing removal, and shall not be easily removable by passengers. Step well lamps shall be protected from damage caused by passengers kicking lenses or fixtures and shall not be a hazard to passengers.

Three lamps shall be provided; a dome at the top of the step well, one on each side of the step well with the bottom one to also provide illumination of the ground area located inside and above the entrance door.

2.8.3.6 DRIVER CONTROLS

All switches and controls necessary for the operation of the coach shall be conveniently located in the driver's area and shall provide for ease of operation. Switches and controls shall be essentially within the hand reach envelope described in SAE Recommendation Practice, J287, Driver Hand

Control Reach. Controls shall be located so that boarding passengers may not easily tamper with control settings.

The door control, kneel control, windshield wiper/washer controls, and run switch shall be in the most convenient driver locations. They shall be identifiable by shape, touch, and markings. The passenger entrance door shall be operated by a single control, conveniently located by the driver's left hand on the control console. The location of this control shall be easily determined by position and touch.

All switches and controls shall be marked with easily read identifiers. All panel-mounted switches and controls shall be replaceable, and the wiring at these controls shall be serviceable from the vestibule or the driver's seat.

A momentary engine override switch shall be provided on the driver control console to permit the driver to move the coach off the road. All labeling of controls shall be permanent.

Left Hand Control Console

A control console shall be located immediately to the driver's left and directly under the driver's window. The console shall house the rotary master/run control switch, outside mirror touchpad controls, engine override switch, auxiliary heater switch, hazard light switch, entrance door switch, kneeling switch, engine brake switch, passenger chime switch, and hazard switch. All switches shall be multiplexed and LED back-lit wherever possible.

Transmission Shift Selector Control

The Allison Transmission Gen IV shift selector control shall be located on the left hand control console. Shifting is totally automatic using the touch pad on the shift selector control module. Fault codes are also displayed on the shift selector to identify potential problems detected by the transmission's built-in diagnostics.

Accelerator, Brake Pedals and Engine Controls

These controls shall be designed for ankle motion. Foot surfaces of the pedals shall be faced with wear-resistant, nonskid, replaceable material that is either slipped or glued for grip. Controls for engine operation shall be closely grouped within the driver's compartment.

2.8.3.7 INSTRUMENTATION

The speedometer, air pressure gauge(s), and certain indicator lights shall be located on the front dash panel immediately ahead of the steering wheel. The steering wheel spokes or rim shall not obstruct the driver's vision of the instruments when the steering wheel is in the straight-ahead position. Instrument panel gauges and switches shall be illuminated when the exterior marker lamps are turned on. Glare or reflection in the windshield, side window, or front door windows from the instruments, indicators, or other controls shall be minimized. Instruments and indicators shall be easily readable in direct sunlight.

Indicators/telltales immediately in front of the driver shall at a minimum include:

- ☐ **Headlamp High Beam**
- ☐ **Right Turn**
- ☐ **Left Turn**
- ☐ **Hazard Warning**
- ☐ **Parking Brake applied**
- ☐ **Service Brakes applied**
(may be common with parking brake indicator – Tell Tale labeled "Stop Lights.")

The instrument panel shall include a speedometer indicating no less than 80 mph (130 kph) and calibrated in maximum increments of 5 mph (5 kph). The speedometer shall be a rotating point type, with a dial deflection of 240° to 120° and 45 mph (73 kph) near the top of the dial. The speedometer shall be sized and accurate in accordance with SAE Recommended Practice J678. A programmable electronic speedometer, or approved equal with odometer indicating vehicle speed in miles per hour, between 0 mph and 80 mph, shall be supplied. Speedometer speed and odometer mileage readings must be accurate within limits of plus nothing to minus 2% when coaches are equipped with new tires. The speedometer shall be equipped with an odometer with a capacity reading no less than 999,999 miles or kilometers.

The instrument panel shall also include air brake reservoir pressure gauge(s) with indicators for front and rear air tanks and voltmeter(s) to indicate the operating voltage across the coach batteries. The instrument panel and wiring shall be easily accessible for service from the driver's seat or top of the panel. Wiring shall have sufficient length and be routed to permit service without stretching or chafing the wires.

2.8.3.8 VISUAL AND AUDIBLE WARNING DISPLAY

Critical systems or components shall be monitored with a built-in diagnostic system. This diagnostic system shall have visual and audible indicators. The diagnostic indicator lamp panel shall be located in clear sight of the driver and shall incorporate LED telltale lights. The intensity of indicator lamps shall permit easy determination of on/off status in bright sunlight but shall not cause a distraction or visibility problem at night. An audible alarm shall sound when certain malfunctions are detected by the diagnostic system. The audible alarm shall be loud enough for the driver to be aware of its operation. Malfunction warnings and other indicators listed in **Figure 2** shall also be supplied on the coach. Space shall be provided in the telltale clusters for future additions of no less than 4 indicators as the capability of onboard diagnostic systems improves.

All diagnostic indicators shall be simultaneously tested by the activation of master switch.

FIGURE 2: Operator's Status Panel Indicators

VISIBLE INDICATOR	TYPE of ALARM
BACK-UP INDICATOR (A)	Back-Up Alarm
CHECK ENGINE INDICATOR	None
CHECK TRANSMISSION INDICATOR	None
ANTILOCK CONDITION LAMP	None
NOT GENERATING	None
HAZARD INDICATOR	Click
HEADLIGHT HIGH BEAM INDICATOR	None
HOT ENGINE INDICATOR (B)	Buzzer
KNEEL INDICATOR	Sonalert
LEFT TURN SIGNAL INDICATOR	Click
LOW AIR INDICATOR	Buzzer
LOW OIL PRESSURE INDICATOR (B)	Buzzer
LOW COOLANT INDICATOR (B)	None
PARKING BRAKE INDICATOR RIGHT	None
TURN SIGNAL INDICATOR STOP	Click
ENGINE INDICATOR	None
STOP REQUEST INDICATOR	Chime

NOTE: (A) This indicator may be located on the transmission control panel
(B) These indicators may be combined with the CHECK ENGINE indicator provided by engine manufacturer.

2.9 INTERIOR TRIM

2.9.1 GENERAL REQUIREMENTS

The interior trim shall be generally pleasing, simple, modern, and free from superficial design motifs. It shall have no sharp depressions or inaccessible areas and shall be easy to clean and maintain. To the extent practicable, all interior surfaces more than 10 inches (254 mm) below the lower edge of the side windows or windshield shall be shaped so that objects placed on them fall to the floor when the coach is parked on a level surface. Handholds, lamps, air vents, armrests, and other interior fittings shall appear to be part of the coach interior design. There shall be no sharp, abrasive edges and surfaces and no unnecessary hazardous protuberances. All plastic and synthetic materials used inside the coach shall be fire-resistant.

Materials shall be selected on the basis of maintenance, durability, appearance, flammability, and tactile qualities. Trim and attachment details shall be kept simple and unobtrusive. Materials shall be strong enough to resist everyday abuse and vandalism; they shall be resistant to scratches and markings. Interior trim shall be secured to avoid resonant vibrations under normal operational conditions.

2.9.1.1 TRIM PANELS

Interior side trim panels and driver's barrier shall be textured stainless steel, anodized aluminum, plastic, melamine type material, vinyl-clad aluminum or fiberglass reinforced plastic. The material shall permit easy removal of paint, greasy fingerprints, and ink from felt tip pens. Panels shall be easily replaceable and tamper resistant. They shall be reinforced, as necessary, to resist vandalism and other rigors of commuter coach service. Interior mullion trim, molding, and trim strips shall be textured stainless steel, vinyl-clad aluminum, anodized aluminum or vacuum formed plastic.

The lower sidewall interior trim shall be fabric covered aluminum panels or approved equal, with fabric patterns running horizontally. Panels shall be sectionalized for ease of repair and joined by aluminum extrusion. Ceiling panels shall be vinyl-clad aluminum or approved equal.

2.9.1.2 HEADLINING

Headlining shall be supported to prevent buckling, drumming, or flexing and shall be secured without loose edges. Headlining materials shall be treated or insulated to prevent marks due to condensation where panels are in contact with metal frame members. Molding and trim strips, as required to make the edges tamper-proof, shall be stainless steel, aluminum, or plastic, colored to compliment the ceiling material. The access panel for the antenna base does not require to be hinged but shall be mounted with tamper-proof screws. Materials for the headlining shall typically be vinyl clad aluminum; the front interior cap shall be gray fiberglass or ABS.

2.9.1.3 FRONT END

The entire front end of the coach shall be sealed to prevent debris accumulation behind the dash and to prevent the driver from kicking or fouling wiring and other equipment with his feet. The front end shall be free of protrusions that are hazardous to passengers standing or walking in the front of the coach during rapid decelerations. Formed metal dash panels shall be painted and finished to exterior quality or may be ABS, fiberglass or vinyl-clad. All parts forward of the driver's barrier shall be finished with a dull matte surface. Colors shall match or coordinate with the balance of the coach interior.

2.9.1.4 REAR END

The rear bulkhead and rear interior surfaces shall be paneled with fiberglass reinforced plastic, trimmed with stainless steel, aluminum, vinyl-clad aluminum, or approved equal.

2.9.2 PASSENGER SEATS

2.9.2.1 ARRANGEMENTS

Passenger seats shall be arranged in a transverse, forward facing configuration. Ambulatory passenger capacity shall accommodate 57 seats. An option for a lavatory shall be provided, the lavatory should not displace more than 2 passenger seats. Both configurations will need an attached floor plan.

No more than twelve seated positions shall be lost on any bus configuration to accommodate two wheelchair passengers occupying the securement positions.

Each transverse, forward facing seat, except the rear seats, shall accommodate two adult passengers. Floor seat tracks shall be stainless steel and shall be welded to the coach frame and be nearly flush with the finished floor. The wall tracks shall be stainless steel or aluminum and shall be bolted or riveted to the sidewall.

2.9.2.2 STRUCTURE AND DESIGN

Seats shall be American Seating Model W2005SQ reclining seats or approved equal. Seat frames shall be constructed of high strength, fatigue resistant, welded steel with a durable powder coated, corrosion resistant colored finish which complements the coach interior. The seat frame shall be wall mounted with heavy gauge steel brackets and shall be attached to the coach floor with a heavy duty stainless steel T pedestal. The seat back shall recline five (5) inches (127 mm) maximum with an infinite number of stops. The reclining seat backs shall be provided with a dress up feature to facilitate coach cleaning. Seat width shall be nominal 40.50 inches (1,029 mm). Aisle shall not be less than 14 inches (356 mm) wide.

Seat cushions shall be supported by steel serpentine springs. Seat covering shall be Holdsworth, Lantal, or similar high quality wool fabric. Typical seat covering weight shall be 24 ounces (680 g)/square yard. Overall composition shall typically be 54% wool, 9% nylon and 37% cotton. Pile composition shall typically be 85% wool and 15% nylon. Backing composition shall typically be 100% cotton. Abrasion from a 28 ounce (794 g) loading shall not affect appearance with 60,000 rubs. The front face of the seat upright and side boxing of cushions shall be covered with Holdsworth, Lantal or other similar wool fabric to compliment the seat cushion. Backrest fabric shall be rugged carpet material. Seat armrest shall be dark gray in color.

Seat foam padding shall be polyurethane. Seat upholstery shall utilize zippers or Velcro which allows them to be removed from the seat cushions for cleaning/replacement purposes.

2.9.3 DRIVER'S SEAT

2.9.3.1 DIMENSIONS

The driver's seat shall be a Recaro Ergo Metro or approved equal. The driver's seat shall be adjustable and shall have up to 9.05 inches (230 mm) of fore and aft adjustment. The seat back and cushion shall be adjustable. The seat shall have cushion depth adjustment, height adjustment (5.5 inches (140 mm) maximum), seat back adjustment, rear cushion adjustment and lumbar adjustment so that operators ranging in size from the 98th percentile male to the 5th percentile female may operate the coach. The suspension control shall be ergonomically designed so that the operator can adjust the seat without looking. The suspension height adjustment and lumbar switches shall be operated with a rocker switch, no rotating knobs are acceptable. The seat suspension shall be capable of dampening varying frequencies that are transmitted through the vehicle caused by varying road conditions. The seat shall be cushioned by a dual shock absorber design. One shock shall be adjustable to allow the operator to control the ride settings. A rubber bumper is required to prevent bottoming out of the seat.

A rubber boot shall be provided to cover the suspension to eliminate the potential for pinching. All air lines are to be 0.25 inch (6 mm) diameter and have a quick disconnect at the back of the seat.

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The suspension shall have a minimum of 15 degrees of seat cushion tilt (rake adjustment). The rake adjustment shall be dual-sided and be accomplished without leaving the seat. The seat cushion shall adjust from 18-20 inches (457 – 508 mm) for varying size drivers. Double locking seat tracks with stainless steel bearings shall be provided. The seat tracks shall be located below the seat cushion and above the pneumatic suspension to enhance track durability and improve rearward travel. The seat shall come equipped with an air track release and a manual center release. All controls are to be on the right-hand side of the seat.

The seat shall be equipped with manual dual recliner gears. The seat back shall be adjustable with dual sided hand controls and include a 24.5 degree recline stop. Recline stop is to prevent the seat from interfering with the driver's barrier. The seat back shall be infinitely adjustable from 90 to 114.5 degrees. The seat back shall come with a full protective plastic back shell.

The back structure shall be constructed of steel and include a one piece stamped steel shell. The seat back shall be ergonomically designed and adjustable to provide exactly the right support to match the S-shaped curve of the operators back. The seat back foam shall be fully supported, no wires or spring support is to be provided. Solid steel bolster adjustment supports are required to provide strong lateral supports. Lateral supports will help hold the driver in place and reduce muscle fatigue while driving.

The seat cushion shall be adjustable in length and rake to accommodate operators of various heights. The seat cushion shall have a two inch extension for taller operators. To accommodate shorter operators, the front of the seat cushion shall rake down and retract.

A three cell air lumbar with right hand controls shall be provided for lower back support. Each air bag shall be individually controlled. Switch design and layout shall be positioned so that the operator can adjust without looking. A four way adjustable headrest with six position vertical adjustment shall be provided. The seat shall be provided with a two point 72 inch 72 inch (1.8 m) seat belt that is stored in plastic anti-cinch automatic retractors mounted on the left side of the seat. The seat belt buckle shall be located on the right hand side of the seat for easy access.

2.9.3.2 STRUCTURE AND DESIGN

The driver's seat cushion shall be made of polyurethane foam. The foam shall be constructed to provide lateral support to provide better operator stability in curves and turns. All exposed metal on the driver's seat, including the pedestal, shall be unpainted aluminum or stainless steel. Required seat belts shall be fastened to the seat so that the seat may be adjusted by the driver without resetting the seat belt. Seat belts shall be stored in automatic, inertia locking type retractors that do not tighten up during operation. The retractor shall be located to the left of the driver; the latch mechanism shall be located on the right. The seat belt shall be designed to allow the operator to "set" the tension on the belt. The belt shall be designed to not creep, making the belt tighter or loose. The seat belt shall be long enough to secure a 98% male driver.

Driver's seat covering weight shall be 24 ounces/square yard. Overall composition shall be 54% wool, 9% nylon and 37% cotton. Pile composition shall be 85% wool and 15% nylon. Back composition shall be 100% cotton. Seat cushions shall withstand 100,000 randomly positioned 3.50 inch (89 mm) drops of a squirming, 150 pound (68 kg), smooth surfaced, buttocks-shaped striker with only minimal wear on the seat covering.

2.9.4 FLOOR COVERING

2.9.4.1 VESTIBULE

The floor in the vestibule shall be covered with RCA flooring or approved equal. The floor covering shall remain effective in all weather conditions for a minimum of seven years. The floor covering as well as transitions of floor material to the main floor and to the step well area, shall be smooth and present no tripping hazards. The standee line shall be white and 2.0 inches (51 mm) wide and shall extend across the coach ramp aisle in line with the driver's barrier. The width of this line shall be uniform in width across its entire length. This line shall be white, same color as the edge of the steps. Color shall be consistent throughout the floor covering.

2.9.4.2 DRIVER'S COMPARTMENT

The floor in the driver's compartment shall be easily cleaned and shall be arranged to prevent debris accumulation. Floor covering material, dimensions and color shall match the vestibule area of the bus.

2.9.4.3 PASSENGER AREA

The floor covering in the passenger area shall be the same material, dimensions and color specified for the vestibule. Flooring shall be installed to minimize the quantity of seams. A one-piece aisle center strip shall extend from the rear cross seat running between the rows of transverse seats to the edge of the center ramp. The ramp will include a separate piece of flooring with a standee line imbedded next to the driver's modesty panel. The floor under the seats shall closely fit to the sidewall panels.

2.10 WINDOWS

2.10.1 WINDSHIELD

The windshield shall be designed and installed to minimize external glare as well as reflections from inside the coach. When the coach is operated at night with the passenger interior lighting on, essentially no reflections shall be visible in the windshield immediately forward of the driver's barrier. Reflections in the remainder of the windshield shall be minimized, and no reflection of any part of the coach interior behind the driver's barrier shall be visible in the windshield.

The windshield shall be easily replaceable by removing zip-locks from the windshield retaining moldings. Bonded windshields shall not be used. The glazing material shall have single density tint.

2.10.2 DRIVER'S SIDE WINDOW

The driver's side window section shall be divided vertically and the rearward section shall slide fore and aft in tracks or channels designed to last the service life of the coach. The driver's side window shall not be bonded in place and shall be easily replaceable. The glazing material shall be nominal 0.25 inch (6 mm) laminated, tempered glass with single density tint, the same as the windshield. The side window shall be rated AS-2.

2.10.3 PASSENGER SIDE WINDOWS

Eight large rectangular passenger side windows shall be provided on each side of the 45 foot coaches. The glazed panel outside dimension size will be 36.125 x 57.625 inch (918 x 1466.5 mm) x .188-inch (4.76-mm) thick. The windows will have a nominal 32 x 52-inch (813- x 1,321-mm) clear opening within the inner support frame structure. The side passenger windows will be single-glazed construction, hermetically sealed, AS-3 laminated float, 76% heat-absorbing laminated safety glass with light and solar transmittance of 24%. A painted aluminum sash molding will be installed along the bottom length of the passenger side windows.

All windows shall be top hinged with push out at the bottom, with the exception of the wheelchair

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lift door and lavatory windows which do not open. All top-hinged windows shall be emergency escape type and include a single motion release bar running the entire width of the window at the lower edge to permit emergency egress. Emergency operating instructions printed on metal plates shall be provided at each seat position for operating the push-out window.

2.11 INSULATION

2.11.1 MATERIAL

2.11.1.1 PROPERTIES

The insulating materials may be of differing thicknesses and materials to achieve thermal insulating properties and low interior noise levels. These are described following:

- ☐ Roof: 2.0 inch (51 mm) thick, compressed at installation, resin coated, medium density non bagged fiberglass
- ☐ Sidewall: Rigid molded polyurethane foam of varying thickness.
- ☐ Driver’s area: Minimum 0.50 inch (13 mm), high-density fiberglass under the floor in the driver’s area.
- ☐ Step well area: 1-inch thick urethane foam insulation with stretched polyester film to minimize interior temperature variances during severe external climatic conditions and for sound deadening.
- ☐ Below windshield: 2.0 inch (51 mm) thick, high density fiberglass
- ☐ Complete rear lounge seat area shall be heavily insulated with fiberglass blankets and sound-dampened panels for both noise and heat protection as follows:
- ☐ Behind the rear cross-seat riser and rear cross seat back and cushion are a minimum total of 1.50 inch (38 mm) thick high-density fiberglass blankets.
- ☐ An additional 0.625 inch (16 mm) fiberglass blanket is added behind the rear cross seat back to further impede engine noise propagation to coach interior.
- ☐ Sound barrier with 0.250 inch (6 mm) urethane foam layered on either side of a 0.125 inch (3 mm) urethane elastomer loaded with barium sulfate.
- ☐ Cover panel behind rear cross-seat is 1.0 inch (25.4 mm) thick foamed polyurethane with stretched polyester film facing.
- ☐ Area behind and below this rear area is 2.0 inch (51 mm) medium density fiberglass with a 0.75 inch (19 mm) thick heavy density fiberglass batting cemented to the inner face of the fiberglass rear panel.

2.11.1.2 THERMAL INSULATION

The combination of inner and outer panels on the sides, roof, and ends of the coach, and insulating materials shall provide a thermal insulation sufficient to meet the interior temperature requirements. The coach body shall be thoroughly sealed so that drafts cannot be felt by the driver or passengers during normal operations with the passenger doors closed.

2.11.1.3 SOUND INSULATION

The combination of inner and outer panels and any material used between them shall provide sufficient sound insulation so that a sound source with a level of 80 dBA measured at the outside skin of the coach shall have a sound level of 60 dBA or less at any point inside the coach. These conditions shall prevail with all openings, including doors and windows, closed and with the engine and accessories switched off.

Bus generated noise level experienced by a passenger at any seat location in the coach shall not exceed 80 dBA and the driver shall not experience a noise level of more than 70 dBA under the following test conditions. The coach shall be empty except for test personnel, not to exceed 4 persons, and the test equipment. All openings shall be closed and all accessories shall be operating

during the test. The coach shall accelerate at full throttle from a standstill to 35 mph on level commercial asphalt or concrete pavement in an area free of large reflecting surfaces within 50 feet of the coach path. During the test, the ambient noise level in the test area shall be at least 10 dB lower than the coach

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under test. Instrumentation and other general requirements shall conform to SAE Standard J366. If the noise contains an audible discrete frequency, a penalty of 5 dBA shall be added to the sound level measured.

2.11.1.4 REAR SEAT INSULATION

Special design consideration shall be given to insulation in the area above the engine compartment. Fiberglass or other suitable material shall be applied, together with adequate ventilation, to provide temperatures consistent with the remainder of the coach.

Seat cushions and seat backs shall be suitably insulated to prevent elevated temperature of the seat itself and no cushion or back shall be measurably hotter as compared to any other seat in the coach.

2.12 ANCILLARY FEATURES

2.12.1 DRIVER'S AREA

2.12.1.1 VISORS

Three roller type sunscreens shall be provided at the right and left hand windshield and at the driver's side window. Guide rods shall be located at each end of each screen to allow for infinite positioning. The sunscreens shall be shaped to minimize light leakage between the sunshades and windshield pillars. The sunscreens shall not obstruct air flow from the climate control system or obstruct the operation of other equipment such as the radio handset or the destination sign control. Sunscreen adjustments shall be made easily by hand.

2.12.1.2 STOP REQUEST SIGN

A passenger chime signal audible to the driver and to passengers anywhere inside the coach shall be provided. The chime shall be a push button convenient to seated passengers. A driver-controlled switch shall deactivate the chime system. A stop request sign shall be located in the front center of the coach and fastened to the coach ceiling to permit viewing by all passengers. The sign shall be illuminated when the passenger chime sounds and go off when the entrance door is opened. The passenger chime shall sound once when the sign's light comes on but will not sound again until after the system has been reset by the opening of the entrance door. A passenger chime circuit ON / OFF switch shall be provided in the drivers area.

2.12.1.3 DRIVERS STORAGE

A hook shall be provided for the drivers' coat in the driver's area.

2.12.2 MIRRORS

2.12.2.1 OUTSIDE MIRRORS

The coach shall be equipped with corrosion resistant, heated remote controlled outside rear view mirrors, on each side of the coach. The mirrors shall be mounted so as to permit the driver to view the highway along both sides of the coach, including the rear wheels. Mirrors shall be firmly attached to the coach to prevent vibration and loss of adjustment, but not so firmly attached that the coach or its structure is damaged when the mirror is struck in an accident. Outboard maximum overall mirror width dimension shall not exceed 122 inches while providing maximum visibility to the operator.

The roadside mirror shall be a corrosion-resistant, remote outside rear view mirror, adjustable from the driver's seat. Mirrors shall be split view flat and convex glass integrated in the same housing, overall measurement 10 inches by 13 inches (254 x 330 mm). Mirrors shall permit operator view of road surface as well as the rear wheels. Connections on mirror harness shall be Cannon Sure Seal all weather connectors or approved equal. Mirror head shall be attached to arm with ball/collet adjustment, for positive head location. Mirror arm shall be made to breakaway if struck in an accident or to eliminate damage in bus wash. Mirror arm shall be hollow aluminum for concealing wire.

The curbside mirror shall be a corrosion-resistant remote outside rear view mirror. Mirrors shall be integral flat and convex with overall measurements of 10 inches by 13 inches (254 x 330 mm) and permit driver

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view of roadway as well as coach rear wheels. Mirror arm shall be spring loaded to break away, should impact occur. Mirror arm shall be made to break away if struck in an accident or to eliminate damage in bus wash. Mirror arm shall be hollow aluminum for concealing wire. A mechanical stop shall be provided which prevents contact between the mirror arm and the entrance door. Mirror arm shall also have a five inch convex spot mounted on it to provide a clear view of the front of the coach.

Both mirrors in both housings shall be heated. A switch shall be provided. The switch shall control both mirrors and be provided with pigtail connectors to interface with the wiring harnesses of both remote mirrors. The switch shall be installed in a location that is within easy reach of the operator.

2.12.2.2 INSIDE MIRRORS

A mirror shall be provided for the operator to observe passengers throughout the coach without leaving his seat and without shoulder movement. With a full standee-load, including standees in the vestibule, the operator shall be able to observe passengers in the rear of the coach and anywhere in the aisle. Inside mirror shall be 6.0 inches x 10.50 inches mounted just below the destination sign box and above the driver's line of sight.

2.12.3 PASSENGER ASSISTS

2.12.3.1 GENERAL REQUIREMENTS

Passenger assists in the form of full grip, vertical stanchions or handholds shall be provided for the support and stability of standees and for ingress/egress. Passenger assists shall be convenient in location, shape, and size for both the 95th-percentile male and the 5th-percentile female standee. Starting from the entrance door and moving anywhere in the coach, a horizontal assist shall be provided at the aisle side of the luggage rack that runs the full length of the luggage rack so that a

5th-percentile female passenger may easily move the length of the aisle using one hand and then the other without losing support. Excluding those mounted on the luggage racks, the assists shall be between 1.25 and 1.50 inches (32 x 38 mm) in diameter or width with radii no less than 0.25 inches (6 mm). All passenger assists except for the luggage rack nosing shall permit full hand grip with no less than 1.50 inches of knuckle clearance around the assist.

2.12.3.2 FRONT DOORWAY

Front doors, or the entry area, shall be fitted with assists no less than 0.75 inches (19 mm) in width. Assists shall be as far outward as practicable, but shall be no further than 6 inches (152 mm) from the outside edge of lower step tread and shall be easily grasped by a 5th-percentile female boarding from street level. Door assists shall be functionally continuous with the horizontal front passenger assist and the vertical assist on the front modesty panel.

2.12.3.3 VESTIBULE

The aisle of the driver's barrier panel shall be fitted with vertical passenger assists that are functionally continuous with the overhead assists that extend to within 36 inches (91 cm) of the floor. These assists shall have sufficient clearance from the barrier to prevent inadvertent wedging of a passenger's arm and shall be in complete compliance with ADA requirements.

A horizontal passenger assist shall be located in the front of the coach adjacent to the driver's area. The horizontal passenger assist maximum will be no more than 35 inches (89 cm).

The assists at the front of the coach shall be arranged to permit a 5th percentile female passenger to easily reach from the front door assist to the horizontal assist, then to the vertical assist.

2.12.4 PASSENGER INFORMATION SYSTEMS

2.12.4.1 DESTINATION SIGNS

The displays shall consist of Full Colored LED's. All Full Color LED's used for the destination signs shall be rated for a 50,000-hours. The entire display area of all signs shall be clearly visible and readable both in direct sunlight and at night with a viewing angle of at least 140 degrees. The characters formed by the

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LED's shall meet the requirements of the Americans with Disabilities ACT (ADA) of 1990 Reference 49 CFR Section 38.39. The software will give the end user the capability to select from a vast selection of custom fonts, pre-programmed fonts and the Microsoft TrueType Directory fonts for display on the LED Signs for the most customization possible to the desire of the end user's riding public.

All destination signs shall be supplied with an ambient light detection sensor that controls the LED intensity according to the exterior light conditions. This adjustment shall be continuously linear, not stepped, from 10-100% output.

2.12.4.1.2 Front Destination Sign:

Front Sign shall consist of a minimum matrix of 160 Columns by 17 Rows and shall be full color LED. The sign should be readable from at least 250' with a viewing angle of not less than 140°.

2.12.4.1.3 Curb Side Destination Sign:

Not required

2.12.4.1.4 System Control and Programming

All system control and drive PC boards shall be enclosed in either the sign housings or in the System Control Console. The various destination signs can be programmed to display either one common message or each sign can display an independent message. The System Control Console shall incorporate a flexible keypad with no moving parts.

The system control console shall be used to view display messages and contain the destination sign database. The driver console shall utilize a tactile membrane keypad. The system control console shall be equipped with an LCD display.

Sign system shall be capable of sequentially displaying a minimum of one pre-selected destination message and one public relations message. The operator shall be able to quickly change between pre-selected destination messages without re-entering a message code. Public relations messages shall be capable of being displayed alternately with the regular destination.

The Master Coach Run Switch shall control power to the sign system. The signs shall operate in all positions of this switch except off. The signs shall be internally protected against voltage transients and RFI interference to ensure proper operation in a bus environment.

The system control console shall be used to view and update display messages. The system control console shall utilize a multiple function keyboard with tactile feel, designed especially for the harsh transit environment. The system control console shall contain an LCD display. The system control console shall continuously display the complete message associated with the selected destination code. Diagnostics and/or maintenance and test features that indicate any sign defects shall be included.

The system shall be capable of integrating to on-board computer devices for message listing program via anyone of several possible protocols, including but not limited to J1708, RS485, RS232, RS422 or IBIS. The sign system shall be capable of wireless upload capability for receiving the messaging database. The sign system shall be reprogrammable through the system control console by either a standard USB Thumb Drive or via a 9-pin "D" type keyfob memory device.

2.12.4.1.5 Emergency Message Display

A pre-programmed emergency message may be activated using a customer-selected switch located in the driver area. This message shall be displayed on signs facing outside the vehicle, while signs inside the vehicle, including the driver console, remain unchanged. Removing the emergency signal or entering a new destination shall cancel this message.

2.12.4.1.6 System Level Diagnostics

The system control console shall provide, at a minimum, visual indication of system level errors with the destination signs. This shall include detection of communication failure, power supply failure on a particular sign and display board failure on a particular sign.

2.12.4.1.7 Programming

A PC-based software package will be furnished for creating the destination sign messages. The character shape and size shall be programmable and the software should allow the creation of personalized fonts. These may vary in pixel height and comprise single, double and triple stroke typeface. The program will allow an unlimited amount of special characters, logos or fonts to be displayed.

A programming software package shall be furnished to generate message lists for the destination sign system. It shall be a Windows compatible software package, using drop down menus and help screens. The software shall not require a standalone computer or a computer of a specific make or model. The software will allow, at a minimum, individual font selection, shape and choice of fonts, font creation and import, destination display management (right or left route numbers, pre-defined text fields, alternating screens and scrolling), as well as full system previews are available for all signs. The software shall also offer utilization of the TrueType font directory for programming. Graphic capabilities are available to allow personal logo creation as well as selection from pre-programmed pictograms.

The programming software shall use techniques that require minimal operator training and are intended for use by operators that are not trained in complex computer operations.

2.12.4.1.8 Warranty & Spares

All full color signs and components of the sign system shall be covered by a 5-year warranty. Free spare parts, (whole components), shall be provided to the end user free of charge for storage and use at the end users selected facility. The number of spares to be provided will be commensurate with the number of original systems purchased and shall be agreed to by all parties at the execution of a contract.

2.12.6 LIFT

A Braun model number NUVL855RM24 dedicated access extended travel lift, or approved equal with two forward facing mobility device securement areas to accommodate a maximum 30.0 inches (762 mm) wide mobility device shall be provided. The lift assembly shall comply with all current ADA and FMVSS 403 and 404 requirements. The lift shall be installed below the floor line at the number 2 right-hand luggage bay on the curbside of the coach.

The lift shall be controlled by a dash mounted toggle switch and a rear lift area toggle switch, and operated by up/down switches on a pendant mounted to the lift support bracket inside the number 2 baggage bay. The lift Restraint Belt must be buckled before the lift can be raised or lowered. The safety interlock circuit can be energized to operate the lift only if: the transmission is in neutral, the park brake is applied, engine Fast Idle is ON, the dash-mounted Master Switch is ON, the lift Secondary Switch is ON and the lift restraint belt is buckled.

The wheelchair loading system shall provide safe, comfortable and rapid ingress and egress for applicable passengers from the street level or a curb. When not in use, the lift shall stow in the luggage bay. The lift mechanism shall include a Threshold Warning device to provide "passenger on platform" information and prevent stowing the lift platform when a passenger is sensed. The outer barrier shall be automatically controlled and shall be such that it cannot be overridden by the loading system operator. A dash mounted indicator light shall be provided and shall be illuminated when the loading system is activated. The interlock shall apply, the bus shall not move and the engine throttle shall be disabled whenever the wheelchair loading system is activated. If the lift door is open or ajar, the interlock shall remain engaged. Brackets, clamps, screw heads and other fasteners used on the passenger assists shall be anodized aluminum or stainless steel and shall be flush with the surface and free of rough edges.

The lift control mounted on the lift structure shall have push button Up / Down switches. The toggle electrical supply switch shall be located in close proximity to the controller. This toggle switch must be turned "ON" prior to the lift operation. All lift control switches shall be permanently labeled. Decals shall not be permitted. The stow guard switch shall be red in color and the Stow / Deploy switch shall be black in color. These switches shall be incorporated in a hand held pendant

The Braun NUVL855RM24 or approved equal lift shall include the following

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specifications:

- Lifting capacity (main platform) -700 pounds (317 kg)
- Vertical travel - 63" (1,600 mm) maximum
- Platform width (chair capacity)-30" (762 mm) minimum
- Platform depth (chair capacity) - 48" (1,219.2 mm) minimum
- Platform side height - 1.50" (38 mm)
- Handrail height - two (2) - 30" (762 mm) minimum
- Cassette stowed dimension (depth) - 72.25" (1835 mm) total
- Cassette Width & Height - 43.5" x 8.375" (1105 x 213 mm)
- Operating controls - 3 pushbutton
- Power Source - Electro- hydraulic
- Voltage -24 volts
- DC Back up system - Emergency hand pump
- Construction - Steel and aluminum
- Stow level to ground cycle time - 12 seconds at 70 degrees (21° C)no load
- Ground to floor level cycle time - 12 seconds at 70 degrees (21° C) – no load
- Hydraulic system fluid capacity - 1.0 quart (1 liter)
- Hydraulic system operating pressure - 2500 psi (17,238 kPa) minimum

Department of Transportation Regulations 49 CFR 38.

The lift shall include a hinged platform to bridge the coach floor to the lift platform. Bridge shall be hinged and locked in an upward position to act as a barrier when the lift is in use. Bridge shall also allow the lift passenger to ingress/egress easily from the platform. Lift travel speeds and lift operation shall be adjusted to the lift manufacturer's specifications upon completion of the lift installation into each coach and before coach delivery. The individual handrails shall incorporate a visual aid to insure that they are folded in the proper order.

The lift shall include an emergency system in case of driver operation malfunction. Should an emergency situation occur, the lift operator shall release the pushbutton switch on the controller to immediately stop the lift operation. Loss of electrical power shall also stop the lift operation regardless of switch position. An emergency auxiliary hydraulic hand pump shall be used to complete the lift cycle. The emergency hand pump handles and pump shall be located in an enclosed box at the rear wall of the number 1 right-hand baggage bay to prevent the accumulation of dust and dirt. The pump shall be easily accessible through baggage bay door. The handle shall be stored adjacent to the pump to allow immediate usage.

2.12.5.1 LIFT DOOR

The lift door shall be a single leaf design that operates in a sliding track mounted both above and below the door leaf. The door shall open by sliding to the rear of the coach and shall remain on a horizontal plane throughout the opening and closing process. No pin hinged doors shall be provided. The transmission must be in neutral and the parking brake activated for the lift to operate. The accelerator shall be automatically disabled and the fast idle system activated when either the lift master switch is turned "ON" or the lift door is open in order to provide maximum safety and security. These features shall be wired to the lift master switch to allow activation only when the transmission is in neutral. The coach directional (Hazard) lights will also flash on/off. After the lift operation is completed, the lift shall be properly stored and secured, with the access door closed and the lift master switch at the dash in the "OFF" position in order to move the coach.

The lift door shall have a window in line with the other passenger windows and shall not detract from the appearance of the coach. The door latch mechanism shall be located in the lower section of the door so that operators in the 5th percentile female range can operate the lift door.

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The lift storage door shall not block the visual observation of the lift assembly while utilizing the manual override mode of the lift. A lift door design consisting of a horizontally hinged lift platform egress door mounted within a vertical motion pantograph baggage door is a preferred design.

2.12.5.2 LIFT INSTALLATION

The installation of the lift to the coach structure as well as the installation of the lift door into the sidewall of the coach shall not affect the structural integrity of the coach.

The parcel rack module above the wheelchair lift platform area shall be permanently removed to provide additional headroom. The modified rack shall be professionally finished at all ends.

A Threshold Warning module with a red warning light and acoustic sensor shall be mounted in the ceiling structure above the wheelchair lift entrance doorway.

The heating and air ducts shall be rerouted around the lift area to ensure proper interior air conditioning/heating airflow and distribution.

A passenger chime tape switch shall be mounted on the sidewall at the two (2) wheelchair securement positions.

Each coach shall have adequate information decals installed which details the proper lift operation in both the normal and manual modes of operation.

2.12.5.3 LIGHTING REQUIREMENTS

Lighting for the lift areas shall be designed to exceed ADA and FMVSS 404 standards. Lighting shall be provided to effectively illuminate the lift area. Light shall be wired through the lift master toggle switch on the driver's dash and shall automatically illuminate when this switch is in the "ON" position. The lighting design shall minimize the effect of glare on passengers entering the bus through the wheelchair lift door. During lift operation, the street surface shall be illuminated to a minimum of six candlepower a distance of 3 feet (.91 cm) beyond the external dimensions of the lift platform once deployed and lowered. Additional lighting shall be provided to insure illumination of the instruction placard and the manual override pump when it is in use.

2.12.5.4 SECUREMENT SYSTEM

The vehicle interior shall permit the securement of two (2) forward facing wheelchair passengers in which the primary position shall be on the street side of coach directly across from lift. Securement areas shall be a minimum 30 x 48 inches (762 x 1,219 mm) as required by ADA. Securement devices shall be QRT Deluxe Slide and Click or approved equivalent.

A separate three-point belt securement shall be provided to effectively secure wheelchair passengers.

To further secure the passenger during the lift operation, a retractable seat belt strap shall be provided at the ingress / egress area of the lift platform. This seat belt strap must be buckled to disengage the lift electrical interlocks to allow lift operation. A minimum 10.5 inches (267mm) high barrier shall also be provided at the rear of lift area for additional passenger protection.

2.6 ROOF VENTILATORS/ESCAPE HATCHES

Two roof ventilators shall be provided and designed to perform as escape hatches. One ventilator/escape hatch shall be located in the roof at the front of the coach, another in the roof at the rear of the coach.

3.0 CHASSIS

3.1 PROPULSION SYSTEM

3.1.1 VEHICLE PERFORMANCE

3.1.1.1 POWER REQUIREMENTS

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The propulsion system and drive train shall provide power to enable the coach to meet the defined acceleration, top speed, and gradability requirements. Sufficient excess power shall be available to operate all accessories without jeopardizing coach performance or safety parameters.

3.1.1.2 TOP SPEED

The coach shall be governed at 72 mph (116 kph) road speed, for emergency and passing maneuvers, on a straight, level road at SLW.

3.1.1.3 GRADABILITY

Gradability requirements shall be met on grades with a surface friction coefficient of 0.3 and above at SLW with all accessories operating. The standard configuration power plant shall enable the coach to maintain a speed of 44 mph (71 kph) on a 2-percent grade and 7 mph (11 kph) on a 16- percent grade.

3.1.1.4 ACCELERATION

Vehicle shall accelerate from 0 to 20 mph (0 – 32 kph) in nine seconds, with the coach at S.L.W.

3.1.1.5 OPERATING RANGE

The operating range of the coach run on the design operating profile shall be at least 400 miles (644 km) on a single fill-up of compressed natural gas fuel.

3.1.1.6 OPERATING PERFORMANCE

Speed, gradability, and acceleration performance requirements shall be met at, or corrected to, 85 degrees F (29° C), 29.00 inches (74 cm) Hg, dry air. Performance degradation at conditions other than the test standard shall not exceed 1 % for each 3 degrees F/C and 4 % for 1,000 feet (305 m) of altitude above the standard.

3.1.2 POWERPLANT MOUNTING AND ACCESSORIES

3.1.2.1 MOUNTING

The power plant shall be mounted in a compartment in the rear of the coach. All power plant mountings shall be mechanically isolated to minimize transfer of vibration to the body structure. Clamps required for securing or supporting lines shall be rubber or plastic coated and properly sized for the line being clamped.

3.1.2.2 SERVICE

The power plant shall be arranged so that accessibility for all routine maintenance is assured. No special tools, other than dollies and hoists shall be required to remove the power plant. The power plant shall be mounted on a cradle which can be slid into and out of the coach. Two mechanics shall be able to remove, replace and prepare the engine and transmission assembly for service in less than 25 total combined man-hours.

The muffler, exhaust system, air cleaner, air compressor, starter, turbocharger, alternator, radiator, including charge air circuit, all accessories, and any other components requiring service or replacement shall be installed in or above the engine compartment.

The turbocharger, alternator, air compressor, and starter shall be replaceable without dismounting or removing other coach parts and without gaining access through the coach interior.

The cooling system filler caps shall be removable from the filler neck and be held closed with spring pressure or positive locks. The transmission filler tube shall employ a combination dipstick and cap and shall be the minimum length permissible to make fluid checking easier. All fluid fill locations shall be properly labeled to help ensure correct fluid is added and all shall be easily accessible with standard funnels, pour spouts, and automatic dispensing equipment. All lubricant sumps shall be fitted with drain plugs of a

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standard size except for the transmission which uses a recessed square socket type plug. The power plant shall be equipped with digital, computerized diagnostic capability using laptop or PC-based available diagnostic software for displaying engine and transmission data.

The engine and transmission shall be equipped with sufficient heavy-duty fluid filters for efficient operation and to protect the engine and transmission between scheduled filter changes. To the extent practicable, the filters shall be of the spin-on, disposable type. All filters shall be easily accessible and the filter bases shall be plumbed in a manner so as to assure correct reinstallation.

CNG fuel lines within the engine compartment shall be rigidly supported and shall be composed of stainless steel tubing where practicable. Flexible fluid lines shall be kept at a minimum and shall be as short as required. CNG fuel lines shall be routed or shielded so that failure of a line shall not allow CNG fuel to be released, spray, or drain onto any component operable above the auto-ignition temperature of natural gas.

Flexible lines shall be individually supported and shall not touch one another or any part of the coach.

3.1.2.3 AIR CLEANER

The air cleaner shall be a dry type, horizontally mounted. Airflow through the filter element shall be from the outside in. To service the filter shall take less than 5 minutes, disconnecting an engine air intake duct, air compressor intake duct, or filter housing shall not be necessary. The access cover of the air filter assembly shall be retained to the filter housing with a single wing nut. A Filter Minder air filter restriction indicator, part number 135501-00920, manufactured by Engineered Products Co. or approved equal, shall be provided and calibrated to 20 inches (51 cm) of water/vacuum.

3.1.2.4 ACCESSORIES

Powertrain accessories shall be unit mounted for quick removal and repair. These accessories shall be driven at speeds sufficient to assure adequate system performance during extended periods of operation. The power steering pump and air compressor shall be flange mounted and gear driven from engine. The power steering reservoir shall be remotely mounted to the bus chassis and shall not be mounted on the drivetrain. Alternators shall be Leece Neville or approved equal. Only the 24 volt alternators, A/C compressor and cooling system fans may employ belt drives. Tension on the belt driven A/C compressor shall be maintained by an automatic tensioner. The alternator and the fan drive shall be automatically tensioned as well.

3.1.2.5 HYDRAULIC DRIVE

Hydraulic system service tasks shall be minimized and scheduled not more frequently than scheduled tasks for other major coach systems. All elements of the hydraulic system shall be easily accessible for service or unit replacement. All lines shall be compatible with the hydraulic fluid and maximum pressures of the system. Flexible lines shall be minimized in quantity and length. Lines of the same size and with the same fittings as those on other piping systems of the coach, but not interchangeable, shall be tagged or marked for use on the hydraulic system only. Hydraulic lines shall be individually and rigidly supported to prevent chafing damage, fatigue failures, and tension strain on the lines and fitting. Hydraulically driven radiator and charge air cooler fan drive systems are not acceptable.

The hydraulic system shall be configured and/or shielded so that failure of any flexible line shall not allow hydraulic fluid to spray or drain onto any component operable above fluid auto-ignition temperature.

3.1.3 POWERPLANT

3.1.3.1 ENGINE

The engine shall consist of Cummins ISX 12L 425HP, 1450ft/lb torque EPA engine with Cummins engine brake or approved equal.

3.1.3.2 COOLING SYSTEM

The cooling system shall be sized to maintain fluids at safe, continuous operating temperatures during the most severe operations possible with the coach loaded to GVWR and with ambient temperatures up to

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110 degrees F (43 C). Sufficient reserve capacity shall be provided by the cooling system to provide efficient cooling for the coolant and engine charge air in a degraded condition. Radiator(s) shall be Modine, or approved equal. Radiator(s), complete with charge air cooling circuit shall be provided, mounted above the engine compartment. The charge air cooler and the radiator shall be mounted at least 60 inches (1.50 m) above the road surface. The physical size and heat rejection capacity of the radiator along with the charge air cooling capacity shall be tested and approved by the engine manufacturer for this application. The radiator system shall be easily serviced through the rear doors. The radiator and charge air cooler shall not be stacked in front of one another. Door shall include hinges which hold the doors in the open position.

The charge air cooler (CAC) / radiator assembly shall be primarily of durable corrosion-resistant aluminum construction. Heat exchanger fin spacing shall not exceed 14 fins per inch. Necessary hoses shall be premium, silicone rubber type that are impervious to all coach fluids. All coolant hoses shall be secured with constant tension hose clamps. Fan speed shall be regulated to minimize fan noise. No heat producing components or climate control system components shall be mounted between the engine cooling air intake aperture and the heat exchangers. All cooling system fittings are to be cast iron, brass or copper.

A single fan, belt driven from the engine shall pull outside air through an exterior panel and across the radiator / charge air cooler at a minimum rate approved by the engine manufacturer for maximum cooling efficiency. Belt tension shall be maintained by an automatic belt tensioner to minimize belt slippage and ensure longer belt life. A Linnig fan clutch or approved equal shall control fan operation.

Radiator surge tank shall be made of heavy-duty steel. A sight glass to determine satisfactory engine coolant level shall be provided and shall be accessible by opening the radiator access doors. A spring-loaded radiator cap shall also be provided to safely release pressure or vacuum in the cooling system. An engine alarm system will be included in the engine electronic control. Cooling fan logic shall be controlled electronically through the engine control system. An automatic coolant recovery system will also be provided.

Engine thermostats shall be easily accessible for replacement. The engine cooling system shall be equipped with a properly sized or approved equal cooling system filter with a spin-on, disposable element. The engine coolant shall be extended life Power Cool Plus using Organic Acid Technology (OAT) or approved equal. Shutoff valves shall be provided on the coolant filter base which allows filter replacement without coolant loss. Quarter turn valves shall also be provided and installed in the entire cooling system which permits complete shutoff of both lines for the heating and defroster units.

All low points in the water-based cooling system shall be equipped with drain cocks. Air vent lines shall be fitted at high points in the cooling system. Oil and water temperature gauges will be provided in the engine compartment.

3.1.3.3 TRANSMISSION

The transmission shall be an Allison B500 six speed transmission, equipped with Allison Transmission Electronic Controls (Gen. IV) or approved equal. Maximum input horsepower shall be 550 horsepower. Maximum input torque capability shall be 1650 pound feet of torque. The transmission shall have a one stage, three element, polyphase torque converter and a lock up clutch with a torsional damper. The transmission shall be fully automatic with six forward gear ratios. Shift calibration shall be set so that shifts shall be smooth under all operating conditions. The transmission shall only have one maintenance dipstick, and no other secondary service lane dipsticks. The transmission will also include a Probalyzer, or approved equal, brass Mini-gauge plug to permit transmission fluid analysis sampling.

If an Allison B500 Gen IV transmission is equipped it shall be filled with synthetic transmission fluids that meet Allison TES-295 specification and have a TES-295 approval number and the Allison approval logo. Mobil Delvac Synthetic Automatic Transmission Fluid can be used or Allison TES-295 approved equals such

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as Castrol Transynd. Allison Transmission extended warranty plans require synthetic transmission fluids meeting the TES-295 specification with an approval number and the Allison approval logo to be used.

The gearing shall be of the constant mesh, helical, planetary type with the following ratios:

<i>RANGE</i>	<i>RATIO</i>
First	3.51:1
Second	1.91:1
Third	1.43:1
Fourth	1.00:1
Fifth	0.74:1
Sixth	0.64:1
Reverse	4.80:1

A function of the electronic controls shall be provided to prevent premature engagement and operation of the automatic transmission reverse gear.

The transmission shall be governed by electronic controls, which contain a programmable read-only memory (PROM) that will provide basic transmission control functions. All cabling and electronic devices utilized by the electronic transmission control system shall be adequately shielded against interference.

The transmission electronic module shall be capable of communicating with the engine electronic module to maintain maximum efficiency. The control module shall be equipped with a self- diagnostic system. A failure shall be retained by the control module for evaluation by garage personnel using a Allison DOC software and J1939 / RS232 translation device or approved equal.

Modified diagnostics shall provide timely information on transmission oil and filter change requirements and transmission rebuild timeframes.

The electronic controls shall be completely sealed from the environment. The transmission electronic control unit shall be located in a weatherproof box that is protected from environment or potential damage from under floor baggage.

3.1.3.4 ELECTRIC STARTER

A Mitsubishi 105P70 24 volt starter motor, or approved equal shall be provided as a basic installation. Planetary gear reduction drive technology produces greater starting torque, rotating the armature at a higher rpm. The starter will have "Soft Start" positive pinion gear meshing technology, which will engage the pinion gear into the ring-gear before the starter begins to turn. The starting system shall be inoperable whenever the master control is in the OFF position, and whenever the emergency shut-off switch is activated or the engine is running. A starter interlock shall be provided that shall prevent the starter motor from engaging the flywheel after the engine is started.

3.1.3.5 ALTERNATOR

A 24-volt, 270 amp, brushless, oil-cooled, self-rectifying alternator will be mounted on the engine at the curbside of the coach. The alternator will be belt-driven off an engine-mounted accessory drive pulley. An automatic tensioner will maintain the required belt tension adjustment.

Alternator output at various engine speeds will be: idle (700 rpm) - 210 amperes, fast idle (950 rpm) - 240 amperes, full speed (2,100 rpm) - 270 amperes.

3.1.3.6 BOOST PUMP

A MP Boost Pump, or approved equal shall be provided as the basic coolant boost pump for coach heating requirements. The pump motor shall be a magnetic drive coupled pump operating at 24 volts DC. Coolant flow rate shall be a minimum of eight (8) gallons (30 liters) per minute. The pump operates on demand according to the driver's heat control valve.

3.1.4 EMISSIONS

3.1.4.1 MOTOR VEHICLE POLLUTION REQUIREMENTS

The manufacturer shall provide in writing that:

The engine being provided complies with the Clean Air Act when operated on diesel fuel.

The horsepower of the vehicle is adequate for the speed, range and terrain in which it will be required to operate, and also to meet the demands of all auxiliary power equipment.

3.1.4.2 EXHAUST SYSTEM

A stainless steel exhaust system shall be provided. The system shall be located at the left hand (roadside) rear corner of the coach under structure and shall be accessed through the left rear service door. Exhaust piping shall not restrict underbody clearances. The muffler tailpipe shall direct exhaust gasses downward, toward the road surface and not up through a stack in the body of the coach.

The exhaust system shall include a DPF (Diesel Particulate Filter), designed to reduce particulate emissions. The DPF accumulates soot and residual engine oil, which are the product of combustion. A telltale light shall illuminate when the DPF needs cleaning. A "Regen" (Regeneration) switch located in the right rear corner service bay, accessed through the right rear corner service door, shall activate an internal element within the DPF that burns off the trapped soot and engine oil ash.

3.2 FINAL DRIVE

3.2.1 GENERAL REQUIREMENTS

The two rear axles shall have a load rating sufficient for the coach loaded to GVWR. Transfer of gear noise to the coach interior shall be minimized.

3.2.1.1 DRIVE AXLE

The drive axle shall be a Meritor World Axle or approved equal rated at 22,500 lbs (10,206 kg). The bearing journals on each spindle shall be induction hardened for greater durability. Ring gear shall be bolted to case. The drive axle hub end wheel bearings shall be oil lubricated. Default rear axle ratio shall be 3.73:1.

3.2.1.2 TAG AXLE

A tag axle shall be located behind the drive axle. The tag axle will be a solid beam type with fixed steering. The tag axle shall have single tires the same size as the tires on the front and drive axles. Tag axle weight shall not exceed 14,000 pounds. With full passenger seating capacity, load on any axle shall not exceed 22,400 pounds. Combined load capacity weight on the drive and tag axles shall not exceed 36,500 pounds.

A tag axle unloading feature will allow full or partial unloading, or dumping of air from the tag axle air spring bellows. This feature enables weight to shift to the drive axle for more traction. Manual unloading valves are located inside the RH rear curbside service door.

3.2.1.3 HUBS

The front and tag axle hubs shall feature unitized wheel ends (UWE) complete with factory pre-load bearing/hub assemblies, lubricant and seals.

The drive axle shall have nodular cast iron hub assemblies incorporating Pre-Set tapered roller bearings lubricated by differential oil at each axle end.

3.2.1.4 DRIVE SHAFT

The drive shaft shall be a minimum 3 inches (76 mm) outside diameter, heavy-duty type Meritor 1810 series or approved equal. The drive shaft shall be guarded to prevent it from striking the floor of the coach or the ground in the event of a tube or universal joint failure. U-joint end cap retaining bolts shall be retained by metal locking plates. Both half-round yoke ends shall be attached using self-locking bolts.

3.3 SUSPENSION

3.3.1 GENERAL REQUIREMENTS

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The front and rear axle suspension shall be pneumatic and equipped with straight side lobe air suspension bellows. Four suspension bellows shall be provided on the drive axle and two suspension bellows on the front axle. The tag axle shall be equipped with two straight side lobe type air springs, 9.5 inch (241 mm) nominal in diameter. Pressure in the tag axle suspension shall be automatically adjusted as required by the load-sharing system. Manual air dump valves for unloading the tag axle air suspension bellows shall also be provided in the engine compartment.

The basic suspension system exclusive of bellows, height control valves, bushings and shock absorbers, shall last the life of the coach without major overhaul or replacement. Four (4) heavy-duty rubber bushed silent block sleeve type radius rods shall be provided at both the front and rear drive axles to control lateral, longitudinal, and torsional movement. Radius rod bushings shall be Clevite or approved equal. One transverse stabilizing rod shall be provided on front axle for additional support during coach lane changing or turning of corners. The coach shall be equipped with a sway bar designed to reduce body lean and increase bushing life. Items such as bushings and air springs shall be easily and quickly replaceable. Adjustment points shall be minimized and shall not be subject to a loss of adjustment in service. Necessary adjustments shall be easily accomplished without removing or disconnecting the components.

3.3.2 SPRINGS AND SHOCK ABSORBERS

3.3.3 TRAVEL

The suspension system shall permit a minimum wheel travel of 3.5 inches (89 mm) in jounce and 3 inches (76 mm) in rebound. Elastomeric bumpers shall be provided at the limit of jounce travel. Rebound travel may be limited by elastomeric bumpers or hydraulically within the shock absorbers.

3.3.4 KNEELING

A driver-actuated kneeling device shall lower the coach floor 3.0 to 6.0 inches during loading or unloading operations regardless of load to a floor height of 42 inches (1.07 m) measured at the longitudinal centerline of the front door. The park brake shall prevent movement when the coach is kneeled. The coach shall kneel and rise at a maximum rate of 1.5 inches per second at essentially a constant rate. A flashing indicator visible to the driver shall be illuminated until the coach is raised to a height adequate for safe street travel. An audible warning device that operates with the kneeling system shall be provided. A visual indicator meeting ADA requirements shall be provided on the curbside of the coach and shall activate during the kneeling operation. This indicator shall be appropriately marked and visible to the boarding passenger.

3.3.5 DAMPING

Vertical damping of the suspension system shall be accomplished by hydraulic shock absorbers mounted to the suspension arms or axles and attached to an appropriate location on the chassis. Damping shall be sufficient to control coach motion to 4 cycles or less after hitting road perturbations. Shock absorbers shall maintain their effectiveness for at least 50,000 miles (80,467 km) in normal service. The coach shall be equipped with four shock absorbers on the drive axle and two on each side of the front axle and one on each end of the tag. Shock absorbers shall be interchangeable on each axle, side to side.

3.3.6 LUBRICATION

All elements of steering, suspension, and drive systems requiring scheduled lubrication shall be provided with grease fittings conforming to SAE Standard J534. These fittings shall be located for ease of inspection, and shall be accessible with a standard grease gun without flexible hose end from a pit or with the coach on a hoist. Each element requiring lubrication shall have its own grease fitting with a relief path. Lubricant specified shall be standard for all elements on the coach serviced by standard fittings. All fittings shall be standard pipe thread.

3.3.7 UNDERCOATING

Tectyl undercoating, or approved equal, shall be applied to the underside of the body, frame, and wheel wells. Undercoating overspray on the exterior of the coach shall be removed prior to delivery. Underbody components such as air suspension bellows and height control valves, shock absorbers, lubrication fittings,

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air brake system valves, brake lining, muffler and exhaust system components, drive shaft, and engine and transmission sumps shall be protected from undercoating overspray.

3.4 STEERING

3.4.1 STRENGTH

Fatigue life of all steering components shall exceed 1,000,000 miles (1,609,344 km). No element of the steering system shall fail before suspension system components when one of the tires strikes a severe road hazard. Inadvertent alternations of steering as a result of striking road hazards are steering failures. The steering column shall be manufactured by TRW or approved equal and shall provide both tilt and telescope features. The steering wheel shall be a wrapped, molded polypropylene. Finger grips shall be provided on the wheel, down and away from the driver. Steering systems that utilize an intermediate shaft to connect the main axle mounted steering box to the steering column shall utilize intermediate steering shafts manufactured by Dana Corporation or approved equal.

The front axle shall be rated at 16,000 pounds (7,257 kg) and shall be equipped with disc brakes and brake chambers with a load rating sufficient for the coach loaded to GVWR. Front axle shall be a standard, drop center type. Kingpins shall be the low friction, "Easy Steer" type for longer maintenance intervals.

3.4.2 TURNING EFFORT

The steering wheel shall be not less than 18 inches (457 mm) in diameter and shall be shaped for firm grip with comfort for long periods of time and shall not be padded. The steering wheel shall be removable with a standard or universal puller. Hydraulically assisted power steering shall be provided. The steering gear shall be an integral type with flexible lines eliminated or the number and length minimized. Steering torque applied by the driver shall not exceed 10-foot-pounds (13.6 Nm) with the front wheels straight ahead to turned 10 degrees. Steering torque may increase to 70-foot-pounds (95 Nm) when the wheels are approaching the steering stops. Steering effort shall be measured with the coach at SLW, stopped with the brakes released and the engine at normal idling speed on clean, dry, level, commercial asphalt pavement and the tires inflated to recommended pressure. Power steering failure shall not result in loss of steering control. With the coach in operation, the steering effort shall not exceed 55 pounds (25 kg) at the steering wheel rim and perceived free play in the steering system shall not materially increase as a result of power assist failure.

Caster angle shall be selected to provide a tendency for the return of the front wheels to the straight position with minimal assistance from the driver.

3.5 BRAKES

3.5.1 SERVICE BRAKE

3.5.1.1 ACTUATION

Service brakes shall be controlled and actuated by an air system. Force to activate the brake pedal control shall be an essentially linear function of the coach deceleration rate. The angle of the pedal shall be ergonomically designed to minimize fatigue. At least 6.0 inches (152 mm) of slack in the airlines shall be available to allow for change out of the brake treadle valve and pedal assembly. The brake pedal shall be slightly higher than the accelerator. Provisions at the front shall be made to activate the brakes from the towing vehicle. Release of the emergency/parking brake shall require one full application of the service brake once the emergency/parking brake release valve is depressed.

3.5.1.2 FRICTION MATERIAL

Brake pads shall be non-asbestos, and must be designed and approved for use on the vehicle being proposed. Brake pads must provide optimum performance with the brake system being used and shall minimize brake noise under all weather conditions.

3.5.1.3 ANTILOCK BRAKE SYSTEM

The coach shall be equipped with a Meritor Wabco or approved equal antilock brake system or approved

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equal electronic controller assembly that will provide full vehicle wheel control braking for the coach. The system shall utilize an antilock brake system with disc brakes. The design of the digital electronics shall provide a high degree of protection from radio and electromagnetic interference.

The antilock brake system shall provide individual wheel control by using a wheel speed sensor and modulator at the front axle, drive axle and tag axle. The drive axle brakes shall be controlled completely independent of each other and therefore brake application pressure at an individual wheel shall be adjusted solely on the basis of its behavior on the road surface on which it is traveling. Wheel speed sensors shall be provided on the drive axle and will simultaneously control the wheels on the tag axle. A single modulator shall be provided that controls both rear curbside wheels and another modulator shall control the rear roadside wheels.

Inputs to the electronic control unit (ECU) equal shall be generated from a tone ring (exciter) by wheel sensors, which generate a signal, which varies in voltage and frequency as the speed of the wheel increases or decreases. The wheel sensor shall provide wheel speed information at the rate of 100 pulses per wheel revolution. The unit shall simultaneously receive, and individually interpret speed signals from four wheel sensors.

Outputs from the unit shall be provided to Meritor Wabco or approved equal brake modulator. The modulator shall be capable of receiving signals from the ECU and shall be designed to modify operator applied air pressure to the service brakes. The modulator shall be located near the service actuator(s) it controls and shall be the last air valve through which air passes on its way to the brake actuator. A wiring harness shall connect each modulator to the ECU. Solenoid valves contained in the modulator shall provide the electrical interface between the controller electronics and the air brake system. The ECU shall be capable of simultaneously and independently controlling four individual modulator assemblies.

The antilock brake system logic shall be designed to respond to component equipment failure using a conservative fail safe philosophy. Any single electrical failure of a component devoted to antilock braking shall result in simultaneous illumination of the antilock condition lamp on the dash, a disabling of all or part of the antilock system, and reversion to standard braking on wheels no longer under the control of antilock. The ECU is divided into two separate parts, each equally controlling a pair of diagonal brakes. When a failure or damage occurs to one half of the ECU, ABS braking function shall be maintained in the wheels that are controlled by the working part of the ECU.

The wires that carry information and power into and out of the controller shall be terminated with a weatherproof connector with the wiring sealed to the connector with the exception of the ECU connectors. The wire gauge used shall be sized specifically for the task which it is designed to perform. A dashboard mounted antilock condition lamp shall be provided which shall be controlled by the ECU via the multiplex system and shall serve as a means of providing the operator with the operating condition of the antilock brake system. All electrical connections on the antilock system shall be Meritor molded connectors, or approved equal. The ECU shall utilize 4 amp "JUNIOR-POWER-TIMER" series connectors, or approved equal.

The Data Link function shall be provided which enables the ECU to report its operating condition to an external source. The controller data link configuration shall conform to SAE standard J1708 and the coded language used shall conform to SAE J1587. Two connections in the controller shall be provided.

3.5.1.4 ELECTRONIC STABILITY CONTROL (ESC)

ESC (Electronic Stability Control) shall be integrated with the ABS braking system to provide improved vehicle stability. Sensors within the brake system monitor coach sideways movement and rotation, steering angle and brake application pressure to maintain coach directional stability.

The Electronic Control Unit (ECU) containing directional sensors shall be located in baggage compartment #3. A steering angle sensor shall be located in the steering column. These systems feed information that interacts with the ABS system providing directional and braking control.

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The ESC/ATC telltale shall be located in the driver’s instrumentation and control center in the right hand telltale cluster. This telltale, along with the ABS telltale, monitors Electronic Stability Control (ESC) and Automatic Traction control (ATC) functions.

Automatic Traction Control (ATC) shall be integrated with the ESC (Electronic Stability Control) to improve traction on slippery surfaces by reducing drive wheel over-spin. ATC shall automatically switch ON and OFF as required by road conditions. If drive wheels spin during acceleration, the ATC telltale will come on, indicating ATC is active. It will go out when the drive wheels stop spinning and traction control is regained.

ATC Mud/Snow Feature

ATC shall include a deep snow and mud feature. This function increases available traction on extra soft surfaces like snow, mud, or gravel by slightly increasing the permissible wheel spin.

The deep snow and mud feature is not automatic. A switch shall turn this function ON and OFF. While this feature is selected, the ESC/ ATC telltale blinks continuously. Once the feature is no longer required, the switch shall turn the deep snow and mud feature off and the telltale will extinguish.

3.5.1.5 AIR SYSTEM

The coach air system shall operate all accessories and the braking system with reserve capacity. The engine drive Wabco SS636 37.4 cfm air compressor, or approved equal shall be sized to charge the air system brake reservoir from 0 psi. to the governor cutoff pressure of 125 psi.±2psi (862 kPa ± 14 kPa) in less than 3 minutes while not exceeding the engines rated speed. The air compressor shall be set to cut in at 105 psi (724 kPa).

Regardless of the systems air pressure, idle up to the rated engine speed shall be available to the driver with the transmission in neutral and the parking brake applied.

With the air system fully charged and the engine shut off, the reservoir capacity shall be sufficient to permit four full brake applications to maintain 60 psig (414 kPa). The pressure relief valve shall be mounted in the compressor cylinder head. The muffler or ping tank shall be mounted in the engine compartment relative to the air compressor discharge port. A drain mounted on the muffler or ping tank shall be directed or piped so as to discharge below the engine cradle or bulkhead level.

Air lines, except necessary flexible lines, shall conform to the installation and material requirements of SAE Standard J844-Type 1 or ASTM B-75 for copper tubing with standard, brass, flared or ball sleeve fittings, or SAE Standard J844-Type 3B for nylon tubing or ASTM

D-1248, Type 1, Class C Grade E5 for polyethylene tubing if not subject to temperatures over 200⁰

F. Accessory and other noncritical lines may use Type 3A tubing. Nylon tubing shall be installed in accordance with the following color coding standards:

HOSE COLOR	AIR SYSTEM INSTALLATION
Green	Indicates primary brakes and supply
Red	Indicates secondary brakes
Brown	Indicates parking brake
Yellow	Indicates compressor governor signal
Black	Indicates accessories
Blue	Indicates suspension

Line supports shall prevent movement, flexing, tension strain, and vibration. Copper lines shall be supported by looms, grommets, or insulated clamps to prevent the lines from touching one another or any component of the coach. To the extent practicable and before installation, the lines shall be pre-bent on a fixture that prevents tube flattening or excessive local strain. Copper lines shall be bent only once at any point, including pre-bending and installation. Rigid lines shall be supported consistent with standard

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automotive practice. Nylon lines may be grouped and shall be continuously supported.

The compressor discharge line between power plant and body mounted equipment shall be flexible extruded PTFE tube with stainless steel wire braid, Aeroquip 2807, or approved equal. Other lines necessary to maintain system reliability shall be flexible hose with a braided stainless steel jacket. End fittings shall be standard SAE or JIC brass or steel, flanged, reusable, swivel type fittings. Flexible hoses shall be as short as practicable and individually supported. They shall not touch one another or any part of the coach except for the supporting grommets. Flexible lines shall be supported at 2 foot intervals or less. Airlines shall be installed to minimize air leaks. Each coach shall not leak down more than 1.5 psi as indicated on the instrument panel mounted air gauges, within 15 minutes from the point of governor cut-off.

All reservoir supply and delivery airlines shall be sloped toward reservoirs and routed to prevent water traps. Grommets shall protect the airlines at all points where they pass through understructure components. Provision shall be made to apply shop air to a convenient location in the engine compartment and at the front of the coach and shall include a standard bore valve. The engine compartment valve shall be located ahead of a quarter turn valve. Air for the compressor shall be filtered through the main engine air cleaner system. All air reservoirs shall meet the requirements of SAE Standard J10 and shall be equipped with clean-out plugs and quarter-turn drain valves. These valves shall be protected from road hazards by major structural members. The air system shall be protected by a pressure relief valve set at 200 psi (1,379 kPa) at the air dryer and

150 psi (1,034 kPa) at the compressor. The air system shall also be equipped with check valves and pressure protection valves to assure partial operation in case of line failures.

The main airline check valve located between the air compressor and the first reservoir must be accessible for maintenance. Means shall be provided to establish the check valve to be in working order.

A Wabco SS1200 Plus or approved equal air dryer shall be provided and installed according to component manufacturer recommendations.

3.6 GENERAL CHASSIS

3.6.1 WHEELS AND TIRES

3.6.1.1 WHEELS

Hub-piloted 9" aluminum Alcoa or approved equal wheels shall be provided. All wheels shall be interchangeable and shall be removable without a puller. Wheels shall be compatible with tires in size and load-carrying capacity. All wheels and tires shall be balanced as an assembly. One spare wheel, complete with mounted tire shall be provided.

The wheel nuts shall meet all physical property requirements defined in ASTM A 194-2H, ISO and SAE standards. The nut shall be coated for corrosion resistance. The bench testing requirements for the lug nuts shall satisfy MIL-STD 1312 vibration test 7 and the Junkers dynamic test. Front and tag axle lugnuts shall be standard Meritor or approved equal components.

3.6.1.2 TIRES

The tires shall be supplied by the vehicle manufacturer. Tires, including spare, shall be Firestone FS-400, 315/80R-22.5, 20 ply, load range L or approved equal. Tires shall be suitable for the conditions of commuter service and sustained operation at the maximum speed capability of the coach. Load on any tire at GVWR shall not exceed tire supplier's rating. Tires shall provide the ride, noise, and handling characteristics associated with the demands of commuter service.

3.6.2.1 – 3.6.2.8 N/A

3.6.3 BUMPERS

3.6.3.1 LOCATION

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Bumpers shall provide impact protection for the front and rear of the coach up to 26 inches above the ground. The bumpers shall wrap around the coach to the extent practicable without exceeding allowable coach width.

3.6.3.2 FRONT AND REAR BUMPERS

The **front bumper** assembly, nominally 20 inches (508 mm) high, shall consist of three energy absorbing modules that are self-restoring black urethane with minimum 1700 psi (11,721 kPa) tensile strength, 250 % elongation, and 350 psi (2,413 kPa) tear strength. The hollow ribbed black urethane cover will have excellent resistance to tears, abrasion, salt, hydro-carbons, detergents, sunlight, and will be repairable. An inner support structure constructed of aluminum or high strength steel shall provide a single, full length structural support for bumper the modules. The bumper assembly shall be hinged at the bottom for access to the spare tire, with the bumper release lever located at the top of the front roadside service compartment.

The **rear bumper** will be nominally 11 inches high (279 mm) consisting of a rigid steel and aluminum inner support structure with a repairable hollow ribbed black urethane cover. The bumper shall be shaped to wrap around the coach rear corners to protect the engine compartment doors and will also incorporate an anti-ride, or pinning feature to prevent unauthorized riders.

The complete assembly will be self-contained, self-restoring and maintenance-free.

3.6.4 ELECTRICAL SYSTEM

3.6.4.1 GENERAL REQUIREMENTS

The basic coach electrical system shall utilize multiplexed Power Management Modules (PMMs) from Actia, or approved equal. Versatility and future expansion of the system shall be provided for by expandable system architecture. The system shall be SAE J1939 compatible. A gateway used to interface between different communications protocols shall be built directly into the PMMs.

The system components shall be capable of reliable operation in an environment of between minus 30C to plus 80C while encountering mobile shock and vibration. Each module shall be adequately shielded to prevent interference by EMI. The multiplex power source shall be isolated, thereby minimizing any ground signal noise. A built in self-test system shall be utilized to check for module communication failures or output feedback problems within the system, and shall display faults on the LCD Diagnostic Interface

The components of the multiplex system shall be of modular design thereby providing for ease of replacement by field maintenance personnel. Power management modules will have the ability be re-programmed from existing PMMs on the coach. Four PMMs shall be distributed throughout the coach (one under the front junction box, one in baggage bay #1, and two in baggage bay #3). Each module shall have 29 programmable inputs and 44 programmable outputs.

An optional 7" diagonal color LCD touch screen with 800 x 480 screen resolution shall be incorporated to provide system status and diagnostics.

Two Leece Neville 24 volt 140 amp alternators, or approved equal shall be provided. All circuits shall be protected by circuit breakers, fuses or solid state devices. Only the bus body and framing shall be used to attach ground studs. Grounds shall not be carried through hinges, bolted joints (except those specifically designed as electrical connectors), or power plant mountings. Wiring and electrical equipment necessarily located under the coach shall be insulated from water, heat, corrosion, and mechanical damage.

3.6.4.2 MODULAR DESIGN

Design of the electrical system shall be modular so that each major component, apparatus panel, or wiring bundle is easily separable with standard hand tools or by means of connectors. Each module, except the main body wiring harness, shall be removable and replaceable in less than 30 minutes by a mechanic. Power plant wiring shall be an independent wiring module. Replacement of the engine compartment wiring module(s) shall not require pulling wires through any bulkhead or removing any terminals from the wires.

3.6.4.3 JUNCTION BOXES

All relays, controllers, and other electrical components shall be mounted in easily accessible junction boxes. The boxes shall be sealed to prevent moisture from normal sources, including engine compartment cleaning, from reaching the electrical components and shall prevent fire that may occur inside the box from propagating outside the box. A rear start and run control box shall be mounted in an accessible location in the engine compartment. No electrical controls shall be located where spillover from the surge tank can wash over the electrical controls or enter junction boxes.

Care shall be taken to route electrical harnesses from junction boxes to facilitate troubleshooting and to reduce defects. Terminal strips not blocks shall be used to make connections. Wiring under the coach floor in the baggage area shall be routed in an enclosed trough.

3.6.4.4 WIRING AND TERMINALS

All wiring between major electrical components and terminations, except battery wiring, shall be waterproof, and shall meet specification requirements of SAE Recommended Practice J555 and J1128 Type GXL or TXL. All wiring harnesses manufactured for buses purchased under this contract shall be designed and manufactured for the operation of all sub components installed on the buses. Harnesses shall be properly designed and sized to the bus. Battery wiring shall conform to specification requirements of SAE Standard J1127-Type SGX, SGT or SGR and SAE Recommended Practice J541.

All wiring shall be properly grouped, numbered, and color-coded full length. Numbering shall be stamped at least every two (2.0) inches (50.8 mm). Installation shall permit ease of replacement. All wiring harnesses over 5-feet (1.50 meters) long and containing at least five (5) wires shall include at least 2 or 10 percent excess wires whichever is greater for spares, excluding the battery cables. In addition, twelve (12) spare wires (excluding battery cables) shall be provided between the front and rear junction boxes. Wiring harnesses shall not contain wires of different voltages unless all wires within the harness are sized to carry the current and insulated for the highest voltage wire in the harness.

Wire insulation shall be maintained as close to the terminals as practicable. The requirements for double insulation shall be met by wrapping harnesses with plastic electrical tape or by sheathing all wires and harnesses with nonconductive, rigid or flexible conduit. Grommets of elastomeric materials shall be provided at points where wiring penetrates the metal structure. Wiring supports shall be nonconductive. Precautions shall be taken to avoid damage from heat, water, solvents, or chafing. Wiring length shall allow replacement of end terminals twice without pulling, stretching, or replacing the wire.

Except for those on large wires such as battery cables, terminals shall be crimped to the wiring. Terminals shall be full ring type or interlocking and corrosion-resistant. T-splices may be used when it is less than 25,000 circular mills of copper in cross-section: a mechanical clamp is used in addition to solder on the splice; the wire supports no mechanical load in the area of the splice; and the wire is supported to prevent flexing.

3.6.5 ELECTRICAL COMPONENTS

3.6.5.1 GENERAL REQUIREMENTS

All electrical components, including switches, relays, and circuit breakers, shall be heavy-duty designs. To the extent practicable, these components shall be designed to last the service life of the coach and shall be replaceable in less than twenty five (25) minutes by a mechanic. Sockets of plug-in components shall be polarized where required for proper function and the components shall be positively retained. Any manual reset circuit breakers critical to the operation of the coach shall be mounted in a location best suited to the application with visible indication of open circuits. The electric motor shall be heavy-duty either wound field type or permanent magnet, as listed below. Electric motors shall be located for easy replacement and except for the cranking motor the brushes shall be replaceable in less than fifteen (15) minutes without removing the motor. Provision shall be made to ensure that the lubrication line for alternator bearing is secured to prevent lubricant leaks.

SYSTEM MOTOR	TYPE Main
Evaporator	Brushless DC
Condenser Motors	Brushless DC
Driver's Heater and Defroster	Permanent Magnet
Windshield Wiper Motor	Permanent Magnet
Windshield Washer Motor	Permanent Magnet

Dual electric horns shall be provided. Horns shall be positioned to be protected from road hazards and the elements. The horn trumpets shall be down turned to assure drainage of any moisture that may have entered.

3.6.5.2 BATTERIES

Batteries shall be easily accessible for inspection and serviceable only from outside the coach. Batteries shall be of premium construction and shall be fitted with threaded stud terminals. Batteries shall be 8D with 1350 cold cranking amp capacity with 450 CCA reserve minimum. Positive and negative terminals shall have different size studs, and the battery terminals and cables shall be arranged to prevent incorrect installation. Battery terminals shall be located for access in less than thirty (30) seconds with jumper cables. No less than two conventional lead-acid batteries conforming to SAE Standard J537-Type 20T8 shall be provided. Battery cables shall be flexible and sufficiently long to reach the batteries in extended positions without stretching or pulling on any connection and shall not lie on top of the batteries. Battery cables are black with red heat shrink on the end for 24V (+), blue heat shrink for 12V (+) and white heat shrink for ground (-). A slave connection to the batteries shall provide a direct connection to the batteries for jump starting.

3.6.5.3 MASTER BATTERY SWITCHES

A master battery switch shall be provided near the batteries to provide complete, simultaneous disconnecting of the batteries from all bus 12 & 24 volt electrical systems. The master switch shall be a "rotary" style switch. The master switch shall be located behind a dedicated access door and shall be accessible in less than ten (10) seconds for operation. The master switch shall be capable of carrying and interrupting the total circuit load. Opening the master switch with the engine operating shall not damage any component of the electrical system.

3.6.5.4 RADIO NOISE SUPPRESSION

Proper suppression equipment shall be provided in the electrical system to eliminate interference with radio and television transmission and reception. This equipment shall not cause interference with any electronic system on the coach. Suppression shall be in accordance with SAE Practice J1708 and FCC standards.

3.7 INTERIOR CLIMATE CONTROL

3.7.1 CAPACITY AND PERFORMANCE

The climate control system shall be highly reliable since most failures are Class 2. Manually controlled shut-off valves shall be installed in the refrigerant lines before and after the filter dryer to allow isolation of the dryer for service. Manually controlled shut-off valves in the refrigerant lines shall allow isolation of the receiver and compressor for service. Self-sealing couplings or manual shut-off valves shall be used to break and seal the refrigerant lines during removal of major components such as the refrigerant compressor or condenser. Condenser and evaporator fans shall have a protective guard to prevent contact between mechanics and rotating fan blades. The appropriate safety warning labels shall be permanently affixed at this location.

Interior climate control system shall be provided and operate on refrigerant 134a. It shall maintain the interior of the coach at a level suitable for climate conditions found in the continental United States. The heating, ventilating, and cooling systems shall maintain an average passenger compartment temperature

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between 60 ~~and 80 °F~~ (27° C) with a relative humidity of 50 percent or less. The system shall maintain these conditions in a ambient temperature range of 10°F to 100°F (12° C to 38° C), with a ambient humidity range of 5 to 100 percent while the coach is running. In ambient temperatures of 95°F to 115°F (35° C to 46° C) with relative humidity greater than 50 percent, the system shall maintain a temperature gradient of 20°F (7° C) while the coach is running. In ambient temperatures of 10°F to -10°F (12° C to - 23° C), the average interior temperature shall not fall below 55°F (13° C) when the coach is running with no passengers.

The air conditioning (AC) compressor shall be a four cylinder, short stroke – 1.65 inch, 2.76 inch bore, 39.4 cubic inch (.65 liter) displacement with a 500 – 3500 RPM range MCI 003 (Bitzer 4NFC), or approved equal. The compressor head and body shall be of rust proof aluminum construction, providing a light weight, compact and efficient unit. The connecting rods shall be of one piece construction for easy, long-life maintenance. Exchangeable cylinder liners shall be used in the cylinder bores for long service life and easy and efficient maintenance. The compressor shall be belt driven through a bi-directional & maintenance free magnetic clutch. Modern, environmentally friendly chlorine free refrigerants can be used with the compressor.

Compressor drive belts shall be manufactured from Kevlar[®] material to provide longer service life. A manually adjustable belt tensioning device shall be provided to maintain proper belt tension.

The main air conditioning system capacity shall be at least 90,000 Btu's/hr. (26,376 W) with R134a. Driver's A/C capacity shall be at least 10,800 Btu's/hr. (3,165 W).

The condenser fan motors with shrouded axial fans shall be brushless type with totally enclosed grease lubricated bearings. Motor shall be 24 volt, minimum 2 horsepower (1.5 kw) and operate only when the A/C is on for maximum efficiency. The condenser core shall be located to the rear of the number 2 baggage bay and include copper tubes and e-coated aluminum fins and have approximately 1,200 in² (7,742 cm²) of condensing surface. The receiver tank shall be equipped with a refrigerant sight gauge to be viewed through a window in the left-hand number 3 baggage compartment.

The evaporator shall be mounted under floor in the same compartment as the heater core for "Reheat Cycle" and humidity control and shall include copper tubes and aluminum fins.

A separate control shall be provided for the front dash heating and air conditioning, as well as for the main under floor unit. A HVAC system control panel is required for the main under floor system. Control shall be within easy reach of the operator. The system shall allow the driver to set a specific interior coach temperature between the range of 60° F (16°C) and 80° F (27°C). The outside temperature can be displayed by switching between interior and exterior on the control panel. The HVAC controller shall monitor the temperature so that the interior temperature selected is maintained consistently. Where practicable, all controls shall be of a solid state design.

The system shall be designed with return air ducts at both front and rear of coach for balanced airflow. The system shall introduce a minimum of 10% fresh outside air when the fresh air intake is open.

Heat shall be applied to the front step tread to prevent accumulation of snow, ice, or slush. Step well heat shall be supplied and controlled by the driver's heater and defroster system. The manufacturer shall provide and install two valves with caps near the air conditioning compressor.

All electric motors which are part of the climate control system shall be permanent magnet type, except the Condenser and Main Evaporator motors, which shall be brushless type. Motors shall have double sealed, pre-lubricated anti-friction, replaceable ball bearings with moisture resistant grease. 3/8 inch (10 mm) and 5/16 inch (8 mm) diameter zinc terminal studs with bonded internal motor leads and anti-rotation insulators shall be used except driver's evaporator and parcel rack evaporators.

3.7.2 CONTROLS

The heating, cooling, ventilating and off operational modes of the interior climate control system shall be controlled by switches or displays conveniently located to the driver. In the heating and cooling modes,

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the system shall be governed by an electronic control that regulates the amount of cooling and heating capacity available to the passenger area. The temperature will be adjustable between 60°F (16°C) and 80°F (27°C). The temperature sensors used must be suitable for transit service and accurate to +/- 1°F.

3.7.3 AIR FLOW

3.7.3.1 PASSENGER AREA

The cooling mode of the interior climate control system shall introduce air into the coach up along the sidewall at a minimum rate of 25 cubic feet (0.71³ m) per minute per passenger based on the standard configuration coach with full standee load. This air shall be composed of no less than 10 percent outside air. Airflow shall be evenly distributed throughout the coach with air velocity not exceeding 60 feet (0.305 meters) per minute on any passenger.

Airflow may be reduced to 15 cubic feet (0.43³ m) per minute per passenger when operating in the heating mode with full standee load. Heated air introduced into the coach shall contain no less than 10 percent outside air. In the heating mode, the fans will activate immediately to assure an air outlet temperature of 70 degrees F (21° C). Outside airflow may be cut off during initial warm up/cool down, provided that manual adjustment is not required.

3.7.3.2 DRIVER'S AREA

The coach interior climate control system shall deliver at least 200 cubic feet (6.0³ m) per minute of air to the driver's area when operating in the ventilating and cooling modes. Adjustable nozzles shall permit variable distribution or shut down of the airflow. A separate heater or windshield defroster unit shall be capable of diverting heated air to the driver's feet and legs. The defroster motor shall be a permanent magnet type motor. The defroster or interior climate control system shall maintain visibility through the driver's side window. A separate evaporator, fan and control shall supply conditioned air to the driver's area.

3.7.3.3 AIR INTAKE

Outside openings for air intake shall be located to ensure cleanliness of air entering the climate control system, particularly with respect to exhaust emissions from the coach and adjacent traffic. All intake openings shall be baffled to prevent entry of snow, sleet, or water. Outside air shall be filtered before discharge into the passenger compartment. More efficient air filtration may be provided to maintain efficient heater and/or evaporator operation. The air filter shall be easily removed for service. Moisture drains from air intake openings shall be located so that they will not be subjected to clogging from road dirt, but shall be accessible for cleaning and inspection.

3.8 RADIO AND PUBLIC ADDRESS

3.8.1 MOBILE RADIO SYSTEM

A radio compartment, antenna, conduit, electrical and other requirements shall be provided to support a mobile radio system as and if required by the end user. The location, materials, and installation of all items installed on the coach in support of the mobile radio equipment is subject to approval by the end user. Any special tools required such as, but not limited to, security screwdrivers and latch handles shall be supplied.

3.8.2 PUBLIC ADDRESS SYSTEM

A public address system shall be installed that enables the driver to address passengers either inside or outside the coach. A total of at least 20 interior speakers shall broadcast, in a clear tone, announcements that are clearly perceived from all seat positions at approximately the same volume level. Speaker shall be provided outside above the entrance door so that announcements can be clearly heard by passengers standing near the door(s). A driver controlled switch shall select inside or outside announcements. The system shall be muted when not in use. The microphone shall not interfere with the operation of the mobile radio system.

3.8.3 ENTERTAINMENT SYSTEM

An in vehicle passenger entertainment system shall consist of 1 AM/FM/CD/DVD/Radio in dash within reach

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of the vehicle operator. A minimum of six 10" or greater LCD monitors shall be placed strategically for maximum passenger viewing.

3.9 EMERGENCY EQUIPMENT

On board emergency equipment, per Federal Motor Carrier Safety Regulations Part 393, shall be provided with each coach. The equipment shall be mounted out of the way of passengers but shall be readily accessible:

Fire Extinguisher - 5 pound (2.3 kg) capacity, Underwriter's Laboratories rating of A, B, C or more, marked as such with charge indicator, mounted in a cradled bracket.

Emergency Warning Triangles - Three bi-directional emergency reflective triangles conforming to the FMVSS 125 in a case and mounted in the battery compartment.

4.0 OPTIONAL EQUIPMENT

A list of optional equipment and/or accessories shall be provided. The list must contain:

- Item
- Description and functionality detail
- Cost of item installed in final delivery of vehicle
- Any changes to listed specifications as outlined above to accommodate options

SECTION "U"
45' DIESEL MOTOR COACH
RESPONSE SHEET

BASE
VEHICLE

COST PER
UNIT

Transit Bus

\$_____ / ea.

Specify Overall Vehicle Length (outside of front bumper to outside of Rear bumper):_____

OPTIONAL ITEMS

COST

Please list available Optional Items for this vehicle. Price should include cost of installation.

1. \$_____ /ea.

2. \$_____ /ea.

3. \$_____ /ea.

4. \$_____ /ea.

5. \$_____ /ea.